



UNIVERSIDADE DE LISBOA  
INSTITUTO SUPERIOR TÉCNICO

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

## **Modern Schools in Angola, 1961-1975 Design with Climate and Heritage**

Maria Margarida Gonçalves Quintã

Supervisors: Doctor Ana Cristina dos Santos Tostões

Doctor Franz Graf

Thesis approved in public session to obtain the PhD degree in Architecture

Jury final classification: Pass with Distinction and Honour





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# Modern Schools in Angola, 1961-1975

## Design with Climate and Heritage

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PhD in Architecture

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### Abstract

The architectural production of Angola between 1961 and 1975 forms the basis of the current study. Taking into consideration that buildings' environmental performance is, at one time, one of the most central aspects of the Modern Movement legacy and a pressing topic in Angolan contemporary renovations, this study will test climate-responsiveness as a design-tool for the re-use of modern buildings.

Looking at the environmental performance of modern schools, this research aims to provide critical insight into the Angolan architectural output during the last years of Portuguese colonial rule. In that period, within a changing society, locally-designed buildings attempted to respond to site-specific concerns.

Focusing on passive environmental solutions for educational buildings, the central objective of this research is to identify suitable strategies for these building's contemporary re-use, matching heritage conservation with Angola's pressing demands for development. Such guidelines, conceived under the current standards of comfort and energy efficiency, should span the distinct steps of the preservation project, from strategic design to construction details.

### Keywords

Angola;  
XXth century architecture;  
tropical climate;  
passive environmental control;  
educational buildings;



# **Escolas Modernas em Angola, 1961-1975**

## **Projetar com o Clima e o Património**

Maria Margarida Gonçalves Quintã

Doutoramento em Arquitectura

Orientadores: Doutora Ana Cristina dos Santos Tostões e Doutor Franz Graf

### **Resumo**

A produção arquitetónica de Angola entre os anos de 1961 e 1975 é o objeto de estudo da presente dissertação. Partindo do princípio que o desempenho ambiental dos edifícios é, simultaneamente, um dos aspetos mais centrais do legado do Movimento Moderno e um tema premente nas renovações contemporâneas em Angola, este estudo testa as estratégias de adequação climática enquanto ferramenta de desenho arquitetónico para o re-uso de edifícios modernos.

Analisando o desempenho ambiental das escolas modernas, esta investigação visa fornecer uma visão crítica sobre a produção arquitetónica angolana durante os últimos anos do domínio colonial português. Nesse período, no contexto de uma sociedade em mudança, os edifícios projetados localmente tentaram responder às preocupações específicas do local.

Tendo como foco soluções ambientais passivas para edifícios educacionais, o objetivo central desta investigação é identificar estratégias adequadas para a reutilização contemporânea destes edifícios, combinando a conservação do património com as exigências prementes para o desenvolvimento de Angola. Tais diretrizes, concebidas sob os padrões atuais de conforto e eficiência energética, devem abranger as diferentes etapas do projeto de preservação, desde a concepção estratégica até aos detalhes construtivos.

### **Palavras-chave**

Angola;  
arquitetura do séc. XX;  
clima tropical;  
sistemas passivos de controlo ambiental;  
edifícios escolares;



# Acknowledgments

This thesis was only made possible with the help of many dear and generous people.

I owe an immense debt of gratitude to my supervisors, and I would first like to thank Ana Tostões, for her enthusiastic encouragement to develop this research and for her valuable suggestions during the process. I am also deeply indebted to Franz Graf for sharing his expertise on preservation strategies for twentieth-century buildings in Europe and for encouraging me to look at existing buildings as resources.

My research was funded by the Fundação para a Ciência e Tecnologia in Portugal, under the Joint Doctoral Initiative between the IST, in Lisbon, and the EPFL, in Lausanne, and it was enriched by the time I spent at both institutions. I therefore extend my thanks to IST's Doctoral School and to the EPFL's Institute of Architecture, namely to Luca Orтели, and to all the team members of TSAM who welcomed me in Lausanne between 2013 and 2015: Giulia Marino, Yvan Delemontey, Melanie Delaune, Stephan Rutishauser, Michael Wyss.

This work was to a great extent determined by the long periods spent in Angola where I benefited from the tireless assistance yielded by the partners of Iperforma, who provided logistical support during my travels throughout the country. In Luanda, Saurimo, Huambo and Lobito I benefited from the comfort of their facilities and the kind assistance of their staff, namely: Eduardo Coelho, Anacleto Cungumala, Alcino Gomes, Tomé Gungui, and Carlos Machado.

I am also deeply indebted to Francisco Castro Rodrigues, Francisco Silva Dias, Antonieta Jacinto, Mário Vieira da Costa, José Quintão, and Fernão Simões de Carvalho for their testimonials and for allowing me to go through their personal archives; and also to the architects and cultural agents that I met in Angola, with whom I discussed the future of twentieth-century buildings: Ilídio Daio, Ricardo Gerick, Isabel Martins, Ângela Mingas, Paula Nascimento, Cristina Pinto (Associação Kalu), Filomeno Saraiva, Christiane Schultz (Goethe Institut), and Carlos Taboada.

I furthermore extend my thanks to the following individuals and their institutions: Rui Marques, Luís Felix da Mota (Laboratório de Engenharia de Angola); Honoré Mbunga, Domingos Mateus Neto (Arquivo Histórico Nacional de Angola); Isabel Martins (Faculdade de Arquitectura da Universidade Agostinho Neto); Tomás Pena (Lupral); Ana Canas (Arquivo Histórico Ultramarino); Irene Figueiredo (Gabinete de Estudos, Planeamento e Estatística do Ministério da Educação); António Flor (Secretaria de Estado da Construção); Cecília Maria dos Santos Gorgel (Instituto Nacional do Património Cultural); Pedro Chissanga (Património Cultural do Huambo); Fernando Maia (Faculdade de Medicina Veterinária da Universidade José Eduardo dos Santos); Cristóvão Simões (Reitoria da Universidade José Eduardo dos Santos); Calunga Francisco Zage Quissanga (Serviços Técnicos e Infraestruturas do Huambo); Argentino Moma (Brigada 74 das Forças Armadas Angolanas); Narciso Jorge (NJ Design); Mário Tavares (Perfil Construções); José Haleca, Evaristo Manjenje (Escola Secundária do 1º Ciclo Comandante Valódia, Lobito); Fernando Zeca (Escola I Ciclo Ensino Secundário, Saurimo).

Finally, my heartfelt gratitude goes to Maria Albuquerque, Barbara Althaus, Joana Barros, Marta Brandão, Soraia Fernandes, Carlos Guimarães, Francisca Lopes, Mafalda Maurício, José Mota, Célio Pereira, Helga Pinto, Afonso Quintã, and Luís Ribeiro da Silva, and above all to my family and closest friends, whose unconditional support carried me through all adversity.



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# Introduction

I spent my childhood hearing my father's stories of the distant, tropical Angola in which he grew up. I heard time and again about the sublime beaches of the peninsula of Mussulo, where my pregnant grandmother had arrived on a liner in 1955 just before giving birth to my father, and where my family spent the most joyful weekends for nearly two decades. Yet time and again I did not hear the accounts of the outbreak of the civil war that forced my family to flee the country in 1975, as if the intactness of my father's memories would be paralleled by the intactness of his motherland.

I was about ten years old when my father was finally able to return to Angola in the early 1990s, at a time when the civil war still overshadowed the country. I recall vividly the videos that he made during his drives around Luanda, for I had never seen so much destruction. Such dissonance between my father's videos and my childhood's memories made a tremendous impression on me, while increasing exponentially my attraction towards Angola.

It was only as an architecture student in Porto that I got my first glimpse of the twentieth-century architecture of Luanda. 2002, the year peace was finally restored in Angola, was also the year of the publication of *Geração Africana*, a book focusing on the architectural production of Portuguese architects in the African colonies from the 1950s to the 1970s. The book is mainly a collection of black and white photographs of outstanding buildings, such as the expressionist *O Leão que Ri* by Pancho Guedes in Mozambique, and of other at the time less known Angolan buildings, such as the colossal Kinaxixe market by Vieira da Costa, or the Flamingo open-air cinema by Castro Rodrigues. The book had no drawings of the buildings and no information whatsoever about their location or current situation. All the published illustrations came from private archives, as the author based his research in interviews with several of these architects. It looked rather like an old photo album that depicted a lost modern architecture.

In 2006, four years past the publication of *Geração Africana*, I finally got the chance to visit Angola. I remember being very impressed by Luanda's architecture, which seemed to be frozen in time. The country was slowly healing from the war and only then were the first tall buildings rising in the capital.

I travelled to Luanda to develop my graduation thesis on the work of Vasco Vieira da Costa, the forerunner of architectural modernity in the country from the 1950s to the 1970s. At that time, searching for Vieira da Costa's buildings was something of a treasure hunt, as all I could rely on was a city map and a vague idea about the buildings' potential location.

It was June, around the winter solstice, and despite Luanda's foggy *cacimbo* weather, I was travelling in cars with locked doors, closed windows, and strong air-conditioning. Strong air-conditioning was in fact the common denominator of most of the spaces I was going to — offices, houses, restaurants — and it was only when I visited the school Pio XII that I experienced one comfortable interior space that was frankly connected with the outdoors.

The school Pio XII was also the first well-preserved building I encountered. All the other works I had visited were either very derelict or in ruins. The buildings that were still in use had been invariably transformed to incorporate air-conditioning systems. For the first time, I could see the original materials intact: terrazzo floors, glass mosaic-

tilled walls, impeccable wood frames, handrails, ceilings, lamps, and furniture. Perhaps even more surprisingly, windows still had glass louvers, and the sun shading movable vertical blades were fully operating.

The building was still used as a school for social work education, and it was something of an oasis, surrounded by lush greenery in the middle of a red earth desert. Windows and doors were wide open and the atmosphere was mild, refreshed by the shade of trees and sun protection devices. I had already seen concrete *brise-soleils* and other shading mechanisms in the other buildings of Vieira da Costa, but I hadn't yet experienced the proper use of natural ventilation: the passive techniques for environmental control of the school Pio XII just worked flawlessly for Luanda's hot humid climate.

I was so impressed by these architectural qualities that my graduation thesis ended up tackling the climatic performance of the buildings I visited in Luanda. My research was built upon my field surveys, with particular emphasis on the analysis of the buildings' masterfully solar and wind orientation. By identifying and analysing the mechanisms of climatic responsiveness in Vieira da Costa's works, namely the shading and ventilation components and systems, I was able to critically reflect on the architectural constraints of a tropical savannah climate, and to recognize the dialectical relationship between the functional, technical and poetic dimensions of Vieira da Costa's architecture.

As I developed my analysis, it became clear that Vieira da Costa used analytical design methods in a very consistent way. He wrote about what he considered the ideal building orientation,<sup>1</sup> but he rarely used it. More often than not it was the plot that influenced the buildings' direction, and the shading and ventilation mechanisms were different each time, designed to fit the singular conditions of each typology and location.

In the years that followed my study Angola experienced great economic development. After the end of the civil war there was a very significant real estate investment in Luanda, which was ranked as the most expensive city in the world in 2013.<sup>2</sup> The rapid expansion of Angolan cities in recent years, both economically and demographically, has challenged the contemporary practice of architecture, and at the same time put at risk the integrity of the local architectural heritage.

As a result of the post-civil war urge for development, the Angolan construction industry has grown massively in the last fifteen years. Contractors from abroad, especially from China and Portugal, are rebuilding the country's infrastructure and reshaping cities. However, because manufacturing industries are scarce, this building activity is based on the huge import of materials and equipment. Likewise, design solutions are mostly imported and frequently ignore local conditions.

The declined legacy of the Modern Movement is still today the face of Angolan cities, but the country's reconstruction demands novelty with astonishing haste. Within this context, several 20th century buildings have been demolished in spite of their historical relevance, and others have been revamped beyond recognition.<sup>3</sup>

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<sup>1</sup> The notion of 'compromise solution' in: COSTA, V. V. (1969) "Breves considerações sobre urbanismo tropical em zonas rurais", in *Segundas Jornadas de Engenharia e Arquitectura do Ultramar, volume IV, Comunicações*, Luanda: LEA.

<sup>2</sup> According to Mercer's 2013 cost of living survey, Luanda is the most expensive city in the world for expatriates.

<sup>3</sup> See, for instance, the new glass envelope of the Presidente Hotel in Luanda. The Modern building designed by António Campino in 1960 became unrecognizable after the façade's refurbishment.

The most extreme example so far was the demolition of the Kinaxixe Market in 2008,<sup>4</sup> to give way to the construction of a new complex with 22 floors, which includes a shopping center, offices and high-class housing. The demolition was greatly contested by Angolan public opinion, especially by architects such as Ângela Mingas or Isabel Martins.<sup>5</sup> Furthermore, numerous buildings are being radically modified, mainly to improve their environmental performance. The most common and invasive transformations are often the result of introducing air-conditioning systems, which are considered to be a prime necessity. In fact, although adaptability to climate is one of the most singular features of the Angolan Modern legacy, the performance of buildings' passive devices is often largely diminished by a general lack of maintenance: sun-shading and natural ventilation mechanisms have become ineffective due to decades of neglect and distorted transformations.

It is in this context that contemporary expectations concerning interior comfort are demanding the widespread use of air-conditioning and underestimating passive solutions. But introducing artificial devices instead of maintaining natural systems of environmental control is far from being a decision based on actual comfort gains. As a matter of fact, there are no reports on energy expense and patrimonial damage resulting from such practice.

It is therefore imperative that research in architecture is embraced as a vital tool to face the contemporary challenges of Angola's reconstruction process. Reconciling modern buildings' environmental comfort with their patrimonial value is a challenge that must be met at a design stage, within the preservation project. Furthermore, knowledge on passive systems of environmental control must still be deemed as a contemporary design tool.

In Angola, twentieth-century architecture is considered banal. The buildings that are considered special, i.e. monuments, are those that escape the 'modern trend', as expressed in the 1992s heritage law.<sup>6</sup> This has led sometimes to a biased vision over the buildings' historical and patrimonial relevance, which has resulted in the protection of twentieth century revivalist buildings instead of more cutting edge architectural examples. For instance, the Banco Nacional de Angola designed in Lisbon by Vasco Regaleira, is a 1950s traditionalist building rather evocative of an European tradition, which was classified as an Angolan monument in 1995.<sup>7</sup> At the same time, the cutting-edge Kinaxixe Market, designed in Luanda in 1950 by the Angolan architect Vasco Vieira da Costa, was sadly demolished.

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<sup>4</sup> The demolition of the Kinaxixe Market in 2008 represents the neglect for the country's Modern legacy. The Market, Modern Luanda's landmark, was the first work by Vasco Vieira da Costa and was built from 1951 to 1958.

<sup>5</sup> Academics and civil society are currently trying to respond to the rapid transformation of Angola's capital in recent years. The campaign 'Reviver Luanda' is organized by a group of architects and historians who are trying to raise awareness of buildings' patrimonial value, by preparing conferences and city tours.

<sup>6</sup> "Embora vigore a tendência do modernismo, restam ainda alguns exemplares de diferentes séculos (XVII-XIX) representando o gosto e a arquitectura dominante em diferentes períodos da época colonial. (...) havendo necessidade de salvaguardar esses monumentos de eventuais danos, naturais ou intencionados, são classificados os seguintes edifícios" In Despacho nº 47 de 8 de Julho de 1992, p.1.

<sup>7</sup> "O edifício do Banco Nacional de Angola foi construído nos anos 50, sendo na altura filial do Banco de Portugal. Tratando-se de uma construção que é um documento vivo da história socioeconómica de Angola; considerando que se trata de um dos edifícios do século XX que merece ser preservado e protegido, (...) é classificado como Monumento Histórico." In Despacho nº 27, de 8 de Abril de 1995, p.1.

If however some of these tokens of modern architecture have the potential of being acknowledged as historically relevant, most of them do not. Yet these ordinary buildings make up a significant part of the country's resources, which can either be transformed and totally wasted, or re-used in a sensible and productive way. This choice relies not only on developers but also on contemporary architects, and on their sensibility towards this heritage. I would thus argue that, in order to build a critical interpretation, we must start by conducting a serious and committed analysis of these buildings' material histories.

This dissertation thus emerges as a venture for the comprehension of the exceptional climactic performance of the Modern architecture of Angola. I have selected as the objects of my inquiry the school facilities built in the country during the 1960s and the 1970s, which I analyse from the point of view of their sustainable design practices. The three main case studies correspond to diverse educational levels and were designed by different architects: the Saurimo Elementary School, designed by Antonieta Jacinto and Francisco Silva Dias in Saurimo (former Henrique Carvalho), from 1958 to 1959; the Lobito's Lyceum, designed by Francisco Castro Rodrigues in Lobito, from 1963 to 1969; and the Faculty of Veterinary Medicine, designed by Vasco Vieira da Costa in Huambo (former Nova Lisboa), from 1970 to 1974.

The three case studies are located in three different regions of the Angolan territory, corresponding to the three different Angolan sub-climates (Silveira, 1955). Each building, therefore, deals with very distinct climatic constraints and, correspondingly, faces very distinct architectural challenges. For that reason, my aim is to conduct an analytical reading on the geographical differences of the country that may enable a critical understanding of the buildings' true adequacy to their local climate.

Today most primary and secondary schools find themselves utterly damaged by decades of neglect.<sup>8</sup> New secondary schools are under development and renovation of many existing facilities has taken place so far as part of the national reconstruction plan. Based on the recommendations of UNESCO's World Education Forum, the Angolan program 'Education for All (PAN-EPT)' was under development from 2001 to 2015 and has recently been extended until 2025. The scarcity of school infrastructure is still a major topic in the country, and so is the renovation of existing school facilities. As far as higher education is concerned, the Angolan government has been investing in building new university campuses in several cities,<sup>9</sup> so the future of the existing college facilities rests uncertain. In any event, it seems clear that developing viable strategies to 20th-century schools adaptive re-use is subject of pressing importance. Besides, assessing these schools' current environmental performance may not only provide a critical reading on Angolan climate-responsive design, but may hopefully inform contemporary architectural practice in the country.

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<sup>8</sup> *Ministry of Education Report*, 2010; MARQUES, W (1962) *Problemas do Desenvolvimento Económico de Angola*, Luanda: Junta de Desenvolvimento industrial, p. 65-84.

<sup>9</sup> In 2009, the Republic of Angola approved the construction of five University campuses in the provinces of Benguela, Uíge, Huíla, Lunda Sul and Huambo.

## Modern Architecture in Angola

The modern architecture developed in Angola in the last years of Portuguese colonization was not the subject of many studies before the early 2000s. This has only recently become an active field of research, with some scholars contributing to fill the gaps and face the prejudices that concern such recent past.

During the 1960s and the 1970s — the period tackled by my research — Angola was governed by the Portuguese and depended on the *Estado Novo* government to fund local developments. The colony was eager for rapid modernization as a consequence of the great European migratory influx that started after World War II.<sup>10</sup>

In spite of the strong process of urbanization taking place in Angola at that time, Portuguese architectural magazines rarely published articles on buildings developed in the overseas territories. This was contrary to what happened in other colonies, such as the French or the British.<sup>11</sup> In Portugal, those architectural magazines were scarce<sup>12</sup> and, like all media, they were scrutinized by the censorship imposed by the state's political police. With due exceptions, the buildings developed in Angola in this period were rarely publicized in specialized journals.<sup>13</sup> At the same time, there were no Angolan architectural magazines to advertise such production. The abundant new constructions, especially the public structures, were only mentioned in local newspapers,<sup>14</sup> and thus doomed to oblivion.

Today most of the publications in question can only be found in Angola, either in public or private collections. Many public archives have been destroyed or abandoned during the civil war, but some are now relatively accessible to the community. Throughout my research I have found relevant local newspapers and magazines at the national library of Angola (BNA), at the national archive of Angola (AHN), at Vasco Vieira da Costa's archive in Luanda, and at the overseas historical archive in Lisbon (AHU). The largest collection of newspapers from the twentieth century is at the library of the provincial government of Luanda (GPL), including publications such as: *A Província de Angola*, *O Lobito*, *ABC*, *O Intransigente*, *Diário de Luanda*, *O Comércio*, and *Cultura*, to name a few. These materials were of vital importance for the development of this thesis and were frequently the source of the illustrations I used.

In Portugal, surveys on 20th century architecture rarely refer to colonial Africa. To frame the breakthroughs in this field within the Portuguese architectural production, attention should be drawn to the most relevant works

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<sup>10</sup> Numbers of European immigration in Angola during the twentieth century: 1900-9.000 inhabit.; 1910-12.000 inhabit.; 1920-20.700 inhabit.; 1930-30.000 inhabit.; 1940-40.000 inhabit.; 1950-78.000 inhabit.; 1960-172.000 inhabit.; 1970-290.000; 1974-335.000. In 1975 white settlers were 5% of the country's population. Taken from: PIMENTA, F.T. (2012) "Angola's Euro-African Nationalism: The United Angolan Front", MORIER-GENOUD, E. (ed.) *Sure road? Nationalism in Angola, Guinea-Bissau and Mozambique*, Leiden-Boston: Brill, p. 177-198.

<sup>11</sup> See, for instance, *l'Architecture d'Aujourd'hui*: 'France d'Outre-Mer', n 3 (1945); 'Tunisie', n 20 (1948); 'Maroc', n 35 (1950); 'Afrique du Nord', n 6 (1955); 'Afrique Noir', n 7 (1957). *Architectural Review*: 'Commonwealth 1', v 126, n 752 (1959); 'Commonwealth 2', v 128, n 761 (1960).

<sup>12</sup> At that time the only architectural magazines issued in Portugal were *Revista Arquitectura* (1927-1984) and *Binário* (1958-1976).

<sup>13</sup> See the article by Ana Vaz Milheiro: 'A África Moderna nas páginas da Arquitectura e da Binário' in MILHEIRO (2012) *Nos Trópicos sem Le Corbusier: arquitectura luso-africana no Estado Novo*, Lisboa: Relógio d'Água, p.158-211.

<sup>14</sup> Periodicals like 'A Província de Angola', 'Correio de Angola' and minor regional newspapers frequently reported the significant new constructions in the colony.

by França in 1974, Portas in 1978, Fernandez in 1985 and Tostões in 1994 and 1998. In fact, the scholarship that followed the Carnation Revolution in Portugal<sup>15</sup> completely ignored Africa's colonial past. Some authors identify the Portuguese amnesia as a period of shame and mourning, resulting from the traumas of the *Colonial War*<sup>16</sup> and of the decolonization process<sup>17</sup> (Matos, 2010).

The first mainstream book published in Portugal devoted to the subject of Modern architecture in the Portuguese colonies was *Geração Africana: Arquitectura e cidades em Angola e Moçambique, 1925-1975*, by José Manuel Fernandes, published in 2002. Since then, Fernandes has written extensively on the subject,<sup>18</sup> and his pioneering contribution has inspired growing interest.

More Recently, there has been a number of researchers developing new studies on architecture in Lusophone Africa. With a specific emphasis on Angola, it is worth mentioning the PhD theses by Martins (2000) and by Fonte (2007); my own graduation thesis (2007), Bonito (2011), Almeida (2012), Correia (2012), Cruz (2012) and Fernandes (2018), and the books by Ramundo (1991), Magalhães (2009) and Goycoolea (2011).

In 2010, Matoso started an ambitious project to document the worldwide heritage of Portuguese influence. Supported by the Gulbenkian Foundation, it included a volume devoted to Africa, the Red Sea and Persian Gulf, in which Angolan Modern architecture was presented. The book was published in 2010, but the survey— which is available online — is still under development, welcoming external contributions to locate and document buildings.

The book *Modern Architecture in Africa: Angola and Mozambique* edited by Tostões in 2013 was the result of a long group research. Tostões was the coordinator of *EWV - Exchanging world visions: modern architecture in Lusophone Africa (1943-1974) looking through Brazilian experience established since the 1930s*, which was funded by the FCT, in Portugal. This research project gathered several scholars that focused on the Modern Movement architecture developed in Mozambique and Angola, and hypothesized its continuity in Brazilian production.

Ana Vaz Milheiro has also developed a research project sponsored by the FCT entitled: *Os Gabinetes Coloniais de Urbanização: Cultura e Prática Arquitectónica*. Her research focuses on the architectural production of the institutional offices based in Lisbon.

While both Tostões' and Milheiro's projects investigate the architecture of the African colonies during the last years of Portuguese colonization, the two researches are parallel and complementary: Milheiro focusing on the institutional designs developed in Portugal and exported to the colonies, Tostões focusing on locally-developed modernisms in Angola and Mozambique.

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<sup>15</sup> The *Carnation Revolution* was a military coup organized by the MFA (Movimento das Forças Armadas) that deposed the dictatorship on 25 April 1974. The revolution led to the establishment of a democratic regime and the withdrawal of Portugal from the African colonies.

<sup>16</sup> During the 13 years of war in Angola (1961-1974), Guinea (1963-1974), and Mozambique (1964-1974), 7 to 10% of the Portuguese population was mobilized. About 8,000 Portuguese soldiers died.

<sup>17</sup> After the colonies' independence, 500,000 to 1 million refugees fled to Portugal in 1975, according to MATOS, M. C. (2010) "Colonial Architecture and Amnesia. Mapping the work of Portuguese architects in Angola and Mozambique", *OASE 82 L'Afrique, c'est chic. Architecture and Planning in Africa 1950-1970*, Rotterdam, 2010, p. 25-34.

<sup>18</sup> Fernandes, 2005, 2010, 2011.



The long Angolan civil war that spread from 1975 to 2002 has naturally hindered the country's developments in several fields. Publications on Angolan Modern heritage are very recent and scarce. Notable exceptions include books by Mingas (2010), Martins and Grilo (2010), and Fernandes and Hurst (2015). Mingas' *Modernismo de Luanda*, was published by the Goethe-Institut and the Lusíada University and is an attempt to exhibit the neglected architectural legacy of the city. With the same aim of documenting Luanda's 20th century heritage, the book edited by Martins and Grilo is a collection of contributions from students of the Department of Architecture of the University Agostinho Neto. The more recent *Angola Cinemas* constitutes a survey of movie theatres built across the country, which has been published by Steidl and sponsored by the Goethe-Institut, one of today's most significant cultural patrons of the country.

In spite of its relevance, the Angolan Modern legacy did not take part in the first surveys on architectural developments in Africa after World War II. The German art historian Udo Kultermann was perhaps the first author to bring the subject to a wide audience in the 60s, with *New Architecture in Africa* (1963) and *New directions in African architecture* (1969). These books constitute seminal references on the subject.

In Kultermann's surveys there were different degrees of information on the different African country — and quite notably the Portuguese colonies — were even bluntly treated alike, in spite of their major dissimilarities. In *New Architecture in Africa* Kultermann stated that "the architecture in the Portuguese possessions is almost exclusively Portuguese colonial style" (Kultermann, 1963, p.22). In the author's opinion, the only exception was the work of Amâncio Guedes in Maputo (former Lourenço Marques), which he discussed widely in his books (Kultermann, 1963, 1969, 2000). Yet, although Amâncio Guedes was unquestionably the most prominent architect in Mozambique at that time,<sup>19</sup> there is an extensive architectural production in the country that does not fit in Kultermann's canon,<sup>20</sup> quite notably the Angolan one.

But Kultermann's work is nevertheless of great relevance to frame the developments of Post-war Angolan architecture, as pointed out by some of the scholars who are currently studying Modern Movement architecture in Africa (Lagae, 2010; Tostões, 2013).<sup>21</sup> In fact, researchers are still today trying to fill the gaps in Kultermann's 1960s African surveys.

The ambition of structuring an architectural map of Africa today, however, still raises a number of methodological issues. In 2000, Kultermann established his revised vision on the theme, nearly forty years after the release of his first book on architecture in Africa. Then, for the first time, he placed a border in the Sahara Desert, separating Northern from Sub-Saharan Africa, and writing the volume "Central and Southern Africa", in *World Architecture*

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<sup>19</sup> Amâncio Guedes' work had been published earlier in *The Architectural Review* in 1961 (vol.129, number 770, April 1961, pp.240-251) and in *L'Architecture d'Aujourd'hui* in 1962 (vol. 33, number 102, June-July 1962, pp.42-49). The Mozambican architect had participated in the 9th congress of CIAM, in 1953, and was an active member of TEAM X.

<sup>20</sup> See, for instance: ALBUQUERQUE, A. (1998) *Arquitetura moderna em Moçambique: inquérito à produção arquitectónica em Moçambique nos últimos vinte e cinco anos do império colonial português 1949-1974*, Thesis (Graduation), Universidade de Coimbra; MIRANDA, E. (2013) *Liberdade e Ortodoxia: Infraestruturas de arquitectura moderna em Moçambique (1951-1964)*, Thesis (PhD), Escola de Arquitectura, Universidade do Minho.

<sup>21</sup> See, for instance, the wide contributions in *Docomomo 28 Modern Heritage in Africa*, March 2003, Paris: DOCOMOMO International, particularly Lagae on the Belgian Congo. Research on Angola and Mozambique's Modern heritage is also being performed by Tostões: *EWV - Exchanging world visions: modern architecture in Lusophone Africa (1943-1974) looking through Brazilian experience established since the 1930s* (PTDC/AUR-AQI/103229/2008).

1900-2000: A Critical Mosaic. However, the cultural and geographical differences are immense within the continent, leading several contemporary authors to try different approaches: addressing exclusively the tropical area, attempting East-West division, or even grouping Africa with the Middle East.<sup>22</sup>

In *African Architecture: Evolution and Transformation* (1997), Nnamdi Elleh also explored a continental sense for African architecture. The author suggests a reading through the 'triple heritage concept', assuming that the cross-over between indigenous, Islamic and Western culture influenced all African architecture.<sup>23</sup> Antoni Folkers, on the contrary, in *Modern Architecture in Africa* (2010) explains that due to the 'enormous richness and variety of cultures' and to his own limited knowledge on the topic, he doesn't pretend to put forward a continental view of the subject, even if his title does suggest so. At the same time, Folkers claims there are 'striking similarities', which would support 'a continent-wide approach that should include the Maghreb'.<sup>24</sup> More recently, David Adjaye proposed an unusual reading of the continent, using six different geographies, which are not directly related to the canonical regional borders. He proposes that the cultural differences are mostly linked with climatic and geographical conditions, such as those of the Maghreb, the desert, the Sahel, the savannah, the mountain, and the forest.<sup>25</sup>

Manuel Herz's book edited by Park in 2015 has also brought renewed interest to the subject. *African Modernism. The Architecture of Independence: Ghana, Senegal, Cote d'Ivoire, Kenya, Zambia* was a pioneering contribution to the field as it presented an astonishing collection of 20th century architecture in Africa to a broad international audience. However, the book is based on the fallacious argument that establishes a relationship between African independence and the architecture developed during such period. In order to pursue such argument, Herz mixes pre- and post-independence buildings in five different countries that gained autonomy from the British and the French empires between 1957 to 1964, overlooking the countries' unrelated backgrounds: historical, cultural, geographical and climatic ones.

It thus seems reasonable to propose that, while there are still many gaps to be filled in architectural surveys in Africa, precise methodological choices should be made when addressing issues at a continental level. Since Africa is around three times larger than Europe and research has not yet covered in any depth a great share of its territory, global readings tend to invariably result in blunt and misleading generalizations.

The Angolan case has traditionally been studied from a Portuguese perspective, comparing it with that of other Portuguese colonies in Africa, especially Mozambique. I, on the contrary, propose a reading that starts intrinsically from the Angolan context and from its colonial society. Instead of looking at how the political measures were introduced simultaneously in different territories by the Portuguese, I argue that some of these developments, namely in the field of education, actually derived from the Angolan colonial administration. Such

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<sup>22</sup> See for instance: Galliano, L. (ed.) (2011) *Atlas: Architectures of the 21st century. Africa and Middle East*, Madrid: Fundación BBVA.

<sup>23</sup> The 'triple heritage concept' was introduced by Professor Ali Mazrui, who is a Kenyan political writer on African and Islamic studies. Nnamdi Elleh tried to apply this concept to architecture in the book: Elleh, N. (1997) *African Architecture: Evolution and Transformation*, New York: McGraw-Hill.

<sup>24</sup> Folkers, 2010, p.13.

<sup>25</sup> Adjaye, D. (2011) *Adjaye Africa Architecture: a photographic survey of metropolitan architecture*, London: Thames & Hudson



is a hypothesis that gains strength as we look deeper at the ways the modern architects of Angola tackled the problematics of “design with climate”.

## **Design with Climate**

The previously-mentioned studies on Lusophone modern architecture approach a range of different themes, focusing particularly on buildings’ adequacy to climate, we may cite the article by Caldas (2010) and my own graduation thesis (2007) on the work of Vasco Vieira da Costa in Luanda, Angola; Almeida (2012) on the work of Castro Rodrigues in Lobito, Angola; and Ferreira (2012), on the work of Fernando Mesquita in Mozambique. These studies have shown that the architects were indeed developing a particular design methodology that sought to deal with local climates.

To approach climate-responsive design methods in tropical regions, the work of Jane Drew and Maxwell Fry stands as a fundamental reference. Their first book on tropical housing, published in 1947, was written from their first experiences in British Africa. Later, their vast work in Nigeria (1944-60), Ghana (1951-54) and Chandigarh (1951-53) led to Maxwell Fry’s appointment as head of the Department of Tropical Studies at the Architectural Association, in London. Fry and Drew’s *Tropical Architecture in the Dry and Humid Zones* was published in 1964, becoming the crucial handbook for architectural design in warm climates.

*Design with climate: Bioclimatic approach to architectural regionalism*, by Victor and Aladar Olgyay was published for the first time in 1963 but was actually the result of a series of articles published since 1951 on the subject of bioclimatic architecture. In this book, the authors gathered contributions from the fields of human physiology, meteorology and engineering in order to define building-design solutions. After setting standards of human comfort and classifying the existing climatic conditions, the authors divided the world into four main regions, establishing distinct design principles for each of them. The Olgyay brothers also focused on the causal relationship between climate and architecture, using vernacular regionalisms to assert their point, and works of authors like Rudofsky (1964), Rapoport, (1969) and Oliver (1969, 1971) may be seen as offshoots of the Olgyay’s approach.

In the same period, Koenigsberger, Evans and Mahoney also defended an analytical approach to architectural design methods. Otto Koenigsberger published widely on the subject of tropical housing, as a result of his experience of living in India from 1939 to 1951 and of his teaching at the AA’s Department of Tropical Studies since 1953. His *Manual of tropical housing and building - Part 1: Climatic Design*, released in 1974, constitutes a complete handbook of architectural design in tropical regions.<sup>26</sup> In Angola, the Engineering Laboratory of Angola (LEA), based in Luanda, published original research and broadcasted international technical reports between 1957 and 1974. The papers focused on various subjects, from structural engineering to mechanical behaviour

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<sup>26</sup> See the article by Figueira and Gil: “Otto Koenigsberger and the Course on Tropical Architecture at the Architectural Association, London. Some Notes on the Portuguese Context”, in *Docomomo Journal 48, Modern Africa Tropical Architecture*, Barcelona: Docomomo International, 2013, p. 71-75.

of materials in warm climates (Rilem Report, 1965). Some of these papers were the result of lectures presented in the *Luso-Brazilian Conferences on Civil Engineering*, which were held for the first time in Lisbon in 1965. The Luso-Brazilian conference had its second and third venues in Rio de Janeiro in 1967, and in Mozambique in 1971. Maputo (former Lourenço Marques) had already welcomed the *First Engineering Conference of Mozambique* in 1965, receiving participants from Portugal and Angola. The second and last edition of this symposium took place in Luanda in 1969 and was named *Second Conference on Engineering and Architecture in Over-seas*. By 1969, the output of papers on architectural developments had indeed increased significantly, as had the local technical research behind these developments.

The reports on environmental comfort and passive design practices in question were based on specific meteorological data. The Meteorological Service of Angola also developed original research and published complete studies in 1955 (Leal, 1955) and 1962 (Silveira, 1962). Starting from the climate classifications of Köppen-Geiger (1931, 1936) and Thornthwaite (1948), local meteorologists were developing a more accurate description of the Angolan climates. Other reports, such as that of Faria on Luanda's prevailing winds, in 1968, or the solar charts published by Malato in 1969 also contributed to the development of this local expertise.

LEA's literature is of great relevance to the current research since it shows the development of a common ground between the architects based in Angola and the local institutions between the 1950s through the 1970s. These papers at the Library of LEA in Luanda remain largely unexplored. My study of the papers on design methods in tropical climates (i.e. Vieira da Costa, 1969), on local climate and climatic elements (i.e. Vieira, 1964; Deventer, 1966) and on thermal comfort (i.e. Ferreira, 1965) is in this sense unprecedented, and aims at providing an accurate description of the state of the art on the subject at that time.

## **20th-century Angolan Heritage**

Angolan modern buildings conservation and re-use is a subject which remains unaddressed to this day. The aforementioned studies focus primarily on historical research with little regard for the buildings' current use and conservation conditions. Nevertheless, researchers like Tostões, Caldas, myself, and Almeida, to name but a few, have built their studies on buildings' on-site observation, even if they did not go as far as to propose suitable conservation strategies for Modern buildings' contemporary re-use.

The paper by Salvador and Rodrigues, "Colonial Architecture in Angola: Past Functions and Recent Appropriations" offers a brief report on the current state of eight buildings in Luanda, Lobito and Benguela. Their observations focus on 18th-century palaces and 20th-century school buildings, cinemas and markets. Looking at such cases as the replacement of the D. Ana Joaquina Palace by a replica in 2000, or the demolition of Kinaxixe Market in 2008, the paper underlines the urgent need for specialized knowledge on preservation and re-use strategies to address the Angolan Modern legacy.

African Modern heritage was also the theme for a Journal published by the international association

Docomomo<sup>27</sup> in 2003, coordinated by Hannah Le Roux, the issue gathered contributions from Morocco to South Africa that put in evidence the diversity of African modernism. In 2013, Docomomo International published *Modern Africa. Tropical Architecture*, which focused on sub-Saharan countries, coordinated by Ana Tostões, the journal assembled a broad range of approaches to the topic, while discussing the problem of tropical architecture beyond Africa.

But even if the two aforementioned journals and a number of other papers from Docomomo's publications have addressed the Modern African legacy, few articles have thus far focused on building renovation processes. In the last issued number of Docomomo, *Modern Africa. Tropical Architecture*, 2013, the paper by Le Roux, Hart and Mayat draws up a particular strategy for the renovation of South African buildings. The authors use Aiton Court, a Modern apartment block in Johannesburg, as a model to describe the common difficulties found in the country's architectural renovations. It is in this context that they define the notion of 'critical conservation': a staged operation of refurbishment that, while only executing the most pressing renovation works, takes into consideration at every stage the prospect of a fuller renovation.

### Angola 1961-1975

The early 1960s was a time of great optimism for the African nations liberated from colonial rule. In *New Architecture in Africa*, Kultermann described 1960, the Year of Africa<sup>28</sup> as a foundational year for a new type of African architecture. The author also pointed out that educational buildings were 'the primary tasks of building in the new nations' and thus constituted 'the most significant architectural achievements in Africa.'<sup>29</sup> Although recent research has proven that these developments were to a certain extent still related to colonial agendas,<sup>30</sup> Kultermann argued that educational and cultural buildings reflected the growing movements towards independence.

But if Kultermann initially presented 1960 as the transition year, in *World Architecture 1900-2000: A Critical Mosaic*, published in 2000, Kultermann then argued that the creation of the United Nations in 1945 'had intense reverberations on the changing status in several parts of Africa.'<sup>31</sup> Kultermann believed that after the Second World War the African continent initiated a process of liberation that was materialized in its modern architectural production. Reformulating the hypothesis formulated in his first book, Kultermann comes to argue that 1945 was

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<sup>27</sup> "International Working Party for Documentation and Conservation of Buildings, Sites and Neighbourhoods of the Modern Movement".

<sup>28</sup> 1960 is also known as the Year of Africa. It represented a peak in Africa's decolonization process, with the independence of 17 countries and the beginning of rebellions towards independence all over the continent.

<sup>29</sup> Kultermann, 1969, p. 25.

<sup>30</sup> See, for instance, Uduku, O. (2003) 'Educational Design and Modernism in West Africa' in *Docomomo 28, Modern Heritage in Africa*, March 2003, Paris: DOCOMOMO International

<sup>31</sup> Kultermann, U. (2000) 'Central and Southern Africa' in Frampton, K. (Ed.), *World Architecture 1900-2000: A Critical Mosaic*, vol. 6, Wien: Springer, p. 23.

indeed more of a turning point than 1960 in that which concerns African architectural development: blurring the boundaries between colonial, postcolonial and post-independence processes.

There is no doubt that Kultermann's argument does fit the reality of a number African countries — such as that of some of the former British and French colonies —but Angola, however, does not count among them. Angolan political liberation only took place much later, in 1975, but the construction of schools in the country exploded after 1961. This process was indeed connected with the beginning of the Angolan liberation war that broke out that same year —just one year after the Year of Africa — to which the Portuguese government responded, at once, with the *Colonial War*, and with a last colonizing effort in the form of an unprecedented dissemination of schools. Kultermann's misconception even seems to have echoed in Portuguese historiography. Portuguese architectural historians have framed the modern architectural developments of Angola as a result of the great migratory influx from Portugal that followed World War II. However, modern architecture as expressed in official buildings and above all in schools, has unequivocally thrived after 1961.

The most modern Angolan architecture was born together with and because of the Angolan War of Independence, and was for the first time designed by local architects. Until that point, all educational buildings were designed by the colonial office in Lisbon, which, in the attempt to create a homogenous Portuguese style, had built similar schools in all of the colonies. After 1961, however, Angolan institutions earned more autonomy, and the projects for public buildings started to be commissioned to and controlled by the local public works departments only. Such were the changes that fostered the development of a new and modern architectural language that broke with the official and conservative architecture of the *Estado Novo*.

We may therefore also understand why the period of the Angolan War of Independence (1961—1975) also corresponded to the period of greatest industrialization of the country (Neto, 1991) and to the period of greatest economic growth of the century (Valerio, Fontoura, 1994). And what's more, it should not go unnoticed that this was also the period of the birth of an Angolan national expression in music and literature, and, ultimately, of a new urban society.<sup>32</sup> Could we then argue that the post-61 school architecture 'mirrored the evolving movements towards independence' in Angola with its new ambitions, new disruptive language, and new design methods?

The colonial government's main ambition was to build as many schools as possible in a rapid and economic way. As a consequence, the autonomy granted to local architects made schools a privileged field for experimentation, in which the most radical passive environmental control systems were tested. Due to urgency and scarcity of means, the period in question saw the rise of a more democratic, more modern, and more environmentally-adapted architecture. Such architecture expressed the growing autonomy of Angola and a clear desire of distantiation from a conservative, traditionalist and anti-democratic Portuguese culture. Such architecture, we could say, no longer wanted to be Portuguese: it was trying to become Angolan.

Such process of construction of a local identity was also notably reflected in the design of climate-responsive buildings. In Angola, climate became a central topic in technical documents and official speeches in the second half of 20<sup>th</sup> century. The meteorological institute had just recognized the country's main climatic zones in late

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<sup>32</sup> Moorman presents the idea that there was "cultural sovereignty" in Angola long before political independence (Moorman, 2008, p. 7).

1950s, even if some region's weather data was still incomplete by the mid 1960s. As it happens, the increasing knowledge on Angola's different geographical environments started allowing projects to become more responsive and less theoretical, more precise and less generic.

But was there ever a true ethic of tropical architecture in Angola?

Was buildings' climate responsiveness ever a driving aim of architectural design?

Were analytical design methods effectively applied by architects?

And are these schools truly adapted to local conditions?

And have such systems escaped the fate of obsolescence?



# Chapter 1

# Education



# For everybody

Poster "Education for everybody"  
[published at Auge magazine,  
Mexico (April 1971).]



## Education Policy during the War, 1961-1975

In April 1961, following the African revolts, Salazar declared it was crucial to go to Angola ‘quickly and strongly’<sup>1</sup>, referring to the immediate mobilization of Portuguese troops and simultaneously to the beginning of a new strategy of colonial development. Education was a field in which the regime widely invested straightaway by sponsoring the construction of numerous school buildings all over the colony.

In fact, whilst fighting the nationalist movements, the ruling fascist political regime envisioned keeping its power over the territory by indoctrinating the Angolan population. The campaign motto was “a sword in one hand and a quill in the other”<sup>2</sup>, which suggested that the maintenance of the Portuguese empire depended on military control and literacy.

As a result, the education reform that took place at the upsurge of war has instigated a massive expansion of the existing school network in Angola. All education levels enjoyed significant improvements, especially because the existing system was extremely deprived. In 1960, there were only 1000 public

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<sup>1</sup> Free translation: “Para Angola, rapidamente e em força”, António de Oliveira Salazar’s speech, 13 April 1961.

<sup>2</sup> Free translation: “Numa mão a espada e noutra a pena” – chapter from *História do Ensino em Angola* referring to the developments in education policy after 1961. The slogan was taken from the epic poem *Os Lusíadas* (Camões, 1572, canto VII, estância 79, verso 8) that chronicles the Portuguese discoveries.

primary schools and 15 secondary school facilities in the whole country.<sup>3</sup> These educational buildings were predominantly located in urban areas and destined to settlers of European descent and to a few assimilated Africans.<sup>4</sup>

The abolition of the *Estatuto do Indígena* by the minister of the Overseas in 1961<sup>5</sup> was one of the most relevant actions of his short governance<sup>6</sup> and caused major repercussions in education policy, since it established the same rights for all Portuguese despite their race.<sup>7</sup> From that date on, the African population, whose instruction had hitherto been restricted to Catholic missions, was admitted into the official education system.

At that time, developments in education were slowly taking place in Portugal. In the beginning of the 1960s, illiteracy rates were high, which limited social mobility and restricted post-primary education to the privileged. The *Estado Novo* traditionally promoted learning based on ideological propaganda but the teaching programs were gradually modernized after the Second World War. The Portuguese integration in the OECD in 1948 and the EFTA in 1960 impelled official changes in education policy, given that the Portuguese underdevelopment in the field became manifest compared to their European partners.<sup>8</sup>

As a result, in 1960 the Portuguese government decreed four years of compulsory education for all children, formally abolishing the gender discrimination that had previously been prescribed by law.<sup>9</sup> Four years later, the period of schooling was enlarged to all children between six and twelve years old, both in Portugal and in the colonies.<sup>10</sup> At the same time, secondary and higher education were also sponsored by the state and had fast growing rates during the 1960s.

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<sup>3</sup> See graphs in SECRETARIA PROVINCIAL DE EDUCAÇÃO (1968) *Síntese das Actividades dos Serviços 1967-1968*, Luanda: Edição dos Serviços de Educação, p.73, 105, 137.

<sup>4</sup> MINISTÉRIO DO ULTRAMAR, *Estatuto dos Indígenas Portugueses das Províncias da Guiné, Angola e Moçambique*, Decreto-lei 39666, 20 Maio 1954.

<sup>5</sup> MINISTÉRIO DO ULTRAMAR, *Revogação do Estatuto dos Indígenas Portugueses das Províncias da Guiné, Angola e Moçambique*, Decreto-lei 43893, 6 Setembro 1961. Adriano Moreira was in charge of the ministry of Overseas from 13 April 1961 to 4 December 1962.

<sup>6</sup> Adriano Moreira was in charge of the ministry of Overseas from 13 April 1961 to 4 December 1962.

<sup>7</sup> See: MOREIRA, A. (2008) *A Espuma do Tempo - Memórias do Tempo de Vésperas*, Lisboa: Almedina, p. 245-246.

<sup>8</sup> ROSAS, F., BRITO, J (1996) (coord.) *Dicionário de História do Estado Novo*, vol.1, Lisboa: Círculo de Leitores.

<sup>9</sup> MINISTÉRIO DA EDUCAÇÃO, *Frequência obrigatória da 4ª classe para todos os menores em idade escolar*, Decreto-lei 42994, 28 Maio 1960.

<sup>10</sup> MINISTÉRIO DA EDUCAÇÃO, *Amplia o período de escolaridade obrigatória*, Decreto-lei 45810, 9 Julho 1964.

In Angola, outstanding evolution took place simultaneously. A new government was named at the outbreak of war to respond to the pressing instability and launch a new social policy. In June 1961, Venâncio Deslandes was named the general governor of Angola and Amadeu Castilho Soares was appointed provincial secretary of education. Both promptly promoted significant changes in education policy but their government was dismissed shortly.<sup>11</sup> Nevertheless, the reforms implemented during their brief governance have brought about substantial educational development to the country.

Amadeu Castilho Soares launched a program for basic education in rural communities that massively promoted natives' literacy. At the same time, local elites found the opportunity to demand the establishment of technical and higher education in the colony. They believed creating universities in Angola was fundamental to a sustained development of the country and its progressive autonomy. Favourable conditions to change arose with the new context of political and social uncertainty and a progressive governor like Venâncio Deslandes.

In fact, the Governor of Angola instigated a major transformation in 1962. He founded a polytechnic center with 19 courses supported by the existing research centres. The law was published in April, but the Portuguese government immediately aborted the program. The ministry of the Overseas replaced the Angolan scheme with the creation of the EGUA<sup>12</sup> in August 1962, which established the same principles in Angola and Mozambique. The long awaited higher education system comprised only 10 courses and was dependent of the Portuguese universities to award the diplomas.

Deslandes's actions were considered insubordinate and pro-self-government and, as a result, his administration was dismissed in September 1962. However, the reforms that were triggered in this period led to major improvements in all education levels in different parts of the country.

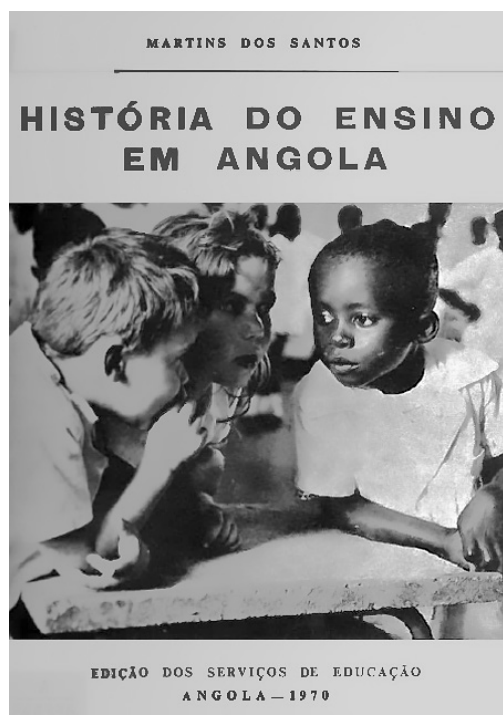
In the following years, the expansion of the primary education network in rural areas continued, new technical schools and high schools were founded, and higher education prospered. In 1968, after 7 years of colonial war, the University of Luanda was recognized and total public school enrolment had tripled in Angola.

The major investment in education as a response to the African revolts is quite representative of the operational shift of the Portuguese regime. However, as has already been pointed out, this corresponded to a new strategy to maintain power over the colony and not necessarily to a new ideology. It was a way to promote social peace in the country by serving a double purpose – on the

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<sup>11</sup> It operated from 23 June 1961 to 26 September 1962.

<sup>12</sup> “Estudos Gerais Universitários de Angola”.



**Book covers**

[*Angola Panorama do Ensino* (1964) and *História do Ensino em Angola* (1970).]

one hand, these measures pleased the settlers of Portuguese descent, who had long demanded reinforcement in education; on the other hand, it was time to acculturate the Africans dispersed throughout the territory.

The Portuguese Colonial-War that started in Angola in 1961, spread to Guinea in 1963 and to Mozambique in 1964. The international community took part of the ideological struggle with consecutive UN's diplomatic boycotts to Portugal since mid 60s.<sup>13</sup> As a result, the Portuguese non-democratic regime and the long war in Africa progressively became fairly unpopular, both in the country and internationally.

In order to improve the image of Portugal abroad, racial integration was advertised not only in local press but also in Portuguese and foreign publications during the 1960s and the 1970s. Following the ideal of *lusotropicalism*, the fast developments in Angola were exhibited and a multi-racial society was portrayed in modern schools that provided "education for everybody". The propaganda pictured children of all races in fraternal environment, treated as equals by the school system, which was the offspring of a new developing society.

Angola represented the utopia of "a new Brazil in Africa". This idea was prolifically sponsored by the regime but it progressively became a dangerous reference. Brazil's independence being unilaterally declared turned out to be an inspirational motto to the local elites and a permanent threat to the Portuguese hegemony. In fact, although the regime's narrative was evident through political actions and propaganda, the colonial power was not always in control of the ideological struggles taking place in Angola.

As previously described, exchanges between the local and central government were not always aligned. The hypothetical insurgence of the Angolan elites caused growing suspicion, so the presence of the political police in the country became more noticeable during the years of war. In 1965, cultural organizations<sup>14</sup> were closed by the PIDE due to their "harmful influence in the intellectual milieu of the Province" since their activities had "serious political effects and caused revolutionary awareness".<sup>15</sup>

In fact, during this period, a constant debate was taking place between local culture and Portuguese culture, explicitly in local press and cultural

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<sup>13</sup> In 1964, the executive committee of UNESCO barred Portugal from the International Conference of Public Education and the International Conference on Illiteracy; in 1965, the General Assembly recommended that the International Bank for Reconstruction and Development and the International Monetary Fund refuse Portugal financial, economic or technic assistance; in 1966, the World Health Assembly suspended Portugal from participation in the Regional Committee for Africa.

<sup>14</sup> *Sociedade Cultural de Angola; Cine-Clube de Luanda.*

<sup>15</sup> PIDE report March 1966 in MARQUES, I.G., FERREIRA, C. (2013) *O Boletim Cultura e a Sociedade Cultural de Angola*, Luanda: União dos Escritores Angolanos, p.49.



**Primary schools built in the Portuguese colonies of Africa before 1961: Angola, Mozambique, Guiné, Cabo Verde and São Tomé e Príncipe**

[MINISTÉRIO DO ULTRAMAR (1960) Relação dos Estabelecimentos de Ensino oficial em funcionamento nas províncias do Ultramar em 31 de Dezembro de 1958, Lisboa, Agência Geral do Ultramar.]





Primary schools in Angola, rural  
expansion post-1961: Luau, M'Ban-  
za Congo, Cazombo  
[IICT.]

organizations. Guided by the local elites, the discussion highlighted the specific Angolan characteristics as opposed to the Portuguese. Therefore, climate was an important topic of this argument since it exposed major and irrefutable differences between the two countries. Angola, with its particular geography and culture, could no longer imitate Portugal but should find its own specificity.

Education was also a divisive subject since the Portuguese colony demanded modernization, industrialization and integration in the developed world. During the 13 years of war, these debates were complex and regularly initiated by settlers of European descent that considered the country was economically restrained by Portugal. The period of the Angolan War of Independence was, therefore, a time of nationalist hope not only for the African movements but also to the settlers' elite. Each group built its own utopia for Angolan freedom.

The complexity of this ideological battle has its best depiction in the architecture produced during the war. The process is particularly paradoxical in educational facilities, since the epic colonialist effort represents a relevant shift in architectural style.

The idea that Portugal was "indivisible from Minho to Timor" had been widespread by the regime and, in previous years, this idea had also been built by colonial architecture. In school facilities, the style from the mother country had been incorporated into the buildings, sometimes erratically, in all Portuguese colonies. In fact, until late 1950s, the state's office designed and fixed the standards for the construction of schools, which were often the first evocative buildings of Portuguese rule in small towns.

In Angola post-1961, school buildings were no longer designed by the state's office in Lisbon. During this period, local institutions managed the commissions and locally based architects designed the schools. Paradoxically, the urgency of the educational reform led to a diverse architectural production unobstructed by official rules.

Many authors have pointed out that 'freedom from rules' led to a modern architectural production developed by Portuguese architects who felt restrained (by the dictatorship) in the mother country and found in Africa 'a place for experimentation'. This view, however valid for singular cases, is only focusing on authorship and blurs boundaries between the African territories.

On the contrary, in Angola, the legal vacuum consented by the colonial government gave place to a local architectural style. This extensive production was an invention of local commissioners, public and private sponsors and local authors that shared a new set of values. The outcomes were not always coherent but unquestionably resulted from a particular culture that arose during the last years of Portuguese colonialism.

This modern movement in architecture was contemporary of the country's



late industrialization and of the origins of Angolan nationalism. The idea of a modern and industrialized society prospering in Africa was represented by the architecture produced during this period. This was particularly evident and early in private commissions and certain typologies, while in public buildings – main representatives of the Portuguese rule – the process was delayed and more complex.

Uneven representations of colonial power were displayed by the school facilities developed during the war. The new teaching policy had specific aims in each educational stage but shared common ground on urgency and economy of means. School buildings were no longer meant to be architecture – with representative goals and aesthetic value -, but were mere constructions that aimed at being functional, technically perfect and economically sustainable. This chapter aims at demonstrating how this new mindset was converted into architectural form.



**Open-air classroom, Lobito**  
[in *Mensagem*, Revista dedicada aos agentes de ensino dos ambientes rurais, ano IV, nº42, Novembro 1967.]

### 1.1. *Levar a Escola à Sanzala: Dissemination of Primary Schools*

Despite the long Portuguese colonization of Angola, the teaching of the Portuguese language to the native populations only took place with a state's literacy plan from 1961 onwards. The assimilation of natives had not been a central concern of the regime until then, but the urge of war started a complex political problem that called for profound changes.

After 1960, legitimization of the Portuguese presence in Africa was increasingly difficult to sustain. The "Year of Africa" represented a peak in Africa's decolonization process, with the independence of 17 countries and the beginning of rebellions towards independence all over the continent. The Independence War that started in Angola in 1961 drew attention of the international community to the conflict and compelled the Portuguese regime to respond with military action, development policies and propaganda.

The new Minister of the Overseas decreed the first relevant measures right after his nomination in April 1961. His reforms aimed at responding to the international political context and at backing the progressive autonomy of the colonies. In September, Adriano Moreira abolished the 1954's law that established the ostracized role of the indigenous populations in Portuguese colonies. The new ruling formally ended the legal distinction between races and established the same formal rights to all the Portuguese.

This law had tremendous impact on the primary education system in the colonies, since it triggered fundamental changes to the existing structure. Until then, there was an open distinction in objectives and means between the teaching of civilized and indigenous children. Following the *Estatuto Missionário*<sup>16</sup> in 1941, religious missions exclusively carried out the teaching of natives in suburban and rural areas. The missions were considered "imperial and civilizing institutions"<sup>17</sup> that ought to educate the indigenous people and prepare them for labor.<sup>18</sup> In this context, Amadeu Castilho Soares was invited to take part of the new Government of Angola and start up the transformations in the education field. Upon his arrival to Luanda in August 1961, the new Provincial Secretary of Education put in action a development plan designed to take schooling to remote areas.

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<sup>16</sup> MINISTÉRIO DAS COLÓNIAS, *Estatuto Missionário*, Decreto-lei 31207, 5 Abril 1941.

<sup>17</sup> Idem, art. 2.

<sup>18</sup> Idem, art. 68: "O ensino indígena obedecerá à orientação doutrinária estabelecida pela Constituição Política (...). Aqueles planos e programas terão em vista a perfeita nacionalização e moralização dos indígenas e a aquisição de hábitos e aptidões de trabalho, de harmonia com os sexos, condições e conveniências das economias regionais, compreendendo na moralização o abandono da ociosidade e a preparação de futuros trabalhadores rurais e artífices que produzam o suficiente para as suas necessidades e encargos sociais."

The program *Levar a escola à sanzala* faced major obstacles, such as enormous distances, transhumance of populations and monetary limitations. As a result, the plan consisted in engaging local communities in the process of structuring their own school. The tribal chiefs were held responsible for choosing the teachers, who were afterwards trained with intensive courses. Keeping them from leaving the village for a long period of training not only reduced state's costs, but also ensured their permanence in the community.<sup>19</sup>

The tribal chief also got to decide the location of the school. School facilities consisted in simple shaded areas or traditional constructions built by the population. Therefore, informal architectural solutions differed according to group's skills and available materials. As a result, and for the first time, formal construction of schools was not necessary to put the educational plan into action.

The most permanent legacies of this teaching policy were, instead, the textbooks that were produced exclusively in Angola at that time. Teaching Portuguese to children who had a different mother tongue was a major challenge and, to face this problem, the first reading manuals for African children were designed with adapted pedagogical techniques. Images of black men and women illustrated the manuals, which presented the novel Portuguese civilizing mission in Angolan rural communities.

The reformist program launched by Castilho Soares faced strong resistance from the Catholic Church<sup>20</sup> and from a few conservative supporters of the regime who openly opposed the educational development of rural areas. Although schooling was a way of sponsoring Portuguese nationalism in the territory, some considered education would ultimately empower the native population and work against Portuguese supremacy.

In fact, the progressive educational policies established by the local government led to its dismissal. The administration was dismantled in September 1962 and, a couple of months later, the minister of the Overseas was also discharged from office and replaced by António Peixoto Correia.

However, the strategy set up in Angola for primary education operated a significant transformation of the school system in a short period of time. As a result, this experiment would serve as the basis for the reform of primary school in Portuguese colonies that was decreed in 1964.<sup>21</sup> At that

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<sup>19</sup> SOARES, A. C. (2002) "Levar a Escola à Sanzala, plano de ensino primário rural em Angola, 1961-1962" in *Episteme*, ano IV, nºs 10-11-12, p. 132-153.

<sup>20</sup> Castilho Soares mentions a letter from the Episcopal Conference addressed to the Government in June 1962 in protest of the interference of the State in the sphere of the competences of the Catholic Church, in CASTILHO SOARES, A. (2002) "Levar a Escola à Sanzala, plano de ensino primário rural em Angola, 1961-1962" in *Episteme*, ano IV, nºs 10-11-12, p. 141.

<sup>21</sup> MINISTÉRIO DO ULTRAMAR, *Reforma do Ensino Primário Elementar nas Provín-*

time, Portuguese school programs were adapted and the reading books created in Angola were implemented in all colonies. Pre-primary school was then established in order to improve the teaching of Portuguese language. Essentially, five-year-old children started learning the language orally, in a less formal environment, which quickly improved the academic results of primary school.<sup>22</sup>

A clear division was established between the state's primary schools built in urban areas and the rural school posts. All urban schools awarded the fourth-class diploma while the school posts operated as their rural branches and only provided the third grade. This dichotomy was also visible in the qualities of the educational buildings developed for each type.

The Portuguese mission was “not only to *instruct* but also *form* the youth”<sup>23</sup>. In a speech in 1965, the minister of the Overseas listed the educational developments achieved until then, but pointed out their priority was still primary level education:

“Não basta que a acção do Estado se desenvolva criando mais escolas, aperfeiçoando os métodos de ensino, facultando o acesso cada vez mais amplo à cultura. É imperioso que, como superior responsável pelo bem comum e pela sobrevivência e perenidade da Nação, actue em relação às gerações mais novas por forma a preservar a sua saúde moral e a garantir a sua perfeita compreensão dos supremos interesses nacionais (...) para isso importará antes de mais activar o desenvolvimento da educação de base, no quadro da reforma do ensino primário recentemente promulgada pelo decreto lei 45 908, de 10 de Setembro de 1964.”<sup>24</sup>

The government was openly focused on a colonialist mission and, therefore, the solidity of the Portuguese nation was their major concern. Accordingly, primary education was the fundamental procedure of spreading the nationalist propaganda to the native population.

In 1974, ten years after the reform of primary school, there were 500.000 children enrolled in primary school in the country.<sup>25</sup> Although the numbers corresponded only to 8% of total population, there had been a 500% growth since 1961.<sup>26</sup> Statistics showed an equivalent increase in primary school

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*cias Ultramarinas*, Decreto-lei 45908, 10 Setembro 1964.

<sup>22</sup> “A pré-primária quer ar livre” in *Mensagem*, Revista dedicada aos agentes de ensino dos ambientes rurais, ano IV, nº42, Novembro 1967, p.3.

<sup>23</sup> Free translation: “não só instruir, mas também formar a juventude” (Speech of the minister of the Overseas in April 28, 1965) in SILVA CUNHA, J.M. (1965) *Instruir e Formar*, Lisboa: Agência Geral do Ultramar, p. 8..

<sup>24</sup> Speech of the Minister of the Overseas in April 28, 1965, in SILVA CUNHA, J.M. (1965) *Instruir e Formar*, Lisboa: Agência Geral do Ultramar, p. 10-11.

<sup>25</sup> At least 80% were in the public education system and were distributed through 4500 schools.

<sup>26</sup> SILVA, E.M (1992) “O papel societal do sistema de ensino em Angola colonial, 1926-



Primary school, Benguela, 1960's  
[IICT.]



**Indigenous teaching**  
[DIRECÇÃO PROVINCIAL DOS  
SERVIÇOS DE EDUCAÇÃO (1964)  
Angola - Panorama do Ensino,  
Luanda: CITA.]



enrolment and in founding new educational facilities. In fact, before the war there were only 1000 state's primary schools located in the main urban areas, while in 1974 all provinces were covered and additional 3500 schools had been built.

Frederico Colaço's 1961 article on low cost primary schools presented the local Public Works Department strategy to the following years and showed a broad understanding of the technical issues involved in building the necessary schools for the country.<sup>27</sup> The report was based on their on-going experience and presented solutions to cut building expenses to the minimum "by using all the scientific and technical resources."<sup>28</sup>

The document presented low cost building solutions that were more or less sophisticated according to the school's location. The author established four classes: the *minimum*, the *rudimentary*, the *intermediate* and the *urban* types. In the same document, he established the building's program, constructive solutions and materials recommended for each type.

The *minimum type*, the humblest, consisted in a classroom of 6 by 9 meters. The *rudimentary type* was identical to the *minimum type* with the addition of a teacher's house of 40 m<sup>2</sup>. These buildings were destined to rural areas with no water or electrical supply; therefore, the toilets were located outside the main construction. It should be an "essentially rural" construction, built by the population with available materials. These buildings were destined to indigenous teaching, so vernacular solutions were favoured and backed by the state. Their impermanent and informal character was not a major concern and no recommendations on materials or architectural solutions were presented.

The fibrocement company Lupral developed *minimum type* designs in 1963, 1965 and 1972. The projects showed little dissimilarity in the dimensions of the buildings but formal options were diverse. In 1963, the company designed an open structure, with no walls, while the architectural solutions presented afterwards were progressively more enclosed. Although the variances could result from the fact that these buildings were destined to different climatic areas, there is no indication of such. Naturally, the three solutions used fibrocement products to the maximum, like vent blocks, roofing and cladding panels.

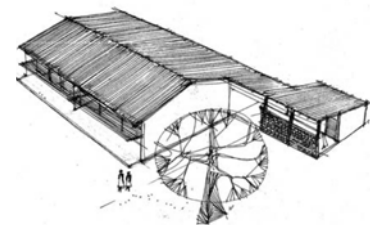
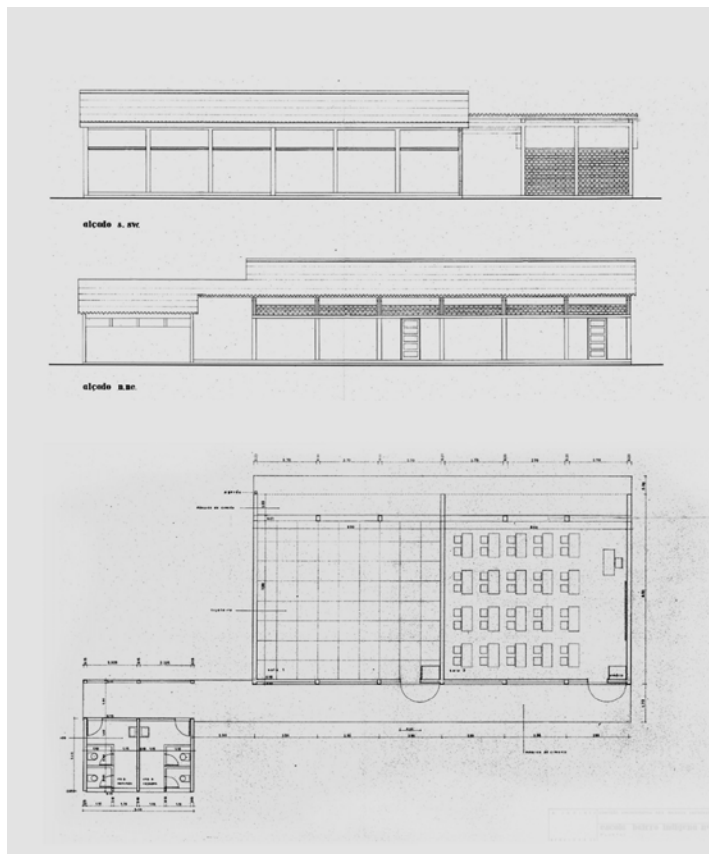
The *intermediate type* should be built in "progressive settlements or suburban areas" with water and electricity, but still with no "major requirements in

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1974" in *Revista Internacional de Estudos Africanos*, Instituto de Investigação Científica Tropical, Lisboa, n°s 16-17 (1992-94), p. 103-130.

<sup>27</sup> COLAÇO, F. (1961) *Nota sobre a planificação de escolas primárias em Angola*, Memória LEA n° 85, Luanda: LEA, p. 59.

<sup>28</sup> Idem, p. 66: "Tratando-se da planificação de escolas primárias, tem de ser reduzido, até ao mínimo indispensável, o custo das construções, para o que se impõe a utilização de todos os recursos da ciência e da técnica."



Primary school at indigenous quarter,  
Luanda, by Antonieta Jacinto, 1959  
[Antonieta Jacinto personal archive.]



architectural language”. These buildings had toilet facilities, artificial light and should “provide better thermal comfort than the rudimentary type”. *Intermediate type* schools had one classroom plus a teacher’s house or two classrooms.

The three mentioned school types were all destined to indigenous teaching, but the *intermediate type* foresaw improved technical solutions. Vernacular constructions were only adequate to rural areas, where the populations built their own schools and empirically addressed the issues of environmental comfort. On the contrary, the *intermediate type* foresaw cultured solutions – low-cost schools designed by architects –, and, therefore, the recommendations emphasized climate responsiveness.

### **Primary school at indigenous quarter, Luanda, 1959** **Antonieta Jacinto (DSOPT)**

The building developed by Antonieta Jacinto in 1959 for a suburban area of Luanda is a typical example of the *intermediate type*. Jacinto was an architect at the Public Works Department in Luanda from 1957 to 1960, and had had a previous experience in Lisbon<sup>29</sup> working for the “Plano dos Centenários”.

<sup>30</sup> Using her training in school design and her Angolan origin, she finished her studies at the ESBAL in 1956 developing a school centre for a tropical country.<sup>31</sup>

In Angola, Antonieta Jacinto was in charge of building a small primary school to an indigenous quarter of the capital city.<sup>32</sup> The building consisted in two different volumes connected by an open corridor – the two classrooms were separated from the toilets and placed on opposite sides of the gallery. The building had a simple modular structure of 3 meters span and a low-pitch gable roof. The classrooms had no walls to the north but large tilt doors that could fully enclose the space or, in turn, open it completely. These panels, when placed on a horizontal position, operated as sun-shading devices and created a sheltered space between indoors and outdoors. Vent blocks were placed on the opposite façade, close to the ceiling, to provide a continuous

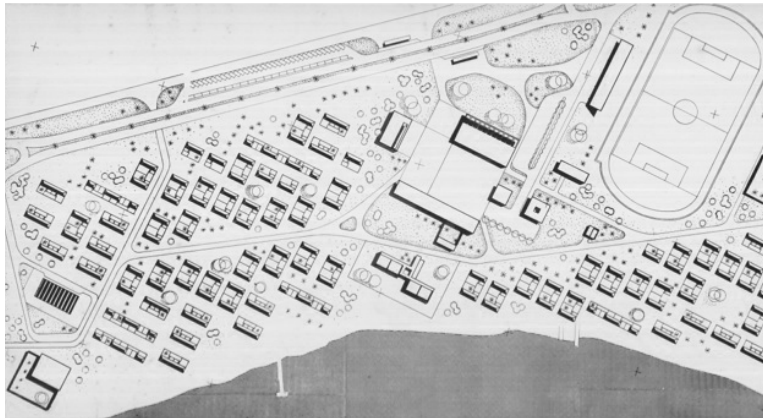
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<sup>29</sup> She worked for Fernando Peres and for the *Direcção dos Edifícios e Monumentos Nacionais* in Lisbon on a revision report to some of the primary schools that had already been built by the program in the regions of Beiras and Trás-os-Montes in the 1940s.

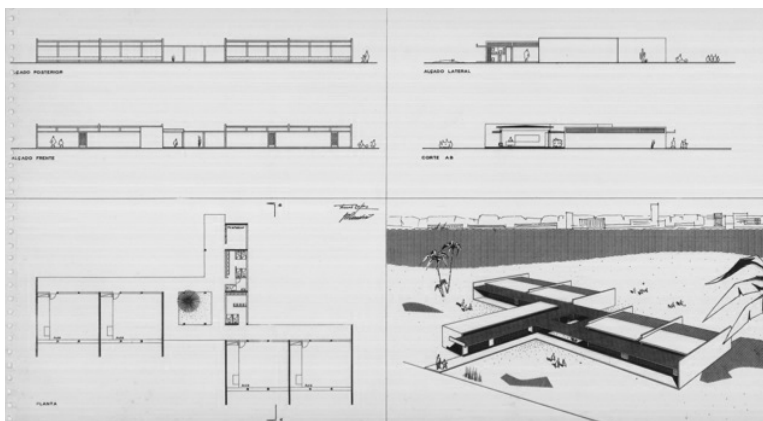
<sup>30</sup> *Plano dos Centenários* was a national plan for the construction of primary schools all over the country, which was undertaken by the *Estado Novo* from 1941 to 1974. The national plan for the construction of primary schools in Portugal was a symbol of the state in every village, with the replication of traditionalist designs by Raul Lino and Rogério de Azevedo. See: MINISTÉRIO DAS OBRAS PÚBLICAS E COMUNICAÇÕES (1943) *Mapa definitivo das obras de escolas primárias: plano dos centenários*, Lisboa: Imprensa Nacional.

<sup>31</sup> Antonieta Jacinto, CODA, *Concurso para a Obtenção do Diploma de Arquitecto*, “Um centro escolar num país tropical”, ESBAL, Lisbon, 1956.

<sup>32</sup> Comissioned by the *Comissão Administrativa dos Bairros Indígenas*.



**Ilha de Luanda Urban Plan, by  
Simões de Carvalho and Pinto da  
Cunha, 1963**  
[Simões de Carvalho personal  
archive.]



**Primary school, Ilha de Luanda**  
[Simões de Carvalho personal  
archive.]

natural ventilation of the classrooms.

The building responded precisely to the guidelines of an *intermediate type* school and presented inventive solutions to favour thermal comfort in the classrooms. Although there were no recommendations regarding architectural form, environmental comfort was required in this case. The technical demand endorsed the architectural design and originated the most interesting features of this straightforward building.

Differently from what happened in Portugal with the “Plano dos Centenários” and in the Portuguese colonies in previous years, there were no requirements regarding primary schools’ architectural language except in the *urban type*. All the other types were destined to indigenous teaching and were located outside the formal cities, so their artistic value was a nonissue. Architecture, or the aesthetic concerns with beauty and harmony, was considered a luxury that was only meant for the city.

Therefore, according to the document, the *urban type* “should respond to the urban and architectural regulations of each area”. Consequently, existed no general norms established by the Public Works Department and it was up to local administrations to establish their own rules. Despite the fact that most municipalities had fixed urban regulations, there were seldom restrictions on architectural language. Therefore, school design was predominantly determined by budgetary restrictions rather than by official rules.

General recommendations stressed on the use of simple and local materials to create low-cost and low-maintenance buildings. Depending on the area’s density, urban primary schools may have 2, 4, 8 or 12 classrooms. The local Public Works Department also considered it was often unfeasible to provide single-sex education, so they refuted Estado Novo’s directive and recommended mixed-gender primary schools.

### **Primary School at Ilha de Luanda, Luanda, 1963**

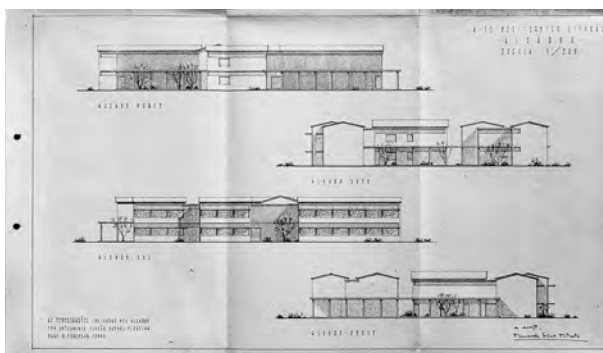
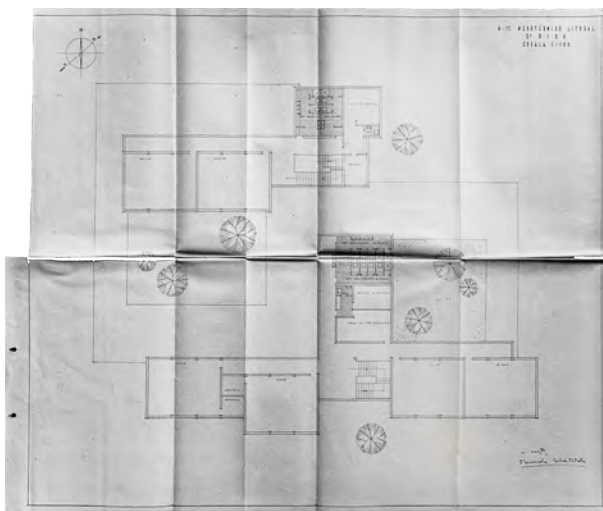
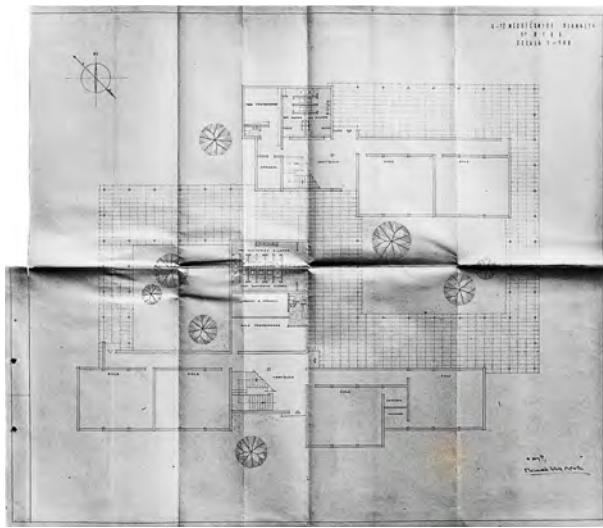
#### **Simões de Carvalho and Pinto da Cunha**

Simões de Carvalho and Pinto da Cunha developed an urban plan for the Ilha de Luanda in 1963. The scheme foresaw an autonomous neighbourhood to the resident fisherman’s community that lived at the shoreline. They designed different house types and a significant number of public buildings, such as a social center, a medical center, a church, a sports club, a post office, a police station, a kindergarten and a primary school. A number of houses were built in the next years, but the original plan was never fully completed.

### **Primary schools to 4 climate types, 1962**

#### **Manuela Silva Mota (DSOPT)**

The notion that climate was the first constraint to be considered for building



Primary schools to four climate types, by Manuela Silva Mota, 1962  
[José Mota, 2018.]

low-cost schools was displayed by Manuela Mota's designs in 1962. The architect designed primary schools for each Angolan sub-climate, considering four climate types – coastal megathermal, coastal mesothermal, inland megathermal and inland mesothermal. Simplified system that divided the country in 4 main climatic regions; a purely theoretical approach - the coastal mesothermal does not exist.

Conclusively, Colaço's planning for primary schools in Angola consisted in building as much as possible with the fewer expenses of time and money. Technical issues were central to create optimized solutions and achieve the greatest possible economy of means. According to the author, the principles were: "science, utility and vulgarization", meaning that building low cost and low maintenance schools could be achieved only with a scientific understanding of technical aspects. Ultimately, these educational buildings should be as less refined as possible.

However, science was only required where vernacular solutions were not feasible. Self-built schools that used local materials and standard constructive techniques presented in fact optimal solutions that were naturally functional and ordinary.

Therefore, the challenge on the table was developing a new vernacular architecture for cities and suburban areas. Information on local climates and knowledge on the new available constructive techniques and materials were crucial to design modern schools that responded to the most basic needs. The author demanded a scientific understanding of environmental control systems and additionally appealed to the use of analytic design processes based on solar orientation:

"A experiência demonstrou que quando se pretende construir uma edificação económica é indispensável expô-la convenientemente à radiação solar, quer directa quer difusa. Como a solução deste problema utilizando recursos gráficos pode tornar mais evidentes as soluções, está sendo desenvolvido um processo gráfico, aproximado, para o efeito, o qual foi já aplicado na implantação das edificações.

Atendendo a que o desenvolvimento final do processo gráfico acima referido, porque teórico, não dispensa as medições meteorológicas locais, referentes aos valores práticos, da radiação solar (já incluindo portanto os coeficientes atmosféricos) e os da radiação difusa, é indiscutível a utilidade destas medições no laboratório competente."<sup>33</sup>

Frequently, the excessive temperatures did not provide the best learning conditions, so thermal comfort was a major concern in school design. However, in Colaço's line of reasoning, knowledge on local climate seemed to

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<sup>33</sup> COLAÇO, F. (1961) *Nota sobre a planificação de escolas primárias em Angola*, Memória LEA nº 85, Luanda: LEA, p. 50.

be mostly necessary to develop an optimal understanding of building physics and ultimately attain the less expensive solutions. Economy was essential while human comfort was apparently just a bonus.

The author called for cooperation between the meteorological services and the engineering laboratory to develop scientific design methods. In fact, Colaço's demands of 1961 were at the basis of a long lasting collaboration between the two research institutes. The results published in the next years provided novel information on climate factors in each region, on building physics and on environmental control systems.<sup>34</sup> Subsequently, the Public Works Department could transmit this precise information to the architects in charge of building new schools of all levels of teaching.<sup>35</sup> This official strategy has become a method for local architects who have used climate responsiveness as their main argument for design.<sup>36</sup>

The ultimate 'colonizing mission' that took place during the war was effective at spreading the teaching of Portuguese language throughout the country by using a new strategy with regard to the construction of educational facilities. While the primary schools built before 1961 aimed at representing the Portuguese nation, the architectural language of schools developed during the war was not fixed by official rules. The means available to put the literacy plan into action were very scarce, so the proliferation of schools was only possible due to simplification practices.

From the 3500 primary schools developed during this period, 85% corresponded to rural school posts and consisted in vernacular and impermanent constructions. Consequently, only around 500 schools were formal buildings, which used modern construction techniques and materials, and were actually designed by architects or engineers. While self-built schools were the epitome of usefulness and efficiency in rural communities, different models were developed to fit cultured areas.

Architects engaged at the DSOPT designed most of the urban educational facilities and, according to their skills, tried to respond to the institution's idea of generalization. Producing low-cost and low-maintenance schools were open goals that funded a modest architectural production all over the country. However, the definition of types never resulted in a clear systematization of models, so the buildings were often simplified versions of former traditional schemes. In this framework, the schools developed by Jacinto, Carvalho and Pinto da Cunha were exceptional designs that tested original arrangements

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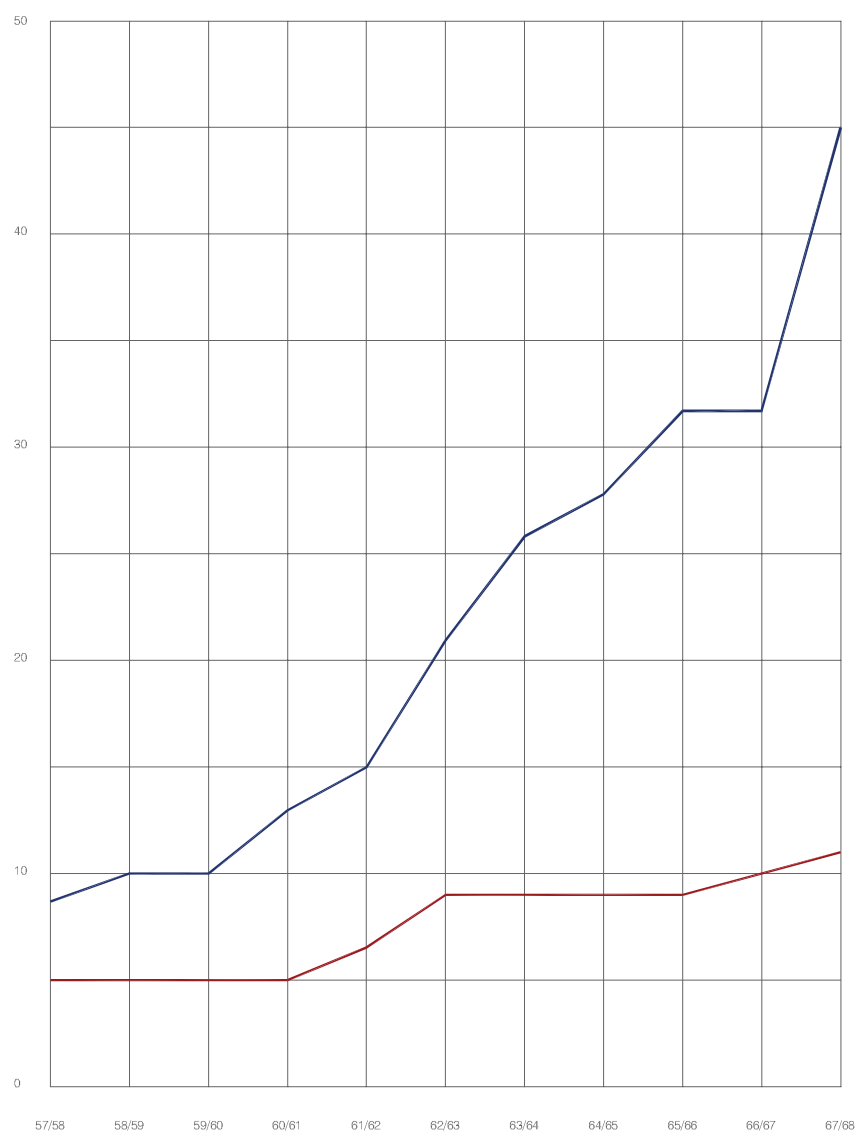
<sup>34</sup> See the chapter *Building Research*.

<sup>35</sup> See for instance: "Condicionamentos urbanísticos para a construção da Escola Comercial do Lobito", CML, 26 Mai 1962. (AHNA/Fundo Obras Públicas/Benguela/Ministério da Educação/17.3.1

<sup>36</sup> As in, for instance, Castro Rodrigues and Vasco Vieira da Costa's project descriptions.

and used a modern architectural language despite humbleness of resources.

Changes in architectural style were in fact more significant in subsequent educational levels. Although primary school development was the Portuguese government's priority, building high schools and colleges was mostly an undertaking of local elites. The settlers aspired to a new society in which education would be a thriving force of development and modernization of the country. Immediate training of local technicians was mandatory to build a stronger elite and quickly foster economic development of the colony.



— Technical schools  
— High schools

**Evolution of public technical schools and high schools, 1957-68**  
[Adapted from SECRETARIA PROVINCIAL DE EDUCAÇÃO (1968) Síntese das Actividades dos Serviços 1967-1968, Luanda: Edição dos Serviços de Educação.]



## 1.2 Secondary Schools: Academic vs. Technical Training

In 1961, expansion of secondary education was more relevant than ever before. At that time, there only existed 5 public lyceums<sup>37</sup> and 10 technical schools across the country, but these numbers doubled immediately at the outbreak of war.

The *Liceu Salvador Correia*, in Luanda, had been built in 1937 and the *Liceu Diogo Cão*, in Sá da Bandeira, in 1949. The facilities of the other three existing lyceums were still under construction in 1961 and their architectural projects had been developed by the GUC from 1954 to 1956. Although designed by different architects working at the Lisbon's office, the three projects corresponded to similar compositions and were also replicated in Mozambique.<sup>38</sup>

At that time, only the cities of Luanda, Sá da Bandeira, Benguela and Nova Lisboa had lyceums, but other urban populations were demanding more educational facilities. As a result, in 1961 Adriano Moreira created four new lyceums in different regions of the country, such as Lobito (*Liceu Almirante Lopes Alves*), Luanda (*Liceu Paulo Dias de Novais*), Moçamedes (*Liceu Américo Tomás*) and Malange (*Liceu Adriano Moreira*). Although the expansion was rather significant in 1961, during the next 14 years only six other lyceums were founded throughout the country.<sup>39</sup> In 1975, 13 Angolan provinces had at least one lyceum, which represented a notable dissemination advance but was far from offering widespread access to public education. Hence, from 1961 to 1975, the number of lyceums tripled and so did school population, which increased from 4000 to 12000 students.

Simultaneously, technical schools had an alternative curriculum to lyceums and also offered training at secondary level.<sup>40</sup> The teaching was divided into 3 different branches – industrial, commercial and agricultural – with two years of common preparatory cycle. In 1961, an equivalent number of students were enrolled in public lyceums and technical schools,<sup>41</sup> but the numbers

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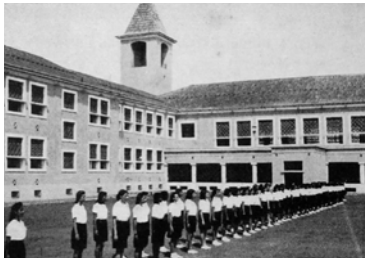
<sup>37</sup> Liceu Salvador Correia, Luanda (founded in 1919; built in 1937); Liceu Diogo Cão, Sá da Bandeira (founded in 1929; built in 1949); Liceu D. Guiomar de Lencastre, Luanda (founded in 1954; built in 1961); Liceu Comandante Peixoto Correia, Benguela (founded in 1956; built in 1961); Liceu General Norton de Matos, Nova Lisboa (founded in 1956; built in 1961).

<sup>38</sup> MILHEIRO, A. V. (2012) “Escolas em Angola durante o Estado Novo”, *Nos trópicos sem Le Corbusier: Arquitectura luso-africana no Estado Novo*, Lisboa: Relógio d'Água Editores, p. 399.

<sup>39</sup> The next 6 lyceums were founded from 1965 to 1970: Liceu Nacional Silva Cunha, Silva Porto, Bié (1965); Liceu Nacional Salazar, Carmona, Uíge (1967); Liceu Nacional Guilherme Capelo, Cabinda (1969); Liceu Nacional Marcelo Caetano, Luso, Moxico (1969); Liceu Nacional Inocêncio Sousa Coutinho, Novo Redondo, Cuanza-Sul (1970); Liceu Nacional Pedro Alexandrino da Cunha, Gabela, Cuanza-Sul (1970).

<sup>40</sup> MINISTÉRIO DA EDUCAÇÃO, *Estatuto do Ensino Profissional Industrial e Comercial*, Decreto-lei 37029, 25 Agosto 1948.

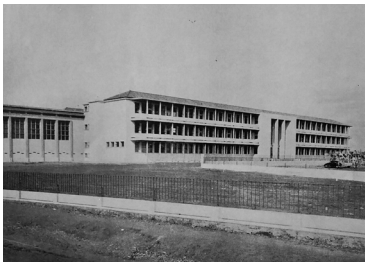
<sup>41</sup> Both had around 4000 students.



A



B



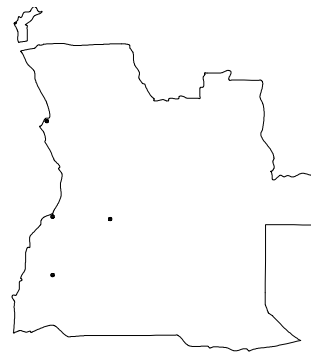
C



D



E



### Location of public lyceums in Angola, 1961

**A**  
Liceu Salvador Correia,  
Luanda, 1937

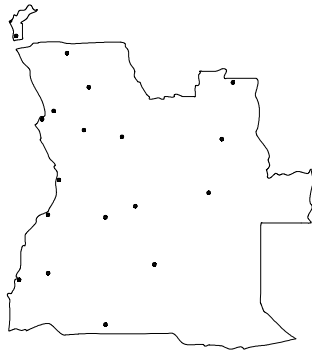
**B**  
Liceu Diogo Cão,  
Sá da Bandeira, 1949

**C**  
Liceu Comandante Peixoto Correia,  
Benguela, 1961

**D**  
Liceu General Norton de Matos, Nova  
Lisboa, 1961

**E**  
Liceu D. Guiomar de Lencastre,  
Luanda, 1961

**A, B, C, D, F, G** [SECRETARIA PRO-  
VINCIAL DE EDUCAÇÃO (1968)  
Síntese das Actividades dos Serviços  
1967-1968, Luanda: Edição dos Serviços  
de Educação.]  
**E** [IICT.]  
**H** [Francisco Castro Ridrigues archive.]  
**I** [Ana Vaz Milheiro, 2004.]  
**J** [Margarida Quintã, 2014.]



**Location of public lyceums  
in Angola, 1970**

**F**  
Liceu Adriano Moreira,  
Malange, n/d

**G**  
Liceu Almirante Américo Tomás  
Namibe (former Moçâmedes), n/d

**H**  
Liceu Almirante Lopes Alves,  
Lobito, 1970

**I**  
Liceu Paulo Dias de Novais,  
Luanda, 1972

**J**  
Liceu, Silva Cunha,  
Kuíto (former Silva Porto), n/d



**F**



**G**



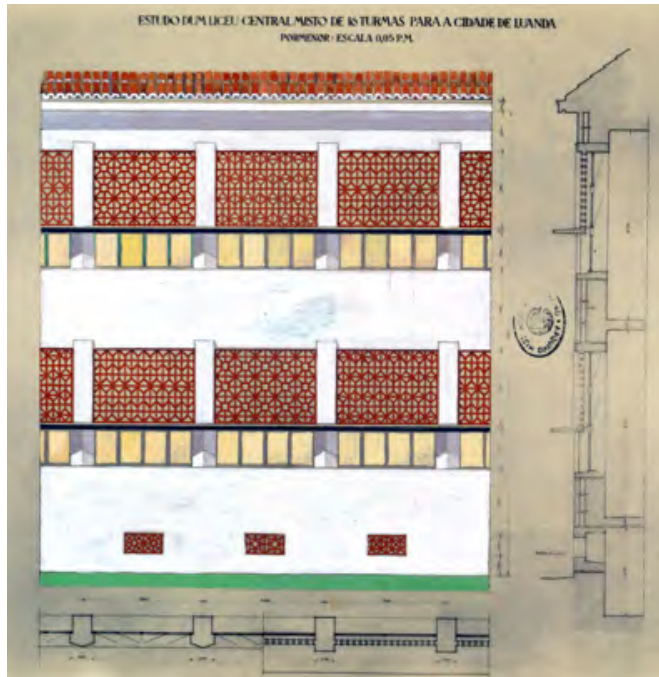
**H**



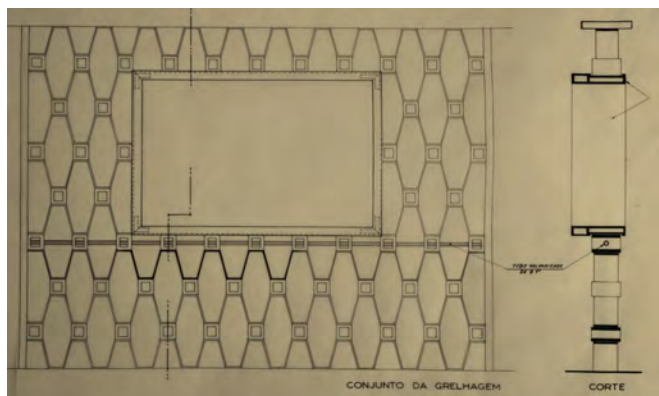
**I**



**J**



Elevation and detail, Liceu  
Salvador Correia, Luanda,  
José Costa Silva  
[Courtesy of Ana Vaz Milheiro.]



Elevation and detail, Liceu  
Almirante Lopes Alves, Lobito,  
Francisco Castro Rodrigues  
[Lupral archive.]

increased differently in the following years.

During this period, local elites were demanding more job-specific training that could contribute immediately to the country's industrialization and modernization. As a result, developing technical instead of academic skills was apparently more urgent and public investment followed along with this notion. From 1961 to 1975, progresses in technical training were fairly more substantial than in lyceums, with higher growth rates in school enrolment and a largest number of new educational facilities.<sup>42</sup>

Immediately at the outbreak of war, technical training also doubled with the establishment of two schools in Luanda, one for each sex, and mixed-gender schools in Cabinda, Carmona, Gabela and Luso. Still in 1961, an industrial institute was founded in Nova Lisboa, a commercial institute in Sá da Bandeira, and an agriculture school in Salazar. Growth in technical training was continuous since 1961 to 1975, differently from what happened with the foundation of lyceums.

Lyceums were major academic institutions with strong symbolic purpose, so their dissemination aimed at representing the state with at least one building in each region of the country. Instead, professional training responded to fundamental operational demands and, therefore, foundation of technical schools was more abundant during this period. In both cases, development post-1961 was very significant but still insufficient to respond to the country's basic needs.

In 1970, Novais Ferreira wrote the article "Ensino e Povoamento" ("Teaching and Settlement"), in which he defended a system of vocational education, established from the first levels of education. His point of view mirrored the concerns of the higher spheres of Angolan society, which aspired to progress by building a highly productive society. Consequently, education should, above all, respond to the primary needs of the country:

"O nosso ensino actual não está de modo algum adaptado às premissas do desenvolvimento do fim do século XX, nem ao ambiente do território em que vivemos. É elitista, não universal, é abstracto, não concreto, é desinteressado, não pragmático."<sup>43</sup>

Novais Ferreira questions the investment with the literacy of the rural populations and affirms that it is not possible to reach education extended throughout the territory due to lack of financial means. The author considers that primary education is too literary and should instead be oriented towards the professionalization of populations.

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<sup>42</sup> In 1968, school population enrolled in public lyceums showed a 5.5 growth rate and in professional schools it corresponded to a 6.6 increase; 6 lyceums had been built vs. 35 technical schools.

<sup>43</sup> NOVAIS-FERREIRA, H. (1972) *Ensino e Povoamento*, Memória LEA nº 165, Luanda: LEA, p. 4.





**Technical School, Lobito, 1967**  
[SECRETARIA PROVINCIAL DE  
EDUCAÇÃO (1968) Síntese das  
Actividades dos Serviços 1967-1968,  
Luanda: Edição dos Serviços de  
Educação.]



**Technical schools in Kuíto, Lobito  
and Benguela (aerial views)**

In fact, at all levels of education, the author advocates a professional and needs-based system in order to capitalize on all investment and favour economic development.<sup>44</sup> At the same time, the author states that the training of local staff is still insufficient to create a self-sustaining employment system in the country.<sup>45</sup> In his view, technical education should be privileged in the case of secondary schools, since it promoted practical training, and therefore more useful “to a developing society”.<sup>46</sup>

This local vision challenged in some way the implementation of the Portuguese education system in the Angolan territory. Moreover, the great Portuguese colonizing effort through the literacy of native populations was openly questioned by colonial society. Local authorities were mainly engaged in the development of urban environments and the incentives for the growth of a “civilized and high-income population”.

In this way, the unifying principles of education were systematically questioned in the local press. While the most staunch supporters of the regime advocated national unity through a single system, the more progressive advocates called for the creation of a model based on local needs and conditions. The school calendar, for example, was a widely debated topic that divided the opinions among Angolan colonial society. In Joana Campina’s articles published in *Prisma Magazine*, this theme is recurrent and nationalist and progressive arguments are simultaneously presented. While some argued that the school year should be identical to the Portuguese one, in order to allow greater mobility between territories, others argued that the school year should be adapted to the local climate conditions. The latter were struck by the autonomy and optimization of the education system and pointed to serious learning problems arising from the tax system.

Secondary school facilities were built all over the country during these years, but school enrolment and occupation rates were much higher in the main cities. In 1968, students enrolled in Luanda and Benguela accounted for around 65% of the total school population at secondary level.

In this way, the construction of educational establishments at the secondary and higher levels, rather than representing the Portuguese state, particularly reflected the aspirations of the Angolan elite. In the post-1961 period, schools were first designed in Angola; the processes were managed by local institutions, increasingly autonomous, and buildings designed by architects

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<sup>44</sup> Idem, p.5: “Temos por total e completamente precipitado abrir uma faculdade de filosofia onde não existe um curso de mecânicos de automóvel.”

<sup>45</sup> Idem, p.4: “Estamos empenhados numa batalha de desenvolvimento. Ela envolve a operação instruir. Mas essa operação terá resultados contraproducentes se não existir simultaneamente a operação emprego compatível.”

<sup>46</sup> Idem, p.5: “A formação de quadros impõe uma reforma total da estrutura do ensino, onde se ajustem, em pirâmide racional, graus sucessivos de ensino profissional até atingir a universidade. O liceu não será o elemento de maior interesse.”



**Lobito Technical School**



**Kuíto Technical School**



**Benguela Technical School**



**Technical Schools, in Benguela  
Lobito and Kuíto**  
[Margarida Quintã, 2014]



established in the country. These conditions led to extensive and widespread architectural production across the territory, especially when compared with the previous situation, which was extremely limited.

However, the local elite were also very committed to this task. The promotion of education was simultaneously supported by local and private entities. The article refers to the award of grants to students of various levels of education,<sup>47</sup> companies that had their own schools, and even privately funded high school nationals.<sup>48</sup>

Still in 1970, *Auge Magazine* published a monographic issue dedicated to Portugal, in which developments in Angola were widely publicized. In the chapter on education, one reads that there are “unlimited opportunities” in Angola:

“In Angola everyone has the opportunity to follow higher studies. The preparatory cycle of secondary education receives the primary school-leavers in 450 establishments, where 1000 teachers instruct 20000 boys over a period of two years. At the end of this course, the students may opt to continue their school studies, or to follow technical and professional or agricultural courses. The enormous educational effort at present involves an impressive half million of the flower of Portuguese youth.”

The Mexican magazine was published in English and its diffusion was mainly international. The issue of racial integration was at the heart of propaganda, as was the creation of more levels of education and the geographical spread of new schools.<sup>49</sup> According to the article, high school buildings were being built in sufficient numbers. The idea of progress and hope for the future of the country implicitly required the continuity of the Portuguese domain. Sponsorship of the education system was finally remarkable, confirming the state's commitment to securing its political sovereignty.

With a propaganda strategy, the Portuguese state sought to demonstrate internationally that Angola offered “education for all.” At the same time that an idea of progress and modernity was being shown, the war for independence continued uninterrupted away from the cities. Thus, internal propaganda was also necessary, and urgent, especially among the younger generations.

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<sup>47</sup> The young people are stimulated by the award of state scholarships and grants from progressive private people for all grades and branches of education, to a professional standard.” in GARCIA, J. (1971) “Education for everybody”, *Revista Auge de Mexico*, Special edition- Portugal Today, April, p. 159.

<sup>48</sup> For instance, the *Liceu Inocêncio Sousa Coutinho* in Sumbe (former Novo Redondo) was sponsored by a rich family. According to Castro Rodrigues, the Seixas family also financed the church and the city hall. DIONÍSIO, E. (2009) *Francisco Castro Rodrigues - Um Cesto de Cerejas - conversas, memórias, uma vida*, Lisboa: Casa da Achada, p. 394

<sup>49</sup> As Angola throws itself into the effort to encourage development in all the various aspects of life, it needs qualified men to sustain the educational system. The enthusiastic response to the call of the educational authorities to carry knowledge to the most rugged corners of the country has been magnificent and offers great hope for the future.” GARCIA, J. (1971) “Education for everybody”, *Revista Auge de Mexico*, Special edition- Portugal Today, April, p. 161.



Book cover: Angola Um plano para a Juventude (1967)  
[Vasco Vieira da Costa archive.]

### 1.3 *Mocidade Portuguesa*: Student Support Facilities

In 1967, the Portuguese youth organization *Mocidade Portuguesa* developed a “Plan for youth”<sup>50</sup> in Angola. Their program consisted in building the necessary residential and leisure facilities to support the educational expansion at secondary, mid and higher levels.<sup>51</sup>

Until then, the MP had only two student residences in the country but the 3<sup>rd</sup> *Plano de Fomento* (1968-73) sponsored their new actions. Due to the political instability, the Portuguese government decided to strengthen the MP’s activities in Angola in order to fulfil the order – “instruct and form”. As pointed out by the minister of the Overseas in 1965, besides creating more schools, the government should also develop a formative action “in order to preserve younger generations’ moral health and ensure their perfect understanding of the supreme national interests”.

According to the MP’s document, Angola presented extra challenges to the youth but the organization could provide the means to win the current “ideological war”. They considered that “the social substratum presents two well-differentiated groups as to its socio-economic and cultural typologies, which requires a redoubled effort to obtain a strongly integrated society.”

The racial issues were thus addressed indirectly, so as not to point out that it was a truly central and divisive issue. The national unity was obviously threatened by the African population, considered in the text the “largest but more fragile group”. The Portuguese paternalism triggered the idea of a multiracial society:

“If we really want to create a highly integrated multiracial society, living an enlightened spirit of national unity and respect for the rights of the peoples (...) it is in a strong youth organization that we have to find the powerful means of forming men who will continue the nation that all Portuguese of good will aspire to.”

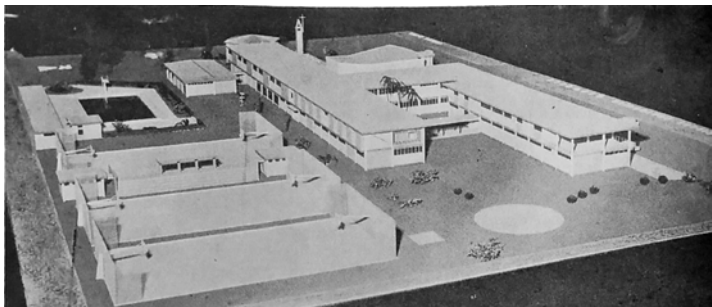
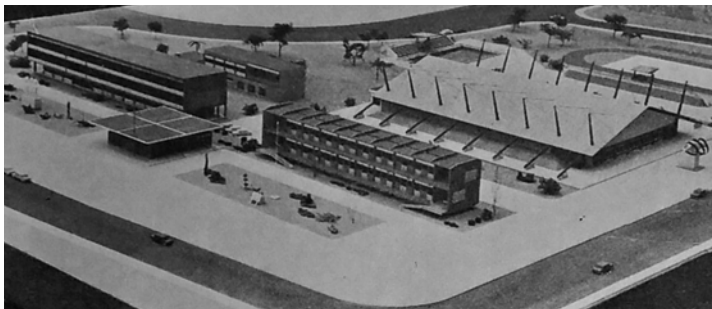
The document also presented an apology for youth organizations and their “valuable formative purpose”. It was considered that, in the past, organizations such as the Opera Nazionale Balilla, the Hitler Youth and the Komsomol had had “reprehensible actions motivated by their expansionist plans” but their activities were “unquestionably useful for training the youth.” Moreover, it was suggested that the Portuguese youth organization had no such plans but a noble welfare policy.

The organization’s nationalist ideology was clear and had, in fact, an ambitious expansionist agenda in Angola. Following the substantial enlargement

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<sup>50</sup> COMISSARIADO PROVINCIAL DA MOCIDADE PORTUGUESA (1967) *Angola: Um plano para a Juventude*, Luanda: Edição dos Serviços da M.P. Angola.

<sup>51</sup> GOVERNO GERAL DE ANGOLA, *Regulamento dos Lares de Estudantes*, Portaria 13360, 17 Agosto 1964.



**Models of Mocidade Portuguesa's student housing facilities in Nova Lisboa, Benguela and Cabinda**  
[SECRETARIA PROVINCIAL DE EDUCAÇÃO (1968) Síntese das Actividades dos Serviços 1967-1968, Luanda: Edição dos Serviços de Educação.]



**Construction works of student housing facilities in Cabinda (1968)**  
[SECRETARIA PROVINCIAL DE EDUCAÇÃO (1968) Síntese das Actividades dos Serviços 1967-1968, Luanda: Edição dos Serviços de Educação.]

of secondary school network in the country, the MP's plan envisaged the construction of 23 new buildings for housing migrant students and providing them with recreational activities. Three building types were required – student residences, recreation centres and youth hostels – and the new facilities should cover all regions.

Building student residences was the priority due to high migratory flow of students from small towns to the major regional capitals. Firstly, it was necessary to provide “a new home”, not just accommodation, for the students who were forced to leave their families. Adding to the existing student residences in Luanda and Sá da Bandeira, the program foresaw the construction of seven more housing facilities<sup>52</sup> located in the cities of Cabinda, Carmona, Malanje, Gabela, Benguela, Nova Lisboa and Silva Porto.

Each of these student residences should be equipped with a recreation center for activities such as swimming, athletics, aero-modelling or photography. Besides those centres, twelve more should be established in smaller cities<sup>53</sup> in the following years.

Additionally, four youth hostels in different regions of the country were announced.<sup>54</sup> The buildings ought to be constructed in diverse climatic zones to cover the country's diversity and foster interregional exchange. Each should have 100 beds and offer an array of activities fitting their coastal or inland locations.

#### **M.P.'s Youth hostel Ilha de Luanda, Luanda, 1968 (demolished) Vasco Vieira da Costa**

The first MP's youth hostel was built in Luanda in 1968 and was designed by Vasco Vieira da Costa. The complex was located at the *Ilha de Luanda*, surrounded by palm trees and close to the beach, hence offering great conditions to practice water sports.<sup>55</sup> As foreseen by the MP's program, the building consisted in a set of six pavilions positioned separately in the plot.

The program comprised administrative services, canteen, meeting rooms and dormitories, wherein each function corresponded to a singular one-storey building. The three dormitory pavilions, with 30 bunk beds each, were simple and repetitive concrete structures in which the connection between walls and roof was its most particular feature. A large concrete roof levitated and

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<sup>52</sup> The program only mentions male student residences for children between 10 and 17 years old.

<sup>53</sup> Moçamedes, Novo Redondo, Salazar, Serpa Pinto, Henrique de Carvalho, Lobito, Cubal, Vila Nova do Seles, Vila General Machado, Camabatela, Luso.

<sup>54</sup> Luanda/Malanje; Novo Redondo/Gabela; Lobito/Nova Lisboa; Moçamedes/Sá da Bandeira.

<sup>55</sup> MERGULHÃO, C. (1970) *Ensinando em Angola*, Film, Telecine Moro, Lisbon.



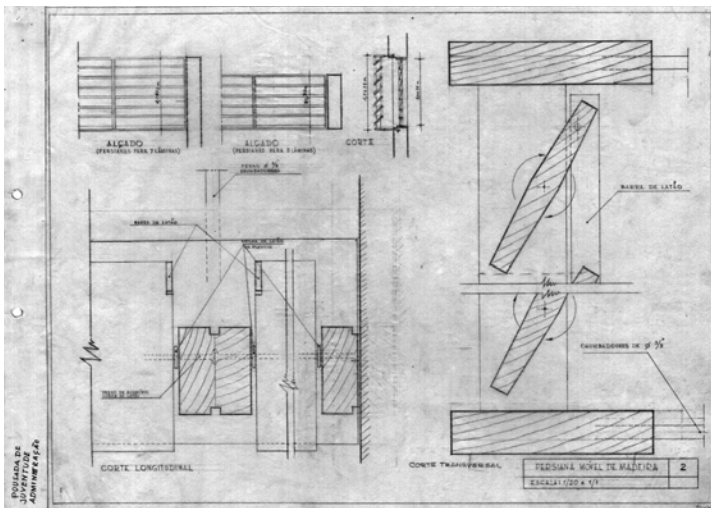


MP Youth Hostel, Ilha de Luanda,  
by Vasco Vieira da Costa, 1968  
(demolished)

Frame from  
*Ensinando em Angola*, 1970  
[directed by Custódio Mergulhão,  
Cinemateca Portuguesa.]



Youth Hostel Dormitories  
[SECRETARIA PROVINCIAL DE  
EDUCAÇÃO (1968) *Síntese das  
Actividades dos Serviços 1967-1968*,  
Luanda: Edição dos Serviços de  
Educação]



Shutters' detail  
[Faculdade Agostinho Neto archive]

hanged over the walls that were separated from the ceiling by a large gap. This continuous line of shadow disjointed the volumes, gave elegance and lightness to the building, and worked simultaneously as an aeration device.

The youth hostel pavilions were evocative of the LEA's architectural language. The two complexes are contemporary and both share the same colour palette, the same large gargoyles and the same concrete grids. In both cases, the complexes were shaped by a set of pavilions but responded to dissimilar functions and contexts. While the LEA was a scientific campus in a suburban scenario, the youth hostel was the model holiday camp standing on the beach.

### **M.P.'s Student Residence , Luanda, 1970 (non-built)**

**Vasco Vieira da Costa and José Quintão**

In 1970, Vieira da Costa and José Quintão got another commission from the MP to design a student residence and recreation center in Luanda. The project was never completed but the studies show this time a more dense solution responding to an urban scenario.

The MP's demands on the building's organization were the same that had been established in 1967 by the "Plan for the Youth" and that were applicable in all other student residences built in the country. However, in this particular case, the MP's document recommended "a simple, airy, proud and pleasant construction" and ended with the note: "it is a building for the youth; it should be bold."<sup>56</sup>

Modern and functional architectural designs were preconditions established by the local commissariat of the institution. The MP was an organization for the Portuguese youth in Angola that was preparing a confident but uncertain future. Therefore, boldness and novelty were required to achieve their ideological goals, and architecture should display the same standards. "School of Angola - Synthesis of fraternal living of the Portuguese of all colors."<sup>57</sup>

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<sup>56</sup> Free translation: "um tipo de construção simples, airosa, com dignidade e agradável (...) construção para a juventude; importa que seja arrojada" in COMISSARIADO PROVINCIAL DA MOCIDADE PORTUGUESA (1970) "Lar de estudantes e clube de juventude - plano de necessidades", unpublished document, 16 February 1970, p.5.

<sup>57</sup> Film narration: MERGULHÃO, C. (1970) *Ensinando em Angola*, Film, Telecine Moro, Lisbon.



*PRISMA* magazine, 1969  
[Arquivo Histórico  
Ultramarino.]



**The University of Luanda**  
[published at Auge magazine,  
Mexico (April 1971).]



### 1.4 Higher Education: EGUA<sup>58</sup> (1962) and the University of Luanda (1968)

The establishment of higher education in the Portuguese colonies of Angola and Mozambique occurred simultaneously in 1962 and resulted from the new political agenda at the outbreak of the Independence War in Angola. However, the Portuguese minister of the Overseas only established the *Estudos Gerais Universitários* after the Government of Angola had unilaterally founded a higher education system.

In 1961, along with the upsurge of the African liberation movements, the settlers' community was distressed and questioning the country's future development. Hence, a new Governor was named to calm this turbulent socio-political context. Although Venâncio Deslandes was not previously familiar with the country, he was supportive of local elites who had long demanded universities as a way to promote the country's economic development.

As a result, in April 1962, he founded a polytechnic center in Angola based on the existing research centres that offered 14 professional courses and 5 specialization courses.<sup>59</sup> In his speech, he explained why his action was on the Portuguese Nation's best interest: "we are forced to move forward so we do not lose control of the vertiginous evolution of the political conjuncture." In his view, Angola couldn't wait for the central government to take action because the situation was urgent:

"The insufficient number of university-level technicians is now the biggest obstacle to Angola's progress. (...) We are sure that Angola would engage at this moment a thousand engineers, agronomists, veterinarians, economists, doctors, secondary school teachers, etc., of which more than two thirds could have immediate access to public service units.

This situation will gradually worsen - and to think otherwise would be to disbelieve in the progress of the Province and the pace with which we intend it to proceed. I think it is not inflated optimism to predict that in the short span of three or four years, if the current system maintains, the shortage will triple. If we carefully analyse the possibilities of the Portuguese University to respond to this growing rhythm of needs, it is easy to see that it cannot adequately support it - as is already happening at this very moment, as evidenced by our present deficiencies."<sup>60</sup>

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<sup>58</sup> "Estudos Gerais Universitários de Angola".

<sup>59</sup> Polytechnic courses: Roman philology; German philology; Geographic and natural sciences; Chemical, physical and mathematical sciences; General medicine; Clinical analysis; Economy; Civil engineering (infrastructures); Civil engineering (buildings and urbanism); Civil engineering (hydraulics); Agronomy; Forestry; Livestock and Veterinary. Specialization courses: General surgery; Public health; Statistic; Agricultural biology and Agricultural engineering.

<sup>60</sup> Venâncio Deslandes, Governor of Angola, speech at the *Conselho Legislativo*, Luanda, April 4, 1962 in GOVERNO-GERAL DE ANGOLA (1962) *Estudos universitários em Angola*, Luanda: Imprensa Nacional de Angola.



**University of Luanda**  
[GOVERNO-GERAL DE  
ANGOLA (1964) *Anuário dos  
Estudos Gerais Universitários  
de Angola 1963/64*, Luanda:  
Imprensa Nacional de Angola.]



**Faculty of Medicine, 1970**  
[Simões de Carvalho personal  
archive.]

The program of the new Polytechnic had been organized by the heads of local research institutes and was ready to be executed immediately. However, Deslandes's act was never implemented because it was perceived as an overly radical change to the regime's development strategy. In fact, an inclusive access to higher education in Angola would promote a sustained development of the colony and ultimately sponsor its autonomy from Portugal.

The Governor's progressive vision clashed with the education policy in force that restrained higher education to the privileged. The most conservative supporters of the political regime had been in favour of maintaining an elitist system that promoted racial, gender and economic discrimination by offering only a few scholarships a year to send students to Universities in Portugal.

<sup>61</sup> In fact, this policy was also valid in the metropole, where access to higher education was not wide-ranging and Universities were only expected to shape a controlled elite.

As a result, the law was declared unconstitutional a couple of months later. This unexpected deprivation frustrated the settlers' ambitions and instigated general protests in Luanda. Immediately afterwards, in July 1962, the ministry of the Overseas revoked the law and created the *Estudos Gerais Universitários* in Angola and Mozambique,<sup>62</sup> declaring, "the University is indeed one, closely linked to the definition and perpetuation of national unity".<sup>63</sup>

At that time, 10 courses<sup>64</sup> were established and a board of professors from Portugal was named to lead the departments. The first classes started in the school year 1963/1964 with 286 students.<sup>65</sup> At first, colleges in Angola could not award the diplomas and, in fact, the last two years of graduation had to be attended in Portugal. This situation would change in 1968 with the founding of the University of Luanda.

Although establishing universities in the colonies was quite revolutionary considering the previous background, this system was still coherent with the idea of national unity by promoting the continuation of the same teaching curriculums and forming a great dependence from the Portuguese universi-

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<sup>61</sup> MINISTÉRIO DO ULTRAMAR (1963) *Bolsas de estudo para estudantes ultramarinos*, Lisboa: Agência Geral do Ultramar.

<sup>62</sup> MINISTÉRIO DO ULTRAMAR, *Anulação do Diploma Legislativo 3235 do Governo Geral de Angola*, Decreto-lei 44472, 23 Julho 1962

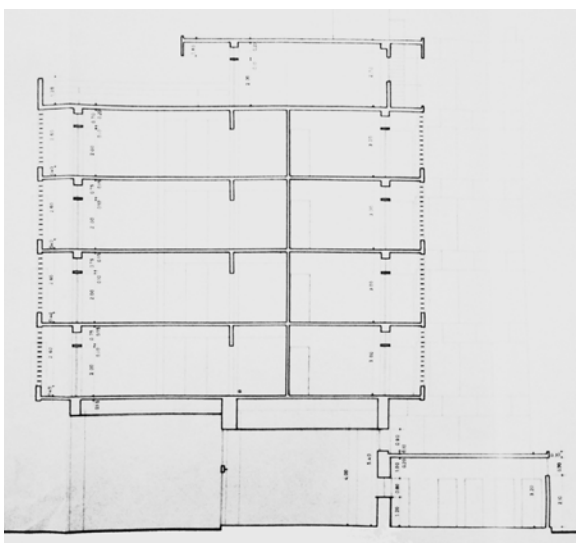
<sup>63</sup> Free Translation: "A Universidade de facto é so uma, intimamente ligada à definição e perpetuamento da unidade nacional" in MINISTÉRIO DO ULTRAMAR, *Criação dos Estudos Gerais Universitários em Angola e Moçambique*, Decreto-lei 44530, 21 Agosto 1962.

<sup>64</sup> Medicine, Pedagogical Sciences, Civil Engineering, Mining Engineering, Mechanical Engineering, Electrical Engineering, Chemical Engineering, Agronomy, Forestry, and Veterinary Medicine.

<sup>65</sup> GOVERNO-GERAL DE ANGOLA (1964) *Anuário dos Estudos Gerais Universitários de Angola 1963/64*, Luanda: Imprensa Nacional de Angola.



**College Students' Residence,  
Vasco Vieira da Costa, 1969**  
[André Almeida, 2011.]



**College Students' Residence,  
Vasco Vieira da Costa, 1969**  
[LEA archive.]

ties. The polytechnic teaching that Deslandes tried to implement was, on the contrary, only supported by local institutions, local professors, and favoured the creation of alternative curriculums to respond to the local conditions.

However, to the *Estado Novo*, allowing autonomous development of a polytechnic center in a colonial territory would acknowledge that necessities were in fact different according to local circumstances. Favouring independence, even if only in the educational system, was enough to threaten the regime and promote the governor's dismissal. Venâncio Deslandes and his government were discharged from office and he left Angola in August 1962. Furthermore, Salazar would also dismiss the Minister of the Overseas a few months later as a result from these insubordinate acts.

In spite of the failure of an autonomous higher education system, discussions continued in the following years opposing nationalism to locality in the teaching policies. Ivo Soares, who was the rector of the EGUA from 1966 to 1974, considered that colleges in Angola shouldn't be based on conservative models but establish a new set of rules. In his view, the University of Luanda should benefit from the low student to teacher ratio,<sup>66</sup> promote debate, and question the traditional Napoleonic model. In a citation from 1970, the rector suggests the University's autonomy and underlines its responsibility towards the country's modernization:

"We are forming men for life in the 21<sup>st</sup> century. We fully understand the tremendous challenge on the table – cutting short the distance separating us from the leading nations. Our destiny is in our own hands. While venerating the past, we must move forward with our eyes open and set on the future."<sup>67</sup>

After its inauguration in 1963/64, the EGUA tripled the number of students in only three years. Initially, the courses were functioning at existing buildings rented or acquired by the institution, but the situation rapidly became problematic.

"Deve reconhecer-se na Universidade de Luanda o fundamento de uma autonomia cultural, de uma maioria técnica, de uma originalidade de acção – o que se pode contrapor à preparação expedita de técnicos para preenchimento de cargos como se previa no projecto que a Universidade de Luanda teve de contrariar para poder existir."<sup>68</sup>

In 1968, with the founding of the University of Luanda, five new courses<sup>69</sup> were created and the first diplomas were awarded in the following year. Imple-

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<sup>66</sup> Ratio was 7 students per teacher in 1970.

<sup>67</sup> Ivo Soares quoted in 1970 at the Revista Auge: GARCIA, J. (1971) "The University of Luanda", *Revista Auge de Mexico*, Special edition - Portugal Today, April, p. 165.

<sup>68</sup> SOARES, I. (1969) "Universidade de Luanda", *Revista Prisma*, nº21, January, p. 7-11.

<sup>69</sup> New courses: biology, physics, chemistry, mathematics (1968), economics (1970).



University of Luanda (classroom)  
[GOVERNO-GERAL DE  
ANGOLA (1964) *Anuário dos  
Estudos Gerais Universitários  
de Angola 1963/64*, Luanda:  
Imprensa Nacional de Angola.]

menting new courses was under discussion, such as fine arts and architecture (1969-1971); Portas, 1971.

“Toda esta atividade se integra na planificação progressiva dos Serviços de Educação no Ultramar, que abrange os diferentes graus do ensino (primário, secundário, médio e superior) e tem merecido a melhor atenção do Governo, como se pode verificar inclusivamente pelas dotações atribuídas a este sector. Assim é que, com os Estudos Gerais Universitários, se despenderam, desde 1964 até agora, em Angola e Moçambique, cerca de 150 000 contos e que, para além disso, pelo II Plano de Fomento, se gastaram com os Serviços de Educação das Províncias Ultramarinas, aproximadamente 500 000, prevendo-se no Plano Intercalar, para o mesmo fim, cerca de 800 000, tendo ainda os orçamentos ordinários das províncias inscrito para despesas de instrução, só nos últimos três anos, 1 360 312 contos.”<sup>70</sup>

In 1970, Martins dos Santos wrote:

“O desenvolvimento de Angola foi enorme nestes anos de Guerra; o progresso verificado no aspeto escolar foi talvez o mais acentuado. O investimento educativo é absolutamente necessário e o mais rentável. As escolas que não tínhamos fizeram-nos imensa falta.”<sup>71</sup>

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<sup>70</sup> CUNHA, J.M.S. (1965) *Na posse do reitor dos Estudos Gerais de Angola*, Lisboa: Agência Geral do Ultramar, p.8-9.

<sup>71</sup> Martins Santos, 1970, p. 281.





## **Chapter 2**



**Ventilation devices**  
[Margarida Quintã, 2006.]

## Design with Climate

Recent scholarship often refers to the architecture produced in Angola in the second half of the twentieth century as ‘modern’ and ‘tropical’. The use of the tag ‘tropical’ suggests that building’s climate responsiveness is one of the main characteristics binding a vast body of work that involves different authors, periods and territories. The label contributes to blur these differences and suggests that this architectural legacy resulted mostly from the architects’ pool of international references, in a process of Western otherness as regards to the local realities.

This chapter investigates how the notion of tropical architecture developed in Angola, by focusing on the evolution of practical knowledge on local climate during the twentieth century. It focuses particularly on the internal processes that gave rise to a growing understanding over the country’s geography and weather, notably through the establishment of local research institutes. Increasingly extensive climate data was collected and later combined with investigations in building physics, giving rise to original research developed in the country by the engineering laboratory. Local institutions broadcasted this knowledge and it ultimately influenced local architects’ design methods and led directly to developments in the construction sector.



**Pink Map (1890)**  
[Sociedade de Geografia de Lisboa,  
1890.]

## 2.1 Angolan Climate

Western discourses on Angolan climate started in late nineteenth century with the first records by Portuguese explorers. This section focuses on the initial descriptions of the exotic weather, with biases and ambiguities, and examines later documents that show the central role of climate data to the country's colonization in the first years of the twentieth century.

The colonialist exoticism of the first reports on landscape and climate gave place to a more in-depth understanding of the territory in mid twentieth century. It was only during the aftermath of World War II, and particularly between 1961 and 1975, that an effective, analytical and interpretative knowledge of the various local climates started to emerge.

During this period, meteorologists developed an accurate description of Angolan climates starting from the climate classifications of Koppen-Geiger (1931, 1936) and Thornthwaite (1948). The seminal reports published by the Meteorological Service of Angola in 1955 (Leal, 1955) and 1962 (Silveira, 1962) established the basis for later research in each locality and specific subjects, such as prevailing winds, solar charts, or rainfall regimes. Locally based research institutes investigated the country's geography and climate and formed a precise knowledge that would inform and potentiate the architectural production. Firstly, Portuguese researchers on missions produced this elementary knowledge. Later, Portuguese settlers based or born in Angola developed these researches and created a network between local institutions. The on-going investigations, although politically dependent of the Portuguese government, was increasingly autonomous and driven by local interests. At the same time, emerging cultural movements at the birth of Angolan nationalism commonly invoked Angolan landscape as national identity whilst fighting the general ignorance towards the country's authentic African nature. As a result, during the 1960s and the 1970s, the growing quest for knowledge on the land and the people was simultaneously motivated by colonialist goals, by autonomist ideals and by the nationalist struggle.

In *The Problem of Nature: environment, culture and European expansion*, David Arnold outlines the history of the invocation of nature in human history. He points out that landscape has been invoked as national identity since the early sixteenth century in Europe, <sup>1</sup> and follows on with the notion that "landscape ceased to be self and took on the alien forms of otherness"<sup>2</sup> when European explorers made their first contacts with remote geographies. According to Arnold, the tropics became not only a physical space, but also a conceptual one. He proves that, throughout history, the label '*tropical*' was at the centre of several biases.

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<sup>1</sup> ARNOLD, D. (1996) *The Problem of Nature: environment, culture and European expansion*, Oxford: Blackwell, p. 137.

<sup>2</sup> Idem, p. 140.





*De Angola à Contra-Costa* (1886)  
[CAPELLO, H.B.; IVENS, R. (1886)  
*De Angola à contra-costa*, vol.2,  
Lisboa: Imprensa Nacional, p. 200.]

### De Angola à Contra-Costa: Portuguese Explorers Facing Tropical Climate

In Angola, the study of climate started in late 19th century with the first voyages of exploration to the inland. These scientific expeditions resulted from the establishment of the *Sociedade de Geografia de Lisboa* in 1875 due to the international political context that preceded the Berlin Conference.<sup>3</sup>

With the end of slave trade<sup>4</sup> and the loss of Brazil in 1825, Portuguese colonial strategy shifted to its African possessions.<sup>5</sup> Nevertheless, it was only after the establishment of the *Comissão de África* that the first great scientific expeditions were prepared with clear imperialist goals. European explorers had started missions to central Sub-Saharan Africa (Livingstone 1851-1873; Stanley 1874-1876) that threatened the fragile Portuguese domain and compelled the country to invest in exploring and colonizing the inland.

In 1884, the Berlin Conference brought together the European countries<sup>6</sup> that were in quest for the African continent and established the principle of effective occupation of territories (The General Act of the Berlin Conference 1885). At that time, the rules of African colonization were established by the European powers and the definition of borders took place in the following years. Portugal demanded a coast-to-coast empire connecting the colonies of Angola and Mozambique, which was represented in the *Pink Map* (1885). The Portuguese claim for sovereignty over these inland territories ultimately clashed with the British intentions of connecting Cairo to Cabo, and lead to the British Ultimatum to Portugal in 1890.

Although the Portuguese project failed, the first national expeditions had been organized to prepare the Pink Map. The epic journey of Capelo<sup>7</sup> and Ivens<sup>8</sup> (*De Angola à Contra-Costa*, 1884-85) established for the first time a land route between Angola and Mozambique and brought new cartographic information of South-central Africa. Their missions to the inner territories had started in 1877 with Serpa Pinto<sup>9</sup>, when they were sent to explore the hydrographic basins of Zaire and Zambeze. The scientific journey from Benguela to Iaca prepared the ambitious travel from the Atlantic to the Indian coast of Africa,

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<sup>3</sup> The Berlin Conference (1884-1885) organized the rules of the European colonization of Africa.

<sup>4</sup> Abolition of the slave trade was legislated in 1837 but only effected in 1850.

<sup>5</sup> Scholars deploy the period between 1825 and 1975 as the third Portuguese empire (Clarence-Smith, 1985).

<sup>6</sup> The 14 countries at the meeting were: Great Britain, France, Belgium, Denmark, Sweden-Norway, Austria-Hungary, Germany, Italy, the Netherlands, Spain, Portugal, Turkey, Russia and the United States of America.

<sup>7</sup> Hermenegildo Brito Capelo (1841-1917).

<sup>8</sup> Roberto Ivens (1850-1898).

<sup>9</sup> Alexandre de Serpa Pinto (1846-1900).



**Roberto Ivens' sketchbooks**  
 [published in TAQUELIM, M.  
 (2008) *Desenhando em viagem: os cadernos de África de Roberto Ivens*, Thesis (Master), Faculdade de Belas Artes da Universidade de Lisboa.]



which served a clear colonizing mission.<sup>10</sup> Besides confirming Portuguese sovereignty over the African inland, the travel aimed at establishing a commercial route between the two colonies and at finding new forms of exploitation.<sup>11</sup>

Climate was one of the aspects consistently portrayed in the explorer's notebooks, alongside with descriptions of the flora and fauna of these regions. During the journey from Moçamedes to Tete, Capelo and Ivens recorded weather data, such as: atmospheric pressure, air temperature, vapor pressure, air humidity and wind direction and strength, and later presented it on graphs and charts at the second volume of the book *De Angola à Contra-Costa* (1886). Besides the purely scientific measurements, their empirical descriptions of climate provided information on their perception of discomfort and showed astonishment towards the alien conditions they found. Arriving in Luapula, Capelo and Ivens recorded:

“Intense heat and permanent storms devastated the encampment (...). It rains in an extraordinary way (...). The humidity here is excessive, oppressing the lungs in the thickest of the woods. (...) Inside the tents, although fires were constantly lit, the suitcases, boxes and shoes were covered entirely with mold.”<sup>12</sup>

Their writings fit David Arnold's notion that the *tropics* are a conceptual space that existed only “in mental juxtaposition to something else – the perceived normality of the temperate lands.”<sup>13</sup> In the end, the Portuguese authors arrive to a somewhat surprising conclusion: it is actually possible to live in the *tropics*, since “today Africa is already one of the world's neighborhoods, as suitable to life as any other place.”<sup>14</sup>

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<sup>10</sup> CAPELLO, H.B.; IVENS, R. (1881) *De Benguella às terras de Iácca*, Lisboa: Imprensa Nacional.

<sup>11</sup> “Hoje já ninguém vê na África senão um dos vastos quarteirões do mundo, tão próprio à vida como qualquer dos outros conhecidos, tão digno de desvelo como o mais rico dos supracitados, amplo campo de afã comercial, cuja primeira base de segura civilização cumpre ou antes é dever do europeu explorar, não só no interesse dos seus habitantes, como em proveito do tráfego comum; enfim, de esquecido e oculto que foi, tornar-se-á dentro em pouco opulento, cobiçável e assaz visitado, transformando-se num grande centro de consumo para todo o excesso da nossa produção” in CAPELLO, H.B.; IVENS, R. (1886) *De Angola à contra-costa*, vol.1, Lisboa: Imprensa Nacional, pg XXIII.

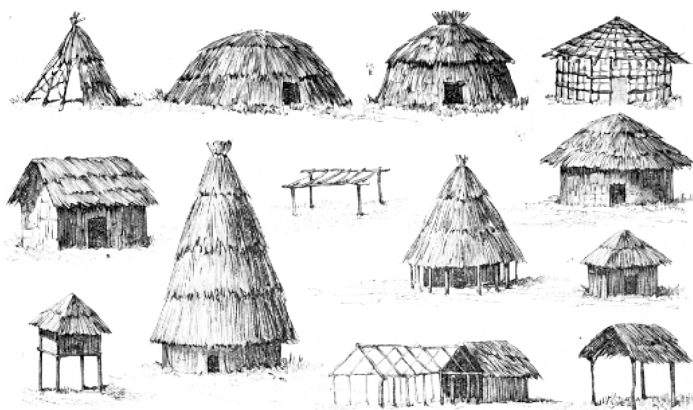
<sup>12</sup> “Intenso calor e permanentes tempestades assolavam o acampamento (...) Chove nesta região por modo extraordinário. (...) A humidade ali é excessiva, oprimindo no mais denso dos bosques os pulmões, (...) dentro das barracas, embora se achassem constantemente ateadas fogueiras, as malas, caixas e calçado cobriam-se inteiramente de bolor.” CAPELLO, H.B.; IVENS, R. (1886) *De Angola à contra-costa*, vol.2, Lisboa: Imprensa Nacional, p. 200.

<sup>13</sup> ARNOLD, D. (1995) ‘Inventing tropicality’, in *The Problem of Nature: Environment, Culture and European Expansion*, Oxford: Blackwell Publishers, p.150.

<sup>14</sup> CAPELLO, H.B.; IVENS, R. (1886) *De Angola à contra-costa*, vol.2, Lisboa: Imprensa Nacional, p. 202.



**Weather Station**  
Expedição Portuguesa ao  
Muatiânvua 1884-1888 (1892)



**Dwellings**  
Álbum da expedição ao  
Muatiânvua (1884-1888)  
[CARVALHO, H. (1892) *Expedição Portuguesa ao Muatiânvua - Meteorologia, Climatologia e Colonização: método práctico de fazer colonisar com vantagem as terras de Angola, Lisboa*]

“One of the principal manifestations of environmental otherness in European thought since the fifteen century has been in terms of a developing distinction between temperate and tropical lands, and that the complex of ideas and attitudes that we will here call ‘tropicality’ represents environmentalism in one of its most influential and enduring forms”<sup>15</sup>

Orientalism (Said, 1978); notion of alien in climate, vegetation, people and disease: In Europe, landscape has been invoked as national identity since the early sixteenth century, but when European explorers made their first contacts with remote geographies “landscape ceased to be self and took on the alien forms of otherness”.<sup>16</sup>

Roberto Ivens’ notebooks present a collection of African drawings (Taquelim, 2008) in which the exoticism of people, animals and landscapes are portrayed. Even the weather, understood as peculiar and unpredictable, is represented in his drawings and notes. Graphic representations of the exotic start with the book cover, with elephant, palm trees and enormous sun. This empirical, superficial understanding – notion of otherness and exotic – also combined with the first accurate weather data collected during the journey.

### **Meteorology, Climatology and Colonization**

Other expeditions to the Angolan inland took place at the same time as Capelo and Ivens’ odyssey. Henrique de Carvalho<sup>17</sup> also started his voyage to the region of the Muatiânvua in 1884 but only concluded the expedition four years later. The Kingdom of Lunda (1665-1887), in the northeast of Angola, was an unknown but potentially rich territory. Henrique de Carvalho was sent to establish contact with local people, start a commercial route and create a Portuguese colony in the region. In 1895 he would become the first Portuguese governor of Lunda.

Due to the expedition’s extended stay in the region, the albums and reports presented a more in-depth knowledge of the people – its history, culture and language.<sup>18</sup> Henrique de Carvalho performed ethnographic research, learned the native dialects and published the first conversation guide<sup>19</sup> insofar as language was a primary tool for making commercial deals.

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<sup>15</sup> ARNOLD, D. (1995) ‘Inventing tropicality’, in *The Problem of Nature: Environment, Culture and European Expansion*, Oxford: Blackwell Publishers, p.161.

<sup>16</sup> Idem, p. 140.

<sup>17</sup> Henrique Augusto Dias de Carvalho (1843-1909) was a Portuguese army officer and an explorer in Africa.

<sup>18</sup> CARVALHO, H. (1890) *Ethnographia e História Tradicional dos Povos da Lunda*, Lisboa: Imprensa Nacional.

<sup>19</sup> CARVALHO, H. (1890) *Methodo pratico para fallar a lingua da Lunda contendo narrações históricas dos diversos povos*, Lisboa: Imprensa Nacional.



**Pictures from Henrique Carvalho's expedition to Lunda (1884-1888)**  
[CARVALHO, H. (1892) *Expedição Portuguesa ao Muatiânvua - Metereologia, Climatologia e Colonização: método práctico de fazer colonisar com vantagem as terras de Angola*, Lisboa]

Besides informing about the geography of the region and its agriculture, the idea of exploring weather data was also very important to the mission. Planning the Portuguese colonization of the region was a priority and in fact climate data was central to inform the mission:

“Since I am studying the colonization of the lands of Angola, some unexplored and others where exploration has just begun, I had to know first of all its climatological characteristics.”<sup>20</sup>

Following this major concern, in 1892 Henrique de Carvalho published a volume devoted to the meteorological observations, which contained detailed information about the weather stations in the country and offered an analytical reading of the results. He described the 13 weather stations where he worked, starting from Luanda’s observatory that existed since 1878. The building was located at an elevated area of the city, 60 meters above sea level, and was described as a perfect observation point. According to Henrique Carvalho, the conditions were ideal because the solid construction was originally the city’s cathedral and had a 20 meters tower. It also had a complete set of instruments and daily measurements taking place five times a day.<sup>21</sup> He used Gomes Coelho’s meteorological and magnetic observations from 1879 to 1881 to compare with the data they collected at the rudimentary weather stations built on their way to Luanda.<sup>22</sup>

Although Henrique de Carvalho considered air temperature to be the most relevant weather parameter in a tropical region,<sup>23</sup> soon he realized air humidity also caused great discomfort and diseases amongst the expedition members. (...) For that reason, the connection between tropical climate and health was a topic he addressed in his book using contemporary studies on tropical medicine by Portuguese physicians, such as Ribeiro<sup>24</sup> and Osório.<sup>25</sup> Since preventing diseases and acclimatizing Portuguese settlers to the

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<sup>20</sup> “Propondo-me a estudar a colonização das terras de Angola, algumas inexploradas e outras onde a exploração está apenas iniciada, precisava conhecer antes de tudo, os seus caracteres climatológicos, o que não podia ter lugar sem o estudo dos meteorológicos, dos geográficos e ainda dos peculiares a essas terras.” in CARVALHO, H. (1892) *Expedição Portuguesa ao Muatiânvua - Meteorologia, Climatologia e Colonização: método práctico de fazer colonisar com vantagem as terras de Angola*, Lisboa: Typographia do Jornal As Colónias Portuguezas, p.3.

<sup>21</sup> Idem, p. 67.

<sup>22</sup> Idem, p. 3.

<sup>23</sup> “Quando se trata duma região entre os trópicos, principalmente das que se nos afiguram das mais quentes na zona tórrida, o que se pretende conhecer em primeiro lugar, são as modificações da temperatura; porque se considera que as variações do calor são as influências de maior importância a que o homem tem de se submeter num clima novo.” Idem, p.4.

<sup>24</sup> RIBEIRO, M. F. (1886) *Estudos Medicco Tropicaes 1877-1878*, Lisboa: Sociedade de Geografia de Lisboa.

<sup>25</sup> OSÓRIO, B. (1889) *Tentativa de um ensaio de Meteorologia Médica*, Lisboa: Sociedade de Geografia de Lisboa.





**Meteorological stations in Angola**  
[IICT archive.]

Angolan environment was a priority, an institute for medical statistics had been established in Luanda in 1878. Their results suggested that:

“Man is not cosmopolitan, the various human races support unevenly the same climate (...) under a different climate, characters modify in such a way that by disease dies the individual, as by sterility the race extinguishes”<sup>26</sup>

The book argues that climatology should be central to a successful occupation of the country since the local weather was hostile to European inhabitants. The author recommended Portuguese settlers should be medically examined in order to determine the most suitable places for migration according to their hometown and physical condition. The last chapter of the book focused on individual and public sanitation, offering practical advice to settlers on the necessary hygiene care for good acclimation. The author precised:

“Acclimation is a science that teaches the best processes for modifying, correcting, or transforming areas and formulates the laws by which all mankind should be directed in the occupation and exploration of the entire surface of the earth.”<sup>27</sup> “We paid a high price for acclimation – we lost lives and works were mostly frustrated, and for this contributed many causes, the main ones being: ignorance of the influences of climates, that were entirely foreign, and how to react to them (...)”<sup>28</sup>

This expedition, differently from the first one, openly aimed at promoting Portuguese settlement in the region. The search for scientific knowledge on climate served this purpose and promoted a more profound study on weather conditions. The first superficial measurements and impressions by Capelo and Ivens gave rise to thorough investigation by Henrique de Carvalho, who was determined to foster economic exploitation of the Angolan inland.

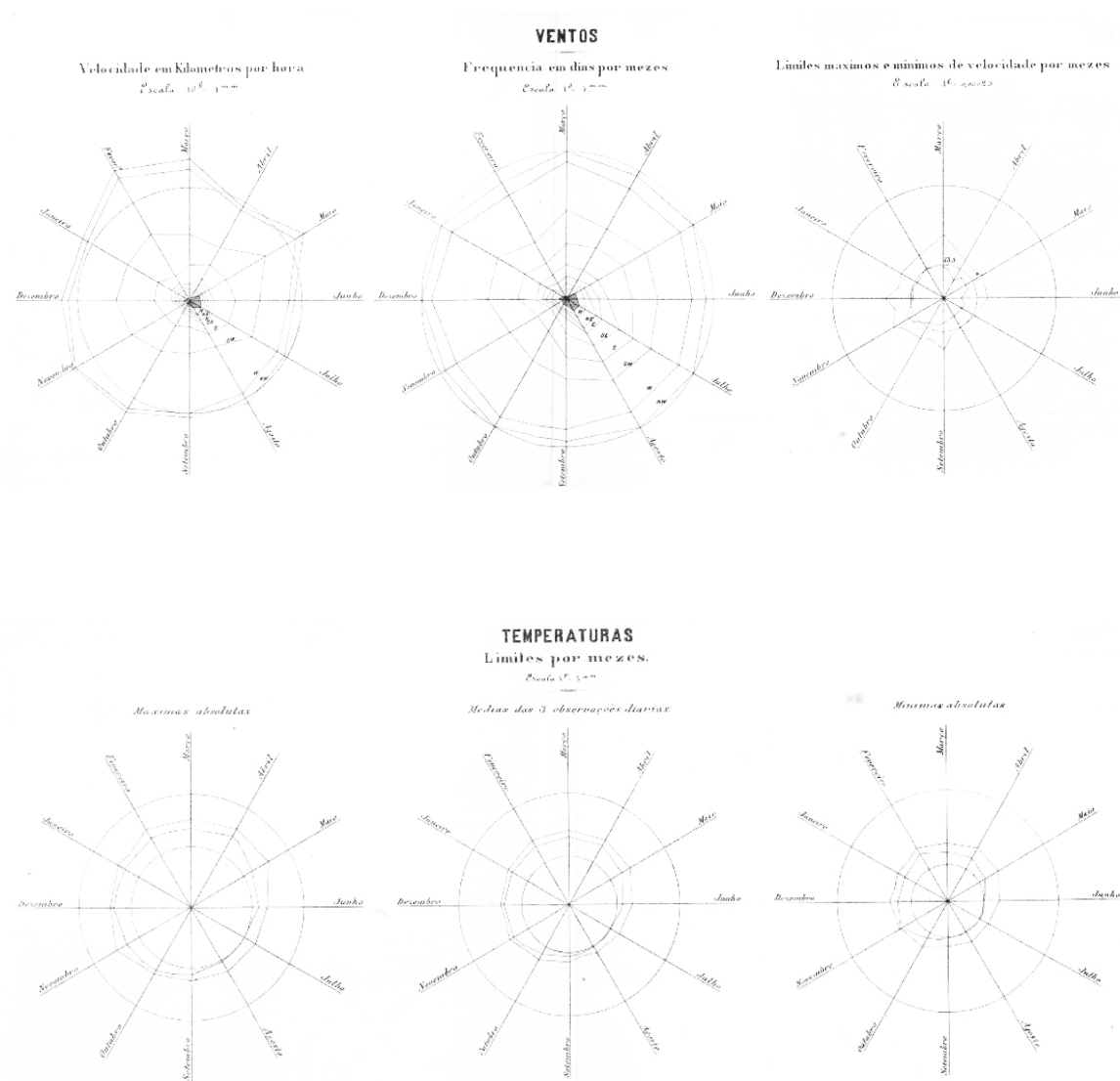
He considered “the Portuguese had been adventurers so far, but not colonizers,” unlike other European powers that had already started investing

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<sup>26</sup> “Está provado que o homem não é cosmopolita, as raças humanas diversas suportam desigualmente um mesmo clima (...) sob um clima diverso, por tal forma se modificam os caracteres que por doença morre o individuo, como pela esterilidade se extingue a raça” CARVALHO, H. (1892) *Expedição Portuguesa ao Muatiânvua - Metereologia, Climatologia e Colonização: método práctico de fazer colonisar com vantagem as terras de Angola*, Lisboa: Typographia do Jornal As Colónias Portuguezas, p.74.

<sup>27</sup> “A aclimação é uma ciência que ensina os melhores processos para modificar, corrigir ou transformar as localidades e formula as leis por que deve dirigir-se toda a humanidade na ocupação e exploração de toda a superfície da terra.” RIBEIRO, M. F. (1886) *Estudos Medicco Tropicaes 1877-1878*, Lisboa: Sociedade de Geografia de Lisboa, p.11 (quoted by Henrique de Carvalho).

<sup>28</sup> “Pagamos uma aprendizagem de aclimação custosíssima em vidas e de trabalhos que se frustraram na maior parte, concorrendo para isso muitas causas, sendo as principais: a ignorância das influências dos climas que eram inteiramente estranhos e de saber reagir-lhes” CARVALHO, H. (1892) *Expedição Portuguesa ao Muatiânvua - Metereologia, Climatologia e Colonização: método práctico de fazer colonisar com vantagem as terras de Angola*, Lisboa: Typographia do Jornal As Colónias Portuguezas, p. 359.





in their African colonies.<sup>29</sup> Consequently, he endorsed the idyllic idea of inhabiting the Angolan territory and cultivating the fertile lands:

“It is in the healthy lands of the interior, cut off from beautiful rivers, abundant in firewood and pasture, - in those lands where whites live almost as well as in Brazil (...) that farms can develop and prosper.”<sup>30</sup>

Agriculture developed timidly in the following years and the economic exploitation of the inland began with the foundation of the railways of Luanda (1889-1909), Benguela (1889-1929) and Moçamedes (1905-1961). Before the railway was introduced, inland penetration was made exclusively through the fluvial courses.

The emigration of settlers is progressively encouraged, but few operations (Sá da Bandeira, settlers from Madeira island in 1885); after the establishment of the Republic in Portugal (1910), new breath of investment, new cities in the inland, Norton de Matos and Huambo 1912; agriculture is developed from 1930 onwards, exporting coffee, sisal, sugar and corn. Definition of borders (Gago Coutinho, 1912); later: colonization and investigation, new forms of exploitation; colonize with military, economic and technical power; need for development.

Metereological Charts, 1892  
[ref. p.15]

A República (1910-1926); Ditadura militar (1926-28); Vicente Ferreira : “uma terceira nação de língua e de tradições portuguesas; um segundo Brasil, ou melhor, um terceiro Portugal”; Ditadura nacional (1928-33); Estado Novo 1933 (1933-74).

António Vicente Ferreira<sup>31</sup>: “uma terceira nação de língua e de tradições portuguesas; um segundo Brasil, ou melhor, um terceiro Portugal”<sup>32</sup>

### **Tropical Science: from Exploratory Missions to Locally-based Research**

Following the Berlin Conference, the diplomatic definition of Angolan borders occurred between 1885 and 1891, but several expeditions were still organized in the beginning of the 20th century to determine their exact

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<sup>29</sup>“A Holanda, a Inglaterra, a França, ultimamente a Alemanha e a Bélgica, nações muito mais práticas do que nós, estão prosseguindo com grande persistência, não se poupando aos sacrifícios indispensáveis para conseguirem a aclimação da raça branca nas suas possessões intertropicais.” Idem, p.350.

<sup>30</sup> “é nas saudáveis terras do interior, cortadas de belos rios, abundantes em lenhas e pastos, - nessas terras onde os brancos vivem quasi tambem como no Brasil” Idem, p.352.

<sup>31</sup> António Vicente Ferreira (1874-1953) was a Portuguese engineer and politician. He was the minister of colonies (1923) and he held the position of high commissioner in Angola from 1926 to 1928, during the National dictatorship (1928-33).

<sup>32</sup> FERREIRA, A.V. (1954) “Angola e a experiência do Brasil” in *Estudos Ultramarinos* vol.3, p. 247-273.



Meteorological observatories in  
N'Dalatando and Luanda  
[1902 post cards; private collection.]

location. Gago Coutinho<sup>33</sup> led a mission from 1912 to 1914 to draw the southeast border; the southern border was demarcated in 1920; and the border between Angola and Belgian Congo was only fixed from 1921 to 1924. In addition to the geodesic and cartographic fund, these expeditions also brought the first photographs of remote places in Angola that unveiled their geographical and cultural backgrounds.

Portuguese Geographic Missions were established in all colonies with temporary character in order to produce cartographic documents. The first assignment in Angola operated in 1886 to establish a geodetic landmark on the coastline, but worked only for two months and failed to conclude its initial goals (Santos, 2006, p.38).

In 1921, the local Government established the Geographic Mission of Angola, which was devoted to all geodetic, geographic and cartographic works in the country. This initiative was lead by Norton de Matos<sup>34</sup> during the period he was Angola's Governor but when he left the office in 1924 the institution was terminated. The works that started during that period would later be compiled in the 1933's Geological Map of Angola.<sup>35</sup>

John Gossweiler (1873-1952) created the first phytogeographic map of Angola in 1939.<sup>36</sup> The Government of Angola hired Gossweiler as state botanist in 1900 and he remained in the country until his death in 1952. The 1939's phytogeographic map compiled his pioneering research with surveys from other botanists such as Friedrich Welwitsch (1806-1877) and Luís W. Carrisso (1886-1937). Friedrich Welwitsch had carried out the first botanical surveys in Angola in mid 19<sup>th</sup> century, between 1853 and 1860. Other relevant botanical expeditions occurred between 1927 and 1937 and were lead by L. W. Carrisso.

On the other hand, the systematic study of the soils of Angola only began in 1946, with a mission in the plateau region lead by Joaquim Vieira Botelho da Costa and Ário Lobo de Azevedo. From 1951 onwards, the mission received the support of the *Junta de Investigação do Ultramar* and led to the publication of the first soil map of Angola in 1961.<sup>37</sup>

In 1936, the *Junta das Missões Geográficas e de Investigações Coloniais* was

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<sup>33</sup> Carlos Viegas Gago Coutinho (1869-1959) was a Portuguese geographer, naval officer and aviator.

<sup>34</sup> José Maria Norton de Matos (1867-1955) was a general and a politician. He was the Governor of Angola (1912-15) and the High Commissioner of Angola (1921-24).

<sup>35</sup> MOUTA, F., O'DONNELL, H. (1933), *Carta Geológica de Angola 1933*, 87x79 cm, scale 1:2.000.000, topographical map, Lisboa: Ministério das Colónias.

<sup>36</sup> GOSSWEILER, J.; MENDONÇA, F. (1939) *Carta fitogeográfica de Angola*, Lisboa: Ministério das Colónias.

<sup>37</sup> BOTELHO DA COSTA, J.V.; AZEVEDO, A.L.; FRANCO, E.P.C.; RICARDO, R.P. (1961) *Carta Generalizada dos Solos de Angola*, Lisboa: Junta Investigação Ultramar.





**Aerial views of Luanda, Negage;  
Benguela, Huambo; Namibe and  
Saurimo**  
[IICT archive.]

established as a result from the 1934's Portuguese colonial exhibition in Porto (Castelo, 2012, p.400). A few years later, the union was reorganized to face an increasing number of missions in the colonies:

“A Junta fica sendo um organismo aberto, de ilimitado número de membros, destinado ao estudo e discussão académicos dos problemas científicos coloniais; uma comissão executiva de três membros apenas assegurará a indispensável atuação administrativa, tão importante, dado que o número das missões e a quantidade do pessoal que já existem e hão-de aumentar nos próximos anos. Dependentes da Junta funcionarão as missões nas colónias e os institutos ou centros especializados na metrópole, com os chefes, adjuntos, naturalistas-exploradores, colectores, investigadores, estagiários e tirocinantes e pessoal auxiliar que for necessário.”<sup>38</sup>

In 1941 the Portuguese Government created the Geographic Mission of Angola, with a permanent character in the country, which would operate until 1974.<sup>39</sup>

It was only in 1950 that the Weather Service of Angola was established in Luanda<sup>40</sup> and incorporated in the Portuguese Meteorological Service. However, the first meteorological observations were made in Luanda in the year 1879 (Luanda's Observatory). Thereafter took place the installation of numerous meteorological stations in Angola and the publishing of data.

Comprehensive reports of the country's climatic characteristics were published in 1955 (Leal, 1955) and 1962 (Silveira, 1962). Starting from the climate classifications of Koppen-Geiger (1931, 1936) and Thornthwaite (1948), local meteorologists developed a more accurate description on Angolan climates, dividing the country in three main areas. Shortly, it was considered a tropical region in the north of the country (Aw), an arid area to the south and the coast (Bsn), and a temperate region in the inland plateau (Cwb).

Other reports provided more specific descriptions on each region. Faria published studies on prevailing winds in Luanda (1966) and Moçamedes (1969), and offered interpretations for temperature reports in Luanda, Lobito and Dundo (1963). Studies on solar radiation (Vieira, 1964) and solar charts (Malato, 1969) were also developed for the first time in this period.

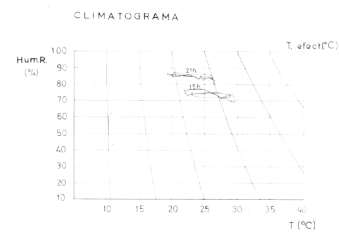
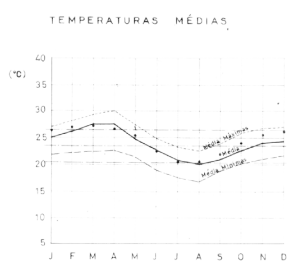
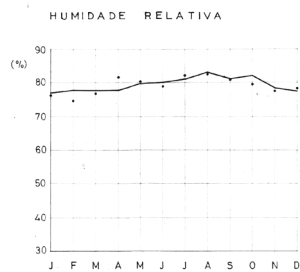
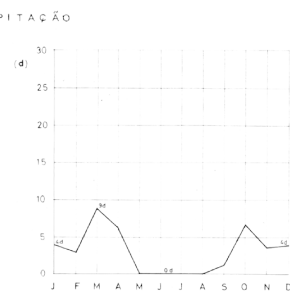
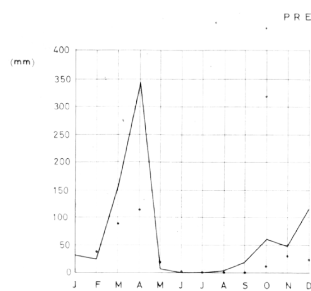
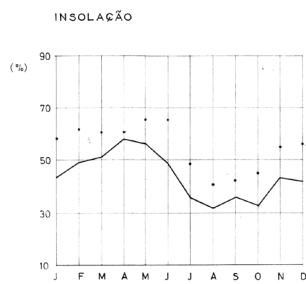
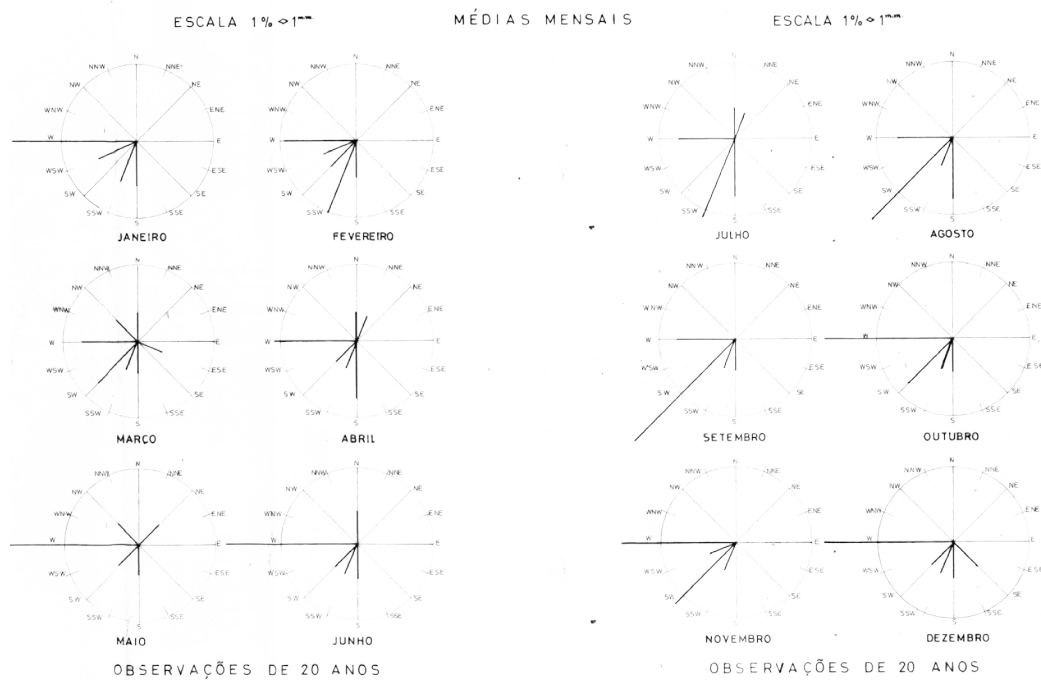
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<sup>38</sup> MINISTÉRIO DAS COLÓNIAS, *Reorganiza a Junta das Missões Geográficas e de Investigações Coloniais*, Decreto-lei 35395, 26 Dezembro 1945.

<sup>39</sup> MINISTÉRIO DAS COLÓNIAS, *Missão Geográfica de Angola*, Decreto-lei 31194, 27 Março 1941.

<sup>40</sup> PRESIDÊNCIA DA REPÚBLICA PORTUGUESA, *Instituição de Serviços Meteorológicos nas Colónias*, Lei 2042, 17 Junho 1950.

# - LOBITO - FREQUÊNCIA DE DIRECÇÃO DO VENTO



In the following years, the county's meteorological services instigated a fair communication with other local institutions, such as the DSOPT and the LEA. Climatological studies were published and distributed by the engineering laboratory and the weather data informed original research on building performance. Weather data was also shared with the architects that got commissions from the DSOPT or the municipalities.<sup>41</sup>

**Meteorological Charts, 1963**

[Francisco Castro Rodrigues  
archive.]

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<sup>41</sup> See, for instance : Escola Comercial e Industrial do Lobito, Jorge Moreira, 1967-1970 (AHN/Fundo Obras Públicas/Benguela/Ministério da Educação/17.3.1). "Chamamos à atenção para a importância que no local reveste a percentagem dos ventos dominantes diurnos. Os do sul são nocturnos. Há que atender à humidade relativa diária que é praticamente constante e de 80 %." in "Condicionamentos urbanísticos", Câmara Municipal do Lobito, 26 de Maio de 1962.



## Planning the Future

A general development plan is responsible for the wonderful view which Luanda and the entire province with its modern buildings, fishing and mining ports; road and rail networks, buildings in progress, all tending to stimulate progress, presents to the visitor.

The Engineering Laboratory as chief technical supervisor of all public and private works controls increasing production determining the efficiency of the efforts of those concerned in development of the province. This is what is happening in the province.

All the big building projects are planned by the Engineering Laboratory which provides the standards for the building of roads, airports, railways, bridges, buildings, reservoirs, the settle-



### Laboratórios de Engenharia de Angola

[published in Auge magazine,  
Mexico, April 1971.]

## 2.2 Building Research

The engineering laboratory was a research and education organization of great relevance in Angolan colonial society, especially during the 1960s and the 1970s. This section describes how the institute gained increasing autonomy from Portuguese organizations through autonomous financing processes. The laboratory built its own facilities in 1963, designed by Vasco Vieira da Costa, and developed original research in different fields of engineering. Its director, who was born in Luanda, had a decisive influence in this process of enormous growth from the beginning of his term, in 1955, until his resignation, in 1975.

The institution exemplified the Angolan quest for scientific knowledge and local development. Building science should assist the country's progress and, finally, architectural design should result from a logical interpretation of scientific knowledge.

### **Laboratório de Engenharia de Angola (LEA): Offspring of Technical Ambition**

The L.E.A. is a public research institute in the field of civil engineering established in Luanda in 1961. However, the origins of the organization date back to 1946, when it operated as a department of the Direcção dos Serviços de Obras Públicas de Angola<sup>1</sup> (D.S.O.P.A.).

In 1945, a ministerial order from the Portuguese Government reorganized the D.S.O.P.A. and founded an office in Luanda for planning and supervision of public works. The office was then divided in three sections: a unit for planning and inspection, a department for technical drawing and archive, and the materials testing laboratory.<sup>2</sup>

The Laboratório de Resistência de Materiais<sup>3</sup> (L.R.M.) in Angola reported to the Laboratório Nacional de Engenharia Civil<sup>4</sup> (L.N.E.C.) in Portugal, which had also been established in the same year.<sup>5</sup> The institution's major goal was to support construction works in the country and in the colonies, thus it was necessary to obtain information on the physical proprieties of soils and local materials in all territories.

Therefore, the Angolan laboratory performed surveys on site to collect

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<sup>1</sup> Public Works Department of Angola.

<sup>2</sup> GOVERNO GERAL DE ANGOLA, *Reorganização do Serviço de Obras Públicas*, Portaria Ministerial 13, 23 Outubro 1945.

<sup>3</sup> Materials Testing Laboratory.

<sup>4</sup> National Laboratory of Civil Engineering.

<sup>5</sup> The L.N.E.C. joined two institutions: the materials testing laboratory, established in 1898, and the scientific research unit, founded in 1942.



**Structural testing**  
[LEA archive.]

and test samples from all regions in order to present a ranked inventory.<sup>6</sup> At the same time, it had to respond to a fast development of the building industry, so in a few years the limited staff<sup>7</sup> became insufficient to deal with such challenging demands. From 1946 to 1955, the volume of construction works increased significantly in the country, and particularly in Luanda.<sup>8</sup> In addition to the public buildings, the works per year tripled, and hardly any organization in the country would have had the expertise to perform geotechnical investigations or test building materials.

As a result, in 1955 the Provincial Government of Angola decreed a new regulation that allowed the laboratory to provide services to private entities with fixed fees.<sup>9</sup> From then on, the laboratory was no longer working exclusively on public works, though it was still ruled by the D.S.O.P.A. This new regulation responded to an urgent need in the country but it created an ambiguous situation that was only acknowledged in 1961 by the Portuguese government.<sup>10</sup>

Other major changes occurred in the organization in 1955. According to the new guidelines, and besides its original aims, the laboratory should “develop studies concerning all civil engineering topics that are relevant to Angola’s development.”<sup>11</sup> Therefore, instigating new fields of research, enriching its library and providing technical training to high school students were new assignments of the unit. The technical staff was expanded with the hiring of the first two engineers, reaching a total number of ten employees in 1955. Henrique Novais Ferreira<sup>12</sup> was appointed director of the Laboratório de Engenharia da Direcção dos Serviços de Obras Públicas de Angola<sup>13</sup> (L.E.O.P.A.) and would lead the institution for the next twenty years.

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<sup>6</sup> GOVERNO GERAL DE ANGOLA, *Regulamento da Direcção dos Serviços de Obras Públicas de Angola*, Portaria Provincial 5:452, 1 Fevereiro 1946.

<sup>7</sup> From 1946 to 1955, the laboratory was gradually equipped with material for topographic measurements and geotechnical investigations but it functioned with only six employees and no engineer.

<sup>8</sup> See the table: “Civil Construction in Luanda”, from: NOVAIS FERREIRA, H., PINHEIRO, F. (1959) *Evolução demográfica de Luanda - subsídios para a sua urbanização*, Memória LEA nº 59, Luanda: LEA, p.174.

<sup>9</sup> GOVERNO GERAL DE ANGOLA, *Regulamento do Laboratório de Engenharia da Direcção dos Serviços de Obras Públicas de Angola*, Portaria Provincial 9:047, 13 Agosto 1955.

<sup>10</sup> MINISTÉRIO DO ULTRAMAR, *Criação do Laboratório de Engenharia de Angola (LEA)*, Diploma Legislativo Ministerial nº 87, 26 Outubro 1961.

<sup>11</sup> Idem.

<sup>12</sup> Henrique Novais Ferreira (1922-2016) was the director of the Laboratório de Engenharia de Angola between 1955 and 1975. He was born in Luanda in 1922 and graduated in civil engineering from the Instituto Superior Técnico in Lisbon in 1945. He worked at the L.N.E.C., in Lisbon, from 1975 to 1990 and at the L.M.E.C., in Macau, from 1990 to 2016.

<sup>13</sup> Engineering Laboratory of the Public Works Department of Angola.



**Construction works at LEA**  
[LEA archive.]

During this new stage, the laboratory started publishing original research work<sup>14</sup> and organized the first conference with engineers from Portugal and Mozambique to discuss road planning. The meeting *Primeiras Jornadas de Estradas* took place in 1957, just before the announcement of the *II Plano de Fomento*<sup>15</sup> (1959-64) that would largely upgrade the Angolan road plan.

The *I Plano de Fomento* was into effect from 1953 to 1958, and had been created to “build the necessary infrastructure for shaping economic development”.<sup>16</sup> Most funds were allocated to the development of communications and transports (66%), namely in the expansion of railways and ports, to ensure the outward flow of raw products. With the *II Plano de Fomento* the investments foreseen for infrastructure were still major, this time focusing mostly in the construction of roads and hydroelectric dams. The investment doubled,<sup>17</sup> and for the first time some funds were assigned for developing scientific studies (4,4%) and to improve education and health (7,2%).

From 1955 to 1961, the laboratory went through a period of exceptional growth. Assisting the construction of roads and dams were major public assignments that provided enough funding, but the institution was also raising money with private commissions. Both incomes enabled the laboratory to thrive and get to 200 employees in 1961.

Although the laboratory was prospering, its fields of expertise and research were still relatively limited and did not respond to the real needs of society. In a paper presented in Kenya in 1959<sup>18</sup>, Frederico Colaço<sup>19</sup> pointed out that:

“o laboratório que está agora a dedicar-se aos problemas das estradas, mecânica dos solos e materiais de construção (...) terá de se desenvolver no sentido de possuir também uma secção de física das construções (...) que trate, nomeadamente, os problemas do conforto térmico, do condicionamento do ar e da luminotécnica, como desenvolvimentos práticos da climatologia aplicada.”<sup>20</sup>

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<sup>14</sup> Collection: “Memórias LEA”.

<sup>15</sup> The Development Plans (I-IV) were strategic mechanisms of the national economy in the post-war period.

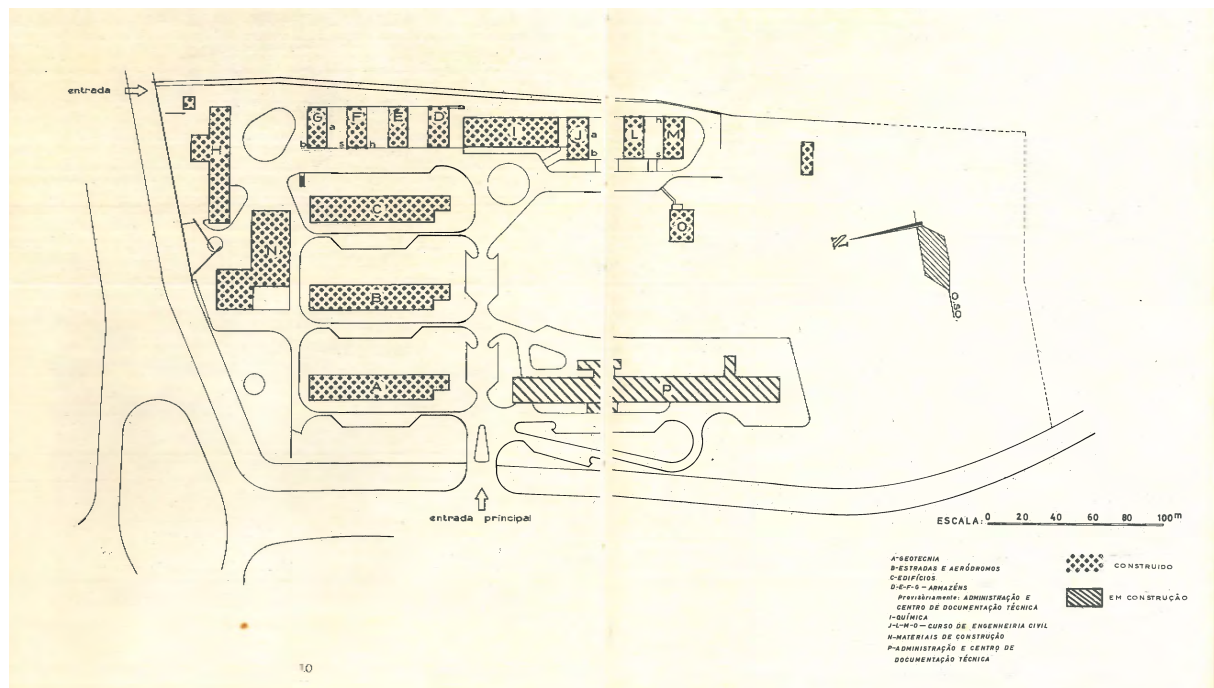
<sup>16</sup> Free translation: “construção das infraestruturas necessárias para à estruturação do desenvolvimento económico” in (1961) *As Comunicações e os Aproveitamentos Hidráulicos da Guiné, Angola e Moçambique*, Lisboa: Agência Geral do Ultramar, p.5.

<sup>17</sup> The second development plan allocated 9 million *contos* instead of the 4.5 million distributed by the former.

<sup>18</sup> Lecture presented at the Inter-African Conference of Town-planning and Housing – CCTA/CSA held in Nairobi, Kenya, 19th-30th January 1959.

<sup>19</sup> Engineer and director of the Repartição de Edifícios e Monumentos Nacionais da D.S.O.P.A.

<sup>20</sup> COLAÇO, F. (1959) *Melhoramentos de habitação tradicional em Angola*, Memória LEA nº 52, Luanda: LEA, p.9.



LEA's General Plan  
[LEA archive.]



He considered that the laboratory should use the climate data collected by the S.M.A. to develop studies and form an analytical approach to climate management in Angola. In the same article, he praised the contribution of architects from the G.U.C. and the D.S.O.P.A. for the improvement of urbanism and architecture in recent years, but he also considered that:

“Da tendência científica moderna resulta que estes problemas [relativos à disciplina da arquitectura] terão de ser examinados em conjunto com os meramente científicos e técnicos.”<sup>21</sup>

Consequently, in his view, climatology, building physics and architecture should come together and start a new field of research at the Angolan laboratory.

Despite the many local demands for expanding the laboratory, the Portuguese Government only decided to grant it more power after the start of the Colonial War. In October 1961, Adriano Moreira<sup>22</sup> decreed a law<sup>23</sup> that transformed the L.E.O.P.A. into an autonomous research institute and named it *Laboratório de Engenharia de Angola*<sup>24</sup> (L.E.A.).

At that time, the Portuguese Government authorized what the Provincial Government had endorsed in 1955, declaring that:

“O L.E.A. tem por fim empreender, promover e coordenar as investigações e os estudos experimentais no campo da engenharia civil, quer por sua própria iniciativa, quer a requisição de entidades públicas ou particulares e, ainda, colaborar com os estabelecimentos de ensino na preparação do pessoal técnico de diversos graus de especialização.”<sup>25</sup>

The new law also determined that the laboratory was financed both by the state and by privates, getting 5% of the value of contracts.<sup>26</sup> Thus, the L.E.A. acquired executive and economic independence from the D.S.O.P.A. and achieved similar status to that of the L.N.E.C. in Portugal.

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<sup>21</sup> Idem, p.9.

<sup>22</sup> Adriano Moreira (1922) was the Minister of the Overseas from 1961 to 1963. He is the father of some reformist political measures, namely the abolition of the *Estatuto do Indígena*, the establishment of the *Código de Trabalho Rural* and the creation of the *Estudos Gerais Universitários* in Angola and Mozambique.

<sup>23</sup> MINISTÉRIO DO ULTRAMAR, *Criação do Laboratório de Engenharia de Angola (LEA)*, Diploma Legislativo Ministerial nº 87, 26 Outubro 1961.

<sup>24</sup> Engineering Laboratory of Angola.

<sup>25</sup> Article 3 in MINISTÉRIO DO ULTRAMAR, *Criação do Laboratório de Engenharia de Angola (LEA)*, Diploma Legislativo Ministerial nº 87, 26 Outubro 1961.

<sup>26</sup> FERREIRA, N. (2014) “Laboratório de Engenharia de Angola” in SOUSA, M.T. (ed.) *Estudos Gerais Universitários de Angola. 50 anos - História e Memórias*, Lisboa: Edições Colibri, p. 89-91.



**Building blocks A, B and C**  
[LEA archive.]

After 1961, the laboratory was free to “select and recruit its technical staff”<sup>27</sup>, which increased significantly in the following years,<sup>28</sup> up to more than 40 engineers from different branches. The L.E.A. could likewise “acquire land and promote the construction of the necessary facilities”<sup>29</sup>, which happened promptly.

Two years later, the institution created three sub-sections, namely: geotechnical engineering, roads and aerodromes, and structures and buildings. During this period, not only the original publications increased in number but also the research topics were expanded, with the publishing of the first contributions on building physics.

Civil engineering was amongst the first higher education degrees established in Angola in 1962.<sup>30</sup> Due to the great lack of teaching staff in the country, the L.E.A. cooperated with the University since the beginning, with classes taking place at the L.E.A.’s facilities from 1966 onwards. College students were hired as part-time employees, improving technical staff shortage and launching a straight link between teaching and practice. In the school year 1969/1970 the first eight engineers graduated from the *Universidade de Luanda*<sup>31</sup> (U.L.), and in 1975 several new graduates had already joined the teaching staff.

Considering the country’s demands for development, the number of engineers was still insufficient but Henrique Novais Ferreira considered in 1967 that students were being “trained with excellent technical level and prepared to the country’s reality, in its social and physical aspects.”<sup>32</sup>

## A Scientific Campus

Vasco Vieira da Costa was the first architect hired by the laboratory in 1960 to work on architecture topics and to design the L.E.A.’s new facilities. Even

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<sup>27</sup> Free translation: “selecionar e recrutar o pessoal” in MINISTÉRIO DO ULTRAMAR, *Criação do Laboratório de Engenharia de Angola (LEA)*, Diploma Legislativo Ministerial nº 87, 26 Outubro 1961.

<sup>28</sup> See table: number of employees between 1962 and 1968 in LABORATÓRIO DE ENGENHARIA DE ANGOLA (1968) *Laboratório de Engenharia de Angola*, Luanda: ABC, p.15.

<sup>29</sup> Free translation: “Realizar aquisições e promover a construção das instalações necessárias ao seu funcionamento” in MINISTÉRIO DO ULTRAMAR, *Criação do Laboratório de Engenharia de Angola (LEA)*, Diploma Legislativo Ministerial nº 87, 26 Outubro 1961.

<sup>30</sup> MINISTÉRIO DO ULTRAMAR, *Criação dos Estudos Gerais Universitários em Angola e Moçambique*, Decreto-lei 44530, 21 Agosto 1962.

<sup>31</sup> University of Luanda.

<sup>32</sup> Free translation: “Engenheiros formados com excelente nível técnico e sensibilizados para as realidades do país, quer de natureza social, quer de especificidades naturais” in NOVAIS-FERREIRA, H. (1967) *Os tipos de investigação e a actividade dos Laboratórios de Engenharia*, Memória LEA nº 125, Luanda: LEA, p.4.



**Building blocks N; G, F, E, D; I, J;**  
[LEA archive.]

before the laboratory gained autonomy, he was already designing a building in a land owned by the D.S.O.P.A. at the Samba Grande. The plot was located at a suburban area of Luanda, on a hill near the ocean, but the limited area and difficult topography were not ideal to the development of the ambitious facilities.

While developing the first solution, the architect had already acquired a precise understanding of the institution's demands. He prepared the general program with the director in order to comprehend the functions of each service, their working methods and interdependences. Both projects considered a general master plan and several construction phases because the program was essentially the same, and so were the values that inspired the architectural design.

In the first project description, Vieira da Costa wrote most extensively about the “captivating but challenging task”<sup>33</sup> to develop a building perfectly adapted to such “specific functions like observing, studying, discovering, creating and controlling”<sup>34</sup>. He quoted Pierre Chevenard<sup>35</sup>, who described the ideal scientific work place as aseptic, methodical and calm.

Accordingly, comfort was a major concern of the project due to its influence on productivity and efficiency. The natural constraints of the site were carefully considered and “the architectural design became essentially the consequence of the local climate”. Luanda's hot and humid climate was controlled only by passive methods, such as building's orientation, natural ventilation and sun shading. Hence, the architectural form resulted from the combination of these features, and was described by the architect as purely scientific result.

A set of buildings with east-west orientation, which was ideal according to the architect:

“considerando que nos climas quentes e húmidos como o de Luanda a correcta orientação das edificações constitui um dos factores que mais pode contribuir para atenuar a sensação de desconforto causada pela elevada temperatura e pelo alto grau de humidade, houve a preocupação de implantar todo o complexo de forma a que os pavilhões beneficiassem da orientação que a teoria e a experiência levam a considerar como a melhor: isto é, o seu eixo maior seguindo a direcção E-O”<sup>36</sup>

Vieira da Costa affirmed: “a laboratory is, indisputably, the most typical

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<sup>33</sup> VIEIRA DA COSTA, V. (1960) “Instalações do Laboratório de Engenharia da DSOPA”, Luanda, Fevereiro 1960.

<sup>34</sup> Idem.

<sup>35</sup> Pierre Chevenard (1888-1946) was a French engineer and scientist.

<sup>36</sup> VIEIRA DA COSTA, V. (1960) “Instalações do Laboratório de Engenharia da DSOPA”, Luanda, Fevereiro 1960, p.1.





**Barragens**  
[IICT archive.]

functional building so it must be (...) a precise and effective tool". Furthermore, he claimed the architectural design should be "alien to monumental or ornamental concerns" because the "the nature of a laboratory determines such strong constraints that (...) necessarily lead the architect to pure expressions". Therefore, the architectural solution epitomized "sobriety and accuracy (...), which are the attributes of the useful and the scientific."<sup>37</sup>

Somehow the architecture aimed at representing the doctrine of the institution, in their theoretical and formal aspects. Accurate, scientific, sober, rigorous. At the same time, or perhaps primarily, it was adapted to local constraints. Climate responsiveness was not an ambition but a condition

Nevertheless, designing a sober building was a challenging exercise with the desire of expressing sobriety as key. When it comes to the composition of the building's elevations: the devices for sun shading are never ornamental but the result of true necessity. Keeping it simple is, professedly, an ideological quest: reaching a scientific, useful, sober, clean, comfortable outcome. The architecture should act as the laboratory – with a scientific approach to the resolution of problems. Everything that came from the design was pure – not ornamental, not monumental – just a plain and simple, logic, result to a certain problem. Designing a building is just like a scientific action: restraint, moderate, controlled.

"Por outro lado, o conhecimento e a compreensão perfeita do trabalho fatigante, preciso e delicado que se processa nos laboratórios lembra, ou mesmo impõe, a necessidade de envolver aquelas instalações num ambiente propício ao trabalho e à meditação, isto é: calmo e harmonioso.

Assim, muito embora o partido arquitectónico resultasse essencialmente dos condicionamentos ditados pelo clima local – que impunham a necessidade de proteger do sol os rasgamentos de iluminação e ventilação dos locais de trabalho – não devemos esconder que nos estudos de composição predominou sempre a preocupação de não atrair aqueles judiciosos conceitos."<sup>38</sup>

In the end, Vieira da Costa had to develop a new project because the site changed. A new plot forced a different building orientation and the limited budget resulted in a set of buildings that didn't have aseptic or controlled environments. The laboratory ultimately adapted to the circumstances –

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<sup>37</sup> Free translation: "o carácter eminentemente utilitário e científico de um laboratório determina só por si tão fortes condicionantes que, se forem sentidas e devidamente consideradas, conduzirão forçosamente o arquitecto a expressões plásticas puras, completamente alheias a preocupações monumentais ou decorativas, mas fortemente caracterizadas pela sobriedade e pela exatidão que são afinal, os apanágios do útil e do científico." VIEIRA DA COSTA, V. (1960) "Instalações do Laboratório de Engenharia da DSOPA", Luanda, Fevereiro 1960, p.2.

<sup>38</sup> VIEIRA DA COSTA, V. (1960) "Instalações do Laboratório de Engenharia da DSOPA", Luanda, Fevereiro 1960, p.3.





Prenda neighbourhood



Ilha de Luanda



Luanda aerial view  
[LEA archive.]

local climate and local conditions. Even though the architect started from a cultured understanding of modern science, aseptic and sterile, he developed a rather permeable architectural solution. Nevertheless, rationality was still fundamental. Adapting to the new conditions was only coherent with his pragmatic approach.

After 1961, the L.E.A. acquired a propriety near the airport and Vieira da Costa developed a new project to fit rather different circumstances. The plot was located in a peripheral area of the city and was much larger than the first. Buildings could now spread out across the land, which led to a different formal arrangement of buildings.

In 1963 he finished the design of the first three pavilions – A, B and C –, which were destined to house the three main sections of the L.E.A.: Geotechnics, Roads and Buildings. The pavilions were built at the north end of the plot, distanced from each other.

“a sua posição relativa dependeu principalmente do estudo judiciosos dos cortes transversais, onde se procurou, por meios simples e económicos, atenuar os inconvenientes resultantes da incorrecta orientação a que a topografia do terreno conduziu.”<sup>39</sup>

Cabinets to the east, general room to the west. The west room take advantage of the prevailing southwest winds, and creates a cooling system for the whole building.

“os grandes vãos correspondentes às portas da sala geral serão protegidos por elementos basculantes, facilmente manobráveis, para que possam ser fixados em várias posições de modo a funcionar como um toldo de grande eficiência.”

<sup>40</sup>

“os alçados limitam-se a acusar a superestrutura, pondo em evidência a rigorosa modulação da planta intencionalmente sublinhada pela alternância ritmada dos vãos e dos cheios. Através da sobriedade e da exatidão procurou-se traduzir o carácter eminentemente utilitário e científico que distingue as instalações desta natureza.”<sup>41</sup>

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<sup>39</sup> VIEIRA DA COSTA, V. (1963) “Instalações definitivas do Laboratório de Engenharia de Angola - memória descritiva dos pavilhões A, B e C”, Luanda, Abril 1963, p.1.

<sup>40</sup> Idem, p.2.

<sup>41</sup> VIEIRA DA COSTA, V. (1969) “Memória descritiva do Pavilhão de Hidráulica”, Luanda, Setembro 1969.

### Publications on Engineering and Architecture

Between 1957 and 1974, the L.E.A. published several original papers and translated technical information from abroad. Throughout the years, the papers focused on the most pressing subjects in the country, starting with geotechnical studies in late 1950s and focusing mostly on building physics in the 1970s. The topics expanded and architecture became progressively more present, not only on their publications, but also at the conferences in Portugal, Brazil, Mozambique and Angola, on which the laboratory took part.

In 1957, the L.E.A. launched its first publication: *Memória* nº 1<sup>42</sup> focused on quality control of concrete and was authored by the director of the institution, who had previously published the same paper in Portugal.<sup>43</sup> All the other scientific papers published in 1957 were the outcome of lectures presented at the *I Jornada de Estradas*.<sup>44</sup> The conference, which took place in Luanda in that same year, gathered engineers from Angola, Portugal and Mozambique.

A new set of publications was released in 1959 and 1960 approaching new fields of study.<sup>45</sup> Rainwater drainage, sewage, railways and dams were some of the research topics added to the initial core of road planning subjects.

In 1959, Frederico Colaço released the first report related to architecture. He wrote a paper on housing developments in Angola,<sup>46</sup> which he presented at a conference in Kenya. In his paper, he pointed out that the laboratory was focusing on the problems of roads, soil mechanics and building materials. He added that a section of building physics should be developed to deal with thermal comfort, air conditioning and lighting technology, as practical appliances of climatology (Colaço, 1959, p.9).

A significant part of the papers published before 1961 were the outcome of research developed in Portugal at the LNEC. Gradually, with the increase of engineers and architects living in Angola, the reports became more specific.

### “Preliminary Study on the Housing Problem in Luanda” (1962)

In 1962, the Governor of Angola nominated a committee for developing a report on the housing problem in Luanda (Despacho 6/2/62). Four members from different fields of knowledge and representing different institutions

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<sup>42</sup> NOVAIS-FERREIRA, H. (1957) *Utilidade e base do controle do betão*, *Memória LEA* nº 1, Luanda: LEA.

<sup>43</sup> *Separata da Técnica*, Revista de Engenharia de Alunos do IST, 22p.

<sup>44</sup> *Memories* 2 to 47 (1957), Luanda: LEA.

<sup>45</sup> *Memories* 48 to 62 (1959); *Memories* 63 to 80 (1960), Luanda: LEA.

<sup>46</sup> COLAÇO, F. (1959) *Melhoramentos de habitação tradicional em Angola*, *Memória LEA* nº 52, Luanda: LEA.

formed the original group; namely: Henrique Novais-Ferreira – engineer and director of the LEA - Fernão Lopes Simões de Carvalho and Vasco Vieira da Costa – architects at the municipality of Luanda - José M. Furtado – geographer engineer from the Geographic Registration Department (SGC). Later, other two members joined the commission - Marciano Bento Quaresma Guerreiro – civil engineer – and Mário Baptista de Sousa Romano – director de Fazenda.

The report was only published by LEA in 1968 though it had been fully developed in 1962. The commission studied several aspects of the city's development to which so far everyone had been oblivious. Social concerns with the city's native population seem to have emerged for the first time after the break of war. Prior to the 1962's study, the only report on the demographic evolution of Luanda contained data on the white settlers population and their housing problems but no information on the African population was given then (Novais Ferreira, 1959).

To develop the 1962's report, several institutions provided specific data and developed particular studies. It was the case of LEA, which in previous and subsequent years published papers based on the studies formulated at that time.

The papers published by the LEA on housing issues in Luanda or Angola are chronologically listed below:

NOVAIS-FERREIRA, H. (1959) *Evolução demográfica de Luanda - subsídios para a sua urbanização*, Memória LEA nº 59, Luanda: LEA.

NOVAIS-FERREIRA, H. (1961) *Tratamento de lixos - o caso da cidade de Luanda*, Memória LEA nº 81, Luanda: LEA.

COSTA FERREIRA, J. (1967) *Planeamento urbano na província de Angola*, Memória LEA nº 126, Luanda: LEA.

FERREIRA, J. (1968) *Do aspecto económico da habitação popular - apreciação sumária*, Memória LEA nº 136, Luanda: LEA.

NOVAIS-FERREIRA, H. (1968) *Habitação social em Angola. Esboço de um programa de acção*, Memória LEA nº 153, Luanda: LEA.

TAVARES, A. (1969) *Para uma sociologia da habitação em Angola - Métodos e perspectivas*, Memória LEA nº 154, Luanda: LEA.

EANES, J. R. (1969) *Algumas realizações do ordenamento urbano*, Memória LEA nº 155, Luanda: LEA.

NOVAIS-FERREIRA, H. (1971) *Habitação e política fundiária*, Memória LEA nº 171, Luanda: LEA.

NOVAIS-FERREIRA, H. (1971) *Custo de terreno e urbanização*, Memória LEA nº 172, Luanda: LEA.



**Workshop and lectures at LEA**  
[LEA archive.]

NOVAIS-FERREIRA, H. (1971) *Alguns princípios a considerar para a resolução do problemas da habitação*, Memória LEA nº 173, Luanda: LEA.

In 1968, the paper “Do aspecto económico da habitação Popular” (Ferreira, 1968) analyses the incomes vs. cost of living of Luanda’s population and shows that 95% of the people cannot afford to pay a rent.

Also in 1968, “Habitação Social em Angola- Esboço de um programa de acção” (Novais-Ferreira, 1968) presents Brazil as case study and describes a study trip in 1967 to learn from the Brazilian experience.

The expression ‘social housing’ is used for the first time in 1967 in the urban planning report (Costa Ferreira, 1967). Informal housing developed by the black population is presented as a pressing public concern since it entails major social problems that are, admittedly, much more broad than the housing shortage for the white settlers.

#### **“Thermal Environment Concept Applied to the Design of Dwellings” (1965)**

In 1965, Novais-Ferreira published the paper “Thermal environment concept applied to the design of dwellings” which, for the first time, examined weather data from the different Angolan sub-climates while discussing thermal comfort and its desirable influence on architectural design. The article was released in Luanda by the LEA and also in Lisbon by the national magazine *Fomento*, which broadcasted scientific contributions to economic and technical developments in the Portuguese colonies.<sup>47</sup>

The paper was originally written in 1963 and was the result of the LEA’s cooperation with the SMA that provided the weather data and supported the climatic classifications presented in the article. The contemporary publications by Faria (1963) and Silveira (1962) brought specific information on Angola weather and allowed developing a method to assist architectural design on the search for human comfort.

The cooperation between the two local institutions had been established before for the completion of other relevant studies, namely on the rainfall regime of Luanda (Memórias 48, 53, 54), which occasionally caused landslides and great damage to roads and buildings. Later, the LEA would also publish the reports developed by Faria (1966, 1969) on the prevailing winds in the country.

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<sup>47</sup> NOVAIS-FERREIRA, H. (1965) *O conceito de ambiência climática aplicável aos estudos de edifícios para habitação*, Memória LEA nº 101, Luanda: LEA; NOVAIS-FERREIRA, H. (1965) “O conceito de ambiência climática aplicável aos estudos de edifícios para habitação”, *Fomento - Técnica e Economia Ultramarinas*, Lisboa, vol. 3, nº 2, 2º trim, p. 145-222.



Bioclimatic design was a topic broadcasted by the LEA from 1965 onwards with the publishing of several foreign studies on the subject. Selected contributions from the United Nations' Housing and Town and Country Planning, the RILEM, or the South African National Building Research Institute were translated and issued in their monthly bulletins. However, no other broad study focused on the Angolan conditions and offered practical solutions as the one developed by Novais Ferreira. His long scientific article aimed at providing an academic reading of the issue and, at the same time, at serving as a handbook to architectural practitioners in the country.

The author highlighted the need to develop a wide-ranging local knowledge on the building industry:

“A construção de edifícios para habitação segue muito naturalmente a experiência local e regional, mas é também influenciada por modismos de todos os territórios, inclusive os de clima temperado e frio. A legislação sobre habitações baseia-se em grande parte nos estudos e trabalhos técnicos levados a cabo na Europa e América do Norte e para os seus climas e regiões. E é bem de crer a inadaptação de alguma dessa legislação a climas tropicais. Modismos arquitectónicos, legislação, hábitos construtivos e até urbanização desconhecadora do local, tendem a erigir habitações onde se poderão juntar, a um tempo, dispêndios inúteis e soluções comprometedoras do conforto da habitação.”<sup>48</sup>

Furthermore, he considered: “knowledge of local climatic conditions was the first step to define, in scientific basis, the conditioning requirements for the construction of housing buildings.”<sup>49</sup> Since research in engineering was exclusive of the laboratory, he pointed out that it was their task to outline technical knowledge on structures, building materials, constructive systems, building physics and bioclimatology that were applicable in Angola.

A table with the volume of construction works in the country triggered the article. An average of 200.000 m<sup>2</sup>/year had been built during the last ten years and there was common prospect that the number would rise. Therefore, the thermo-hygrometric study method was a crucial tool to building design in the different regions of the country.

In the first part of the paper, the author explains the main concepts and quotes technical studies by Dreyfus (1960), Blanc (1952) and Missenard (1960) on the evaluation of termo-hygrometric/comfort environments. He quotes several other authors such as Gomes (1962), Raymond Ayoub (1960) or David

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<sup>48</sup> NOVAIS-FERREIRA, H. (1965) “O conceito de ambiência climática aplicável aos estudos de edifícios para habitação”, *Fomento - Técnica e Economia Ultramarinas*, Lisboa, vol. 3, nº 2, 2º trim, p. 146.

<sup>49</sup> “O conhecimento correcto das condições climáticas locais é o primeiro passo para se definir em bases científicas as exigências condicionantes da construção de edifícios para habitação”. Idem, p.146.



Oakley (1961) in order to validate the need and relevance of such study. He uses Taylor's climograph, Australia, 1916; Stone 1941.

Referring specifically to Angola, he categorizes three eco-climatic types in the country: the dry iso-hygrometric, the isothermal, and the humid iso-hygrometric. He presents psychrometric charts for each region and an overlapped scheme that shows the guidelines to climate responsive design. The latter graph displays the needs for direct or indirect ventilation, thermal inertia, sun shading and air-conditioning.

This report became influential for the architectural practice in Angola in the following years. Often these charts were used in the project descriptions (e.g. Francisco Castro Rodrigues used it at Lobito's lyceum) and were provided to architects by the DSOPT.

Indeed, Novais Ferreira's chart with guidelines for building design and the climographs of most Angolan cities were pioneering tools for architectural practice in the country. Since this info was only made available in 1965, it is fair to say than prior to that, architects had developed an empirical understanding of the climate conditions. This was the first time that Angola's climate conditions were interpreted in order to inform architectural practice. Even though the paper did not present specific design guidelines, the recommendations were specific enough to provide immediate answers on exact needs for shading and ventilation.

### **“Segundas Jornadas de Engenharia e Arquitectura do Ultramar” (1969)**

The *Luso-Brazilian Conferences on Civil Engineering*, held for the first time in Lisbon in 1965, had a second display in Rio de Janeiro in 1967 and the third in Mozambique in 1971. Architecture was progressively more present in these conferences.

The *First Engineering Conference of Mozambique* took place in Maputo (former Lourenço Marques) in 1965, welcoming participants from Portugal and Angola. The second and last edition of this symposium took place in Luanda in 1969 and was named *Second Conference on Engineering and Architecture in Over-seas*. The conference gathered architects and engineers from Portugal, Angola and Mozambique. This conference enlarged the scope of communications and papers on architectural developments were significantly more numerous, as was the technical research supporting these developments (there were more architects presenting papers; more research in the Engineering Labs that was related to building issues - architecture and urbanism.) The conference proceedings were published in five volumes and two additional volumes with transcriptions, including a paper presented by Vieira da Costa.



**Luanda's construction progress**  
 ["O progresso da construção civil na capital angolana"]  
 José Marques Rocha  
 Província de Angola, 1970.]

## 2.3. Construction Industry

This chapter aims to show how the Angolan construction industry developed significantly during the second half of the twentieth-century. While in the 1940s construction was totally dependent on the importation of materials, after the end of World War II, local production slowly developed.

However, the industrialization of Angola only occurred during the 60s, and some scholars located its origin in 1961, coinciding with the beginning of the colonial war. Until then, the Portuguese colonial model was purely centralist, which blocked an independent development of the colony. After the start of the war, the local administration was given greater autonomy and simplified the processes of creation of industries in the country. This resulted in a frank development of local industry, mainly driven by growing European immigration and dynamic local entrepreneurship (Neto, 1991, p.60).

The limited set of materials produced in the country somehow determined the architecture developed during these decades. Together with a modern method, resulting from the new building materials and techniques, architects demanded a building industry that would take local conditions into account. The relatively small group of architects living in the country shared a concern with environmental comfort and the development of an architecture adapted to local climate.

In 1958, Pinto da Cunha wrote an article in the magazine *Cultura* on the housing problem in Luanda.<sup>1</sup> The architect's argument was that a new method for architectural practice should be invented in Angola. He stated that everything needed to be recast, starting with a different legal code and a new way of building adjusted to a tropical city:

“A uma nova técnica, resultante de novos materiais e processos de construção, deve responder uma legislação adequada (...) que permita projectar com liberdade de concepção e com possibilidade de dotar a cidade com soluções tecnicamente certas e com melhor nível arquitectónico. (...) Desde a ventilação e arejamento, à rede de esgotos, ao dimensionamento dos compartimentos, ao isolamento térmico, ao regime de pés direitos, aos sistemas construtivos, etc., tudo importa refundir com novos moldes capazes de garantirem a Luanda edifícios com características de cidade tropical.”<sup>2</sup>

Luanda continued growing during the 1960s, and in the beginning of the

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<sup>1</sup> He argued that construction was rising every day but that it wasn't enough to face the housing demands of the city. He addressed his social concerns and draw attention to the dichotomy between the formal and the informal city. Even though he didn't focused on the obvious racial issues resulting from this division, the magazine would be closed by the political police a couple of years later, since it was raising too many uncomfortable issues.

<sup>2</sup> Pinto da Cunha in “O problema da habitação em Luanda. É preciso construir casas para todos...” *Cultura* n.2 e 3, ano 1, Luanda, Jan.-Mar. 1958, p.12.



**Cement factory, Luanda**

[Roteiro turístico de Angola, 1964.]



**Cement factory, Lobito**

[Roteiro turístico de Angola, 1964.]

1970s the city appeared to be a huge construction site, according to the local press:

“Estão a desaparecer da fisionomia base de Luanda as velhas construções e os edifícios solarengos de sobrado. (...) A cidade modifica-se. Transforma-se. Rejuvenesce. A máquina invade, esventra os terrenos devolutos, onde o capim cresce viçoso. (...) Obra gigantesca de cimento e ferro, que a população da cidade está a ver erguer de dia para dia, com confirmação do querer que as gentes lhe votam. Obra de um povo, que acredita no futuro.”<sup>3</sup>

Therefore, this “gigantic work of cement and steel” represented the hopes of a promising future for this modern city, despite the ongoing war.

### Sovereign Cement

After the end of the Second World War, the rise of construction works in the country was noticeable by the rapid increase of importations of cement and other building materials. From 1946 to 1950, the imports for the building industry augmented around 650%.<sup>4</sup> The largest part of this volume was cement, which amounted 84.800 tons in 1950, while the remaining materials only represented 19.111 tons. At that time, cement was by far the most imported product in the country, accounting for 30% of the total volume of importations.

To face this exponential need, the production of cement started in 1953 in Lobito by the *Companhia dos Cimentos de Angola* and was increased in 1957 with the establishment of a new cement factory in Luanda named *Secil do Ultramar*. The two companies were originally based in Portugal – *Cimentos de Leiria* and *Secil*, correspondingly – and expanded their industries to Angola and Mozambique driven by the new political stability and economic growth.<sup>5</sup>

In 1960, both units were producing enough cement to sustain the local building industry and even started minor exportations to São Tomé and Príncipe and French Equatorial Africa. Since then, Angola became self-sufficient and importations reduced drastically. Even though the Colonial War started in 1961, the prospects for development in this area were very ambitious, according to an economic report from 1962:

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<sup>3</sup> “O progresso da construção civil na capital angolana” José Marques Rocha  
Província de Angola, 1970 Jul 10, p. 10.

<sup>4</sup> See tables Import/Export Porto do Lobito and Porto de Luanda: CASTRO, E.G.A. (1966) *Angola, Portos e Transportes*, Luanda: Obra Política-Económica de Consulta e Divulgação. Cement importation in 1940: 2.939ton; 1946: 13.101 ton; 1950: 84.800 ton; Other materials for building industry 1946: 2.224 ton; 1959: 19.111 ton.

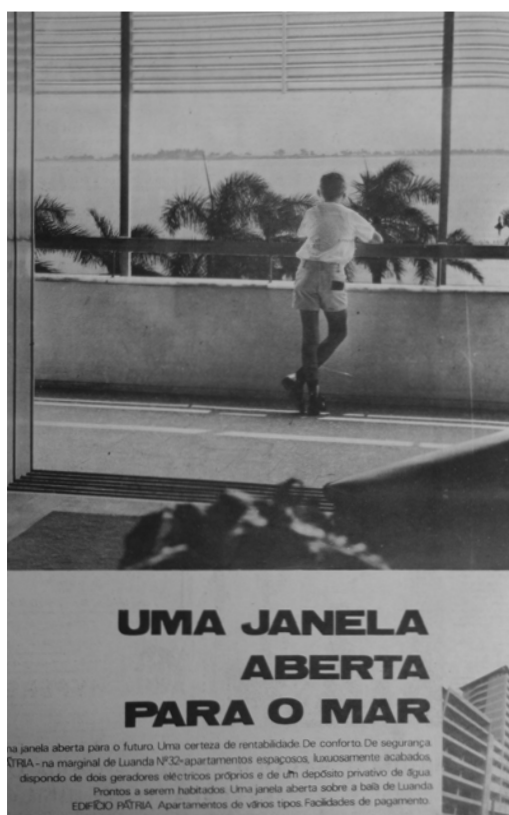
<sup>5</sup> MARQUES, W. (1962) *Problemas do Desenvolvimento Económico de Angola*, Luanda: Junta de Desenvolvimento industrial, p. 372.





## Catalogues

[Vasco Vieira da Costa archive.]



## Real Estate Advertisement

[Roteiro turístico de Angola, 1964.]



“This industry has adequate technical skills and faces truly remarkable prospects if we believe in the outbreak of economic development that will absorb the Province, and if we admit that it must involve building works on roads, bridges, dams, buildings, factories, etc. (...) This sector can believe in a broad future, provided the current political, economic and social perspectives remain.”<sup>6</sup>

The author’s cautious remark only vaguely alluded to the fact that the country was underdoing war between the Portuguese military forces and the nationalist movements. Paradoxically, the armed conflict didn’t seem to present major obstacles to the expected economic development of Angola. His prediction proved to be accurate since the volume of construction works in the country increased massively in the following years, and so did the cement production, which tripled from 1962 to 1969.<sup>7</sup>

Although the cement industry prospered and became autonomous in just a few years, the same didn’t happen with the manufacture and extraction of other building materials in the country. The production of clay block bricks, with older tradition and several small industries disseminated in the country, was insufficient to respond to the growing needs of the region and depended on substantial importations during the 1960s and the 1970s.<sup>8</sup> Other minor transformative industries produced building materials such as glass and paint, but the local manufacture was insignificant compared to the volume of imports.

The Portuguese Government fostered the extraction of wood and stone and exportations to Portugal and Europe started during the 1960s. Exports of wood increased rapidly but the extraction of marble and granite from quarries in the south continuously corresponded to low tonnages. Simultaneously, both extractive industries fed the domestic construction market, but the distribution and transformation of these materials was still precarious.<sup>9</sup>

Portugal developed an economic policy of national integration that fostered the Portuguese single market by establishing only complementary industries

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<sup>6</sup> “Além de uma boa capacidade e técnica adequadas, enfrentam perspectivas verdadeiramente notáveis se acreditarmos no surto de desenvolvimento económico que vai absorver a Província e se admitirmos que, como deve ser, ele trará consigo trabalhos de edificação de estradas, pontes, barragens, edifícios, instalações fabris, etc. (...) Este sector bem pode acreditar num largo futuro a manterem-se as actuais perspectivas políticas, económicas e sociais.” MARQUES, W. (1962) *Problemas do Desenvolvimento Económico de Angola*, Luanda: Junta de Desenvolvimento industrial, p. 375.

<sup>7</sup> See “Table 2: Production Growth Indices” in CHAPMAN, M. (1971) *Angola on the road to progress*, Luanda: Angola Consultantes, p.76.

<sup>8</sup> The production of ceramics in 1962 responded to only 50% of the needs. MARQUES, W. (1962) *Problemas do Desenvolvimento Económico de Angola*, Luanda: Junta de Desenvolvimento industrial, p. 371.

<sup>9</sup> Small carpentries locally produced doors and window frames custom-made for each building. This caused the end of importation of timber elements in 1962, but wooden furniture was imported over the 1970s. Local marble and granite was often used, but contractors would only extract and transform stone depending on the works they were running.



**Edifício dos Servidores do Estado**  
[Vasco Vieira da Costa, archive.]



**Rádio Nacional de Angola,**  
**Simões de Carvalho**  
[LEA archive.]

in the colonies.<sup>10</sup> This strategy was evident in the steel industry, for instance, which was non-existent in Angola. In 1961, Portugal started producing steel in order to supply the domestic market and the colonies.<sup>11</sup> Although investments in Angola were proposed, the Portuguese Government only allowed the establishment of two mini-mills by LUPRAL and ALBA, which did not diminish Portuguese exportations. This partnership also founded the society *Aluminio Português (Angola)* in 1958 to explore the aluminium industry.

Portuguese protectionism did not favour the industrial self-sufficiency of the colony. However, the local business community and the local authorities largely promoted the start-up of industrialization in the 1960s and were responsible for its fast-growing development and autonomy.<sup>12</sup> The country's industrialization arose in several economic areas<sup>13</sup> and the construction industry had a very significant evolution with the start of mechanized production and transformation of basic materials for infrastructure and building. Nevertheless, despite the enormous progresses, construction works depended massively on importations, mainly from Portugal, along the 1960s and the 1970s.<sup>14</sup>

The architectural production in the country was necessarily constrained by this background. Local resources were scarce and the scope of imported materials was also narrow, which naturally limited the architectural solutions. To the architects working in the country, frugality was mandatory – achieving as much as possible, spending the best by spending the least – it was the starting point of every design. This favoured repetition; this created a style; limited the architectural lexicon; inventive solutions; repeated strategies; same materials. Same use of construction methods, building materials, architectural forms, regional character – the same features – it created a style. This style emerged from this society and these conditions.

Cement was the only exception in this scenario of shortage. Since the production of Portland cement was plentiful, there were small industries across the country using the material to produce hydraulic tiles and terrazzo

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<sup>10</sup> This happened before 1961. From 1961 to 1971 a free trade zone was established and an interterritorial payments system guaranteed the free movement of goods in the Portuguese space. In 1971, a new law was created to favour the implantation of manufacturing industries in Angola that could produce for the Portuguese market, while in Portugal the industry should become specialized in technological sectors. NETO, A. M. (1991) *Industrialização de Angola: reflexão sobre a experiência da administração portuguesa*, Lisboa: Escher, p.60-63.

<sup>11</sup> The *Siderurgia Nacional* was founded in 1958 and started its production in 1961.

<sup>12</sup> NETO, A. M. (1991) *Industrialização de Angola: reflexão sobre a experiência da administração portuguesa*, Lisboa: Escher, p.61.

<sup>13</sup> COSTA OLIVEIRA, J. (1972) *Servindo o Futuro de Angola*, Luanda: INA.

<sup>14</sup> Importation of building materials was 40 000 tons/year.



**This is Luanda**  
 [A Província de Angola, 1967-70.]

floors. Consequently, these became the most affordable and popular floor pavements in this period. Fibrocement was also produced locally – by *Lupral* in Benguela and *Cimento de Angola* in Luanda –, thus roofs, pipes and later coatings and façade devices were commonly made of asbestos cement.

The success of these local industries was both a proof of the country's progress and a source of pride. The local press often reported new expansions, acquisitions or relevant production growths of local businesses. This propaganda became more frequent and extreme at the outbreak of Colonial War since it operated as reassurance to the (white) settlers on the country's economic and social stability.

In March 30 1961, two weeks after the UPA's massacre in the north of the country, the *Jornal de Benguela* published a long article on *Lupral*. The “largest industry of Benguela” had just expended a considerable amount of money to buy new equipment and double its production. This “model company” honoured “the city, the Province, and the national industry” due to its modern production techniques. In a time of uncertainty, the company's steady growth and the new investments showed a clear vote of confidence in Angola's future development.

After 1961, advertisement of local companies and brands often presented nationalist appeals. *Lupral* started using the slogan: “Prefer products made in Angola”<sup>15</sup> and “Contribute to a greater Angola by using our products”.<sup>16</sup> The *Companhia dos Cimentos de Angola* promoted “a high quality Angolan product” and *Secil do Ultramar* stressed that: “Our Portland cement responds to the Portuguese norm, but also to the British and the French regulations.”<sup>17</sup> Since these companies were operating exclusively in the Angolan market, their advertisements were directly speaking to a local public. Their commercial interests favoured an emergent economic autonomy from Portugal and visibly promoted the expansion to the neighbouring African markets. In the 1960s and the 1970s, cement was an Angolan product par excellence, which represented the country's projected modernity and emancipation.

### ***Lupral*: a New Style to the Architecture of Angola**

Fibrocement products were manufactured in the country since 1951 with the founding of *Lupral-Lusalite* in Benguela and of *Cimento de Angola* in Luanda, a couple of years later. Both companies initially produced tubes and roofing panels but the production range expanded in only a few years.

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<sup>15</sup> “PREFIRA os PRODUTOS fabricados em ANGOLA”, advertisement to *Lupral*, *Jornal de Benguela*, December 1961.

<sup>16</sup> “Contribua para uma angola maior consumindo os nossos produtos”, in *Roteiro de Angola*, volume1, edição especial do Jornal O Lobito, Setembro 1963.

<sup>17</sup> Both advertisements in AAVV(1964) *Anuário Turístico de Angola 1963-1964*, Lisboa: Editorial de Publicações Turísticas.





**Governor visit to Lupral**  
[IICT.]



**Lupral Advertisement**  
[O *Intrasingente* magazine, 1961.]



*Lupral* began the manufacture of products such as sunshade blades (1953), vent blocks (1955), prefabricated houses (1955), cladding panels (1957) and furniture (1959). The brand offered different solutions in each category and had a technical team developing new models and assisting construction works.

These products became very popular and widespread all over the country. In 1961, an ad showing different types of *brise-soleils* in buildings from different cities affirmed: “*Lupral’s fibrocement products impose a new style on the architecture of Angola*”.<sup>18</sup> This peculiar statement highlighted the strong impact of these devices on the current architectural language and acknowledged the brand’s dominant power. Sunshades had apparently both functional and formal purpose: “Thousands of *Lupral’s brise-soleils* are making buildings cooler, more comfortable and modern.”<sup>19</sup>

It was meant to respond to climate, but in fact, the brand was forcing a new formal arrangement to buildings; style of which architecture couldn’t get rid of; Both used by architects and engineers, contractors or simply bought by the owners; sun shading equalized, levelled, make similar, alike, analogous. Created a style.

The company distributed the Swiss architecture magazine *AC International Asbestos-Cement Review* <sup>20</sup> to designers working in the country.<sup>21</sup> The trilingual publication was supplemented by a short summary in Portuguese providing general information on the buildings presented. The quarterly magazine, which was released for the first time in 1956, published recent buildings around the world that showed diverse uses for the various fibrocement products. Although most examples showed exterior and interior claddings, asbestos cement *brise-soleils* were also presented in the magazine in its first year.

In 1956, the topic was approached with the article “Sun-breakers in South Africa”<sup>22</sup>, that showed recent applications on important buildings in the country and stated *brise-soleils* had become a common feature there. Simultaneously, it highlighted that sun control was also vital in northern climates, but the most relevant examples were to be found in Brazil and the USA:

“Large glass areas are the salient characteristic of all modern buildings. They meet our

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<sup>18</sup> “Os produtos de fibrocimento *Lupral* impuseram um novo estilo à arquitectura de Angola”, advertisement in *O Intransigente*, December 1961.

<sup>19</sup> “Muitos milhares de quebra luzes *Lupral* tornam as construções mais frescas confortáveis e modernas”, *idem*.

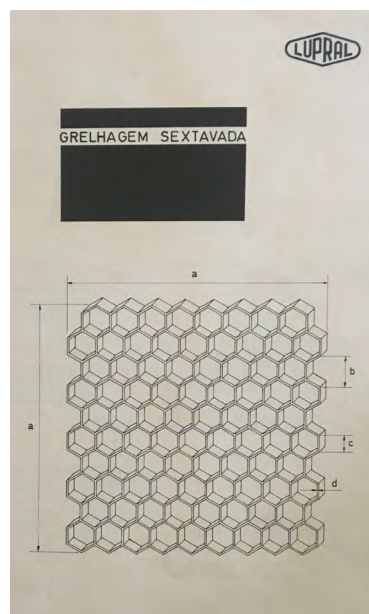
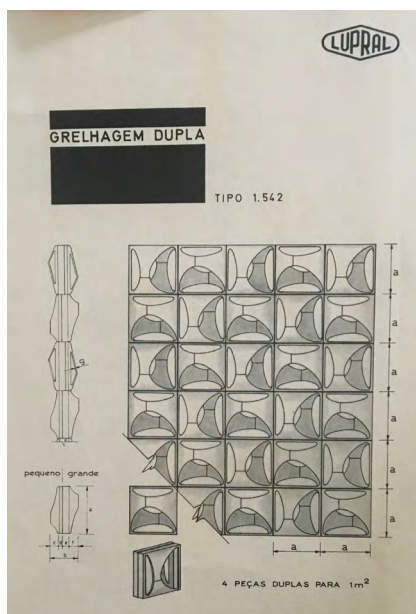
<sup>20</sup> The magazine was printed in Zurich from 1956 to 1985.

<sup>21</sup> At least from 1964 to 1972; archive Vasco Vieira da Costa, Luanda.

<sup>22</sup> AC4, October 1956 “Sun-breakers in South Africa”, p. 10.



**Vent blocks, Benguela**  
[Margarida Quintã, 2014.]



**Lupral's catalogues**  
[Margarida Quintã, 2014.]

demand for open living, sun and indoor-outdoor penetration. (...) It is the *brise-soleil* (sun-breaker or sun-shade) which gives the architect of today the means whereby the effect of the sun can be controlled. The brise-soleil is about to become an element in contemporary architecture much as doors and windows. (...) As in many universally known public buildings in Brazil and USA, the sun-breakers are of asbestos cement. Asbestos cement is very suitable for this purpose as it is obtainable in thin sheets and has very good weathering properties.<sup>23</sup>

Lupral offered the openness of space and environmental comfort demanded by modern architecture. For this reason, the first Lupral brise-soleil was designed in 1953. Several types were developed afterwards, with movable vertical and horizontal blades, in different sizes, and operated by levers. The company also provided vent-blocks sold by catalogue in different shapes and sizes. Furthermore, Lupral had a permanent design team that offered tailor-made solutions for particular buildings, such as the Liceu Almirante Lopes Alves (Castro Rodrigues, Lobito, 1963-70), Escola Comercial e Industrial de Benguela (Jorge Moreira, 1965-1967), and Escola Comercial e Industrial do Lobito (Jorge Moreira, 1967-1970). This technical team also designed prefabricated houses,<sup>24</sup> chapels (1960, 1969), stands for industrial fairs<sup>25</sup> (1957-1974), rural schools (1963, 1965, 1972), and furniture.

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<sup>23</sup> Idem.

<sup>24</sup> Houses for indigenous communities (1955); weekend-house (1962).

<sup>25</sup> Feira de Benguela 1957; Feira das Indústrias de Luanda 1959; Feira de Luanda 1964; Feira do Lobito 1966; Feira de Benguela 1967; 1ª Feira Internacional de Luanda (FILDA) 1969; Feira Comercial e Industrial de Nova Lisboa 1970; FILDA 1970; FILDA 1972; FILDA 1973.



## **Chapter 3**



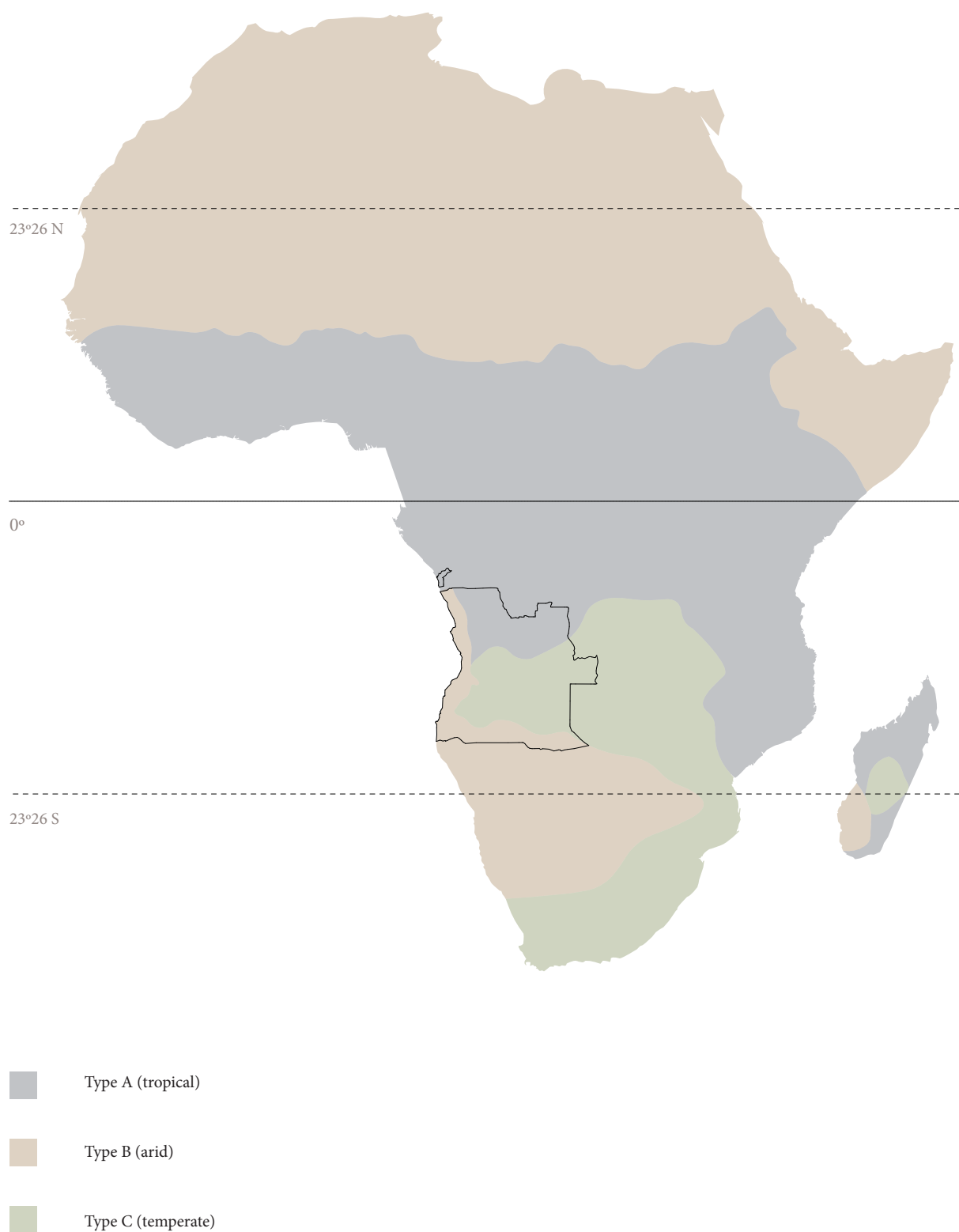


## Case studies

This chapter focuses on educational buildings developed in different regions of Angola from 1961 to 1975. Three schools built during this period are comprehensively analyzed in the sections 3.1, 3.2 and 3.3. The part 3.4 presents a comparative chart summarizing the constructive systems, environmental control devices and overall climate responsiveness of the three buildings.

As previously discussed in the introduction, the selection of the case studies presented involved chronological, typological and geographical criteria whose relevance is further described here. The sample aims at being demonstrative despite the condensed number of buildings presented; the study favors the detailed analysis of each case study rather than offering an extensive mapping of the educational buildings developed in the country. Presenting complete reports on each building, from the official processes to construction details, meant to conduct an investigation mainly based on primary sources that were collected in distinct locations such as Lisbon, Luanda, Saurimo, Lobito and Huambo.

The research draws mainly from the archival materials collected at the national archive of Angola (AHN) and the architects' personal collections, as well as from building surveys on site. The buildings selected aim at representing the chronological period analyzed in this thesis, which corresponds to the start of the Angolan war of independence, in 1961, to the country's liberation in 1975. Therefore, the buildings are organized in a



**Main climate zones in Africa**  
[adapted from Koppen climate classification system and LEAL, F. (coord.) (1955) O Clima de Angola, Luanda: Serviço Meteorológico de Angola]

sequential manner, starting with the Saurimo's School, which was built in 1961, the Lobito's Lyceum, built from 1963 to 1969 and, at last, the Faculty of Veterinary Medicine, built from 1970 to 1975.

Since the three buildings span the entire period studied here, the description of their processes provides a full understanding on the progressive changes that occurred both in education policies and architecture. Complementarity between the chosen case studies was also relevant with respect to building type. Although the three case studies are educational buildings, each is from different educational stages.

Therefore, building programs are not alike or comparable; instead, diversity aims at showing the distinct types of operations that were sponsored during this period. Hence, we are looking at a preparatory school built at the beginning of the war, at an high-school developed during the most prolific expansion years, and at a faculty dated from the last years of colonialism, whose construction works remained unfinished.

Additionally, each school is located in a different region in order to address the spread of educational buildings throughout the country. More importantly, each case study was built in one of the three main climatic zones of Angola, namely from types Aw, Bsn and Cwb according to the Koppen climate classification system.<sup>1</sup>

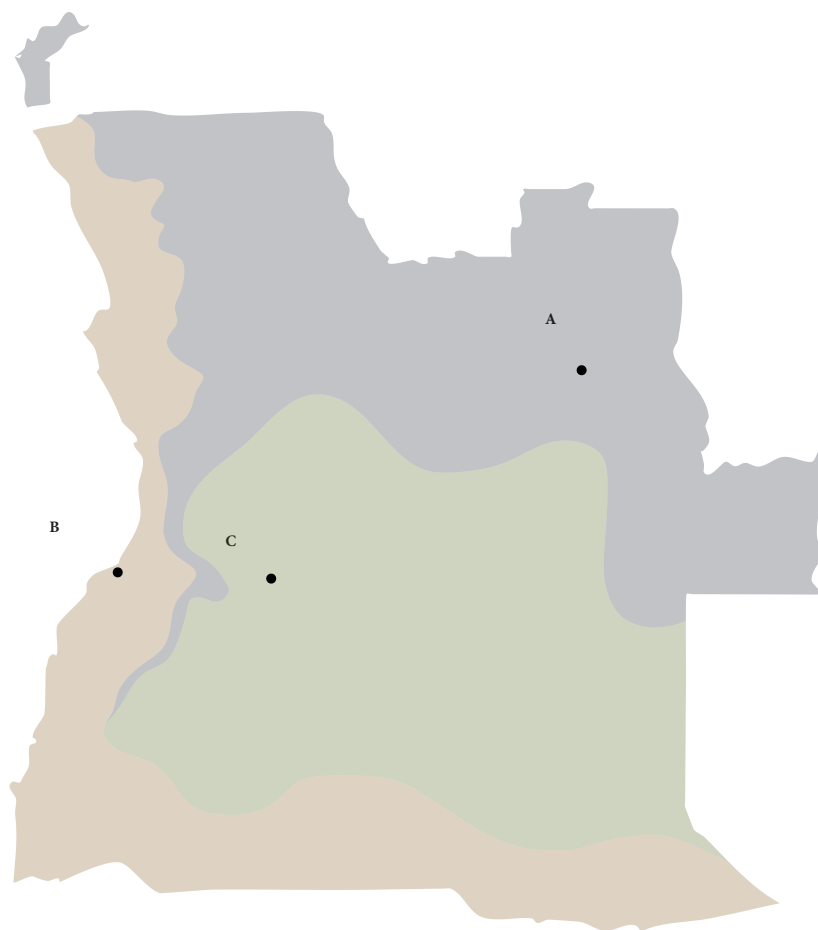
Although the country is located between the Equator and the Tropic of Capricorn, each of these regions presents different weather parameters that do not qualify as the typical tropical climate. Analyzing the school's climate responsiveness in different climate zones will enable a conclusive inquiry about the architects' real scientific knowledge on weather parameters and the applicability of meteorology as a tool of architectural design.

In order not to center the discussion on the skills of one single architect, the three case studies have different authors. Therefore, the architects represented here, working individually or in partnerships, have different academic and personal paths. Although all of them studied architecture in Portugal, they have different backgrounds with respect to their place of birth and length of stay in Angola.<sup>2</sup> This diversity is illustrative of the characteristics of the professional community of that time, which was not particularly homogenous and let alone fixed. However, all the authors developed these architectural projects while living in Angola and shared a self-proclaimed interest in

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<sup>1</sup> Corresponding to tropical, arid and temperate climates.

<sup>2</sup> Vasco Vieira da Costa, born in Aveiro in 1911, lived in Angola from 1913 to 1982; Antonieta Jacinto, born in Huambo in 1930, lived in Angola from 1930 to 1960; Francisco Castro Rodrigues, born in Lisbon in 1930, lived in Angola from 1953 to 1985; Francisco Silva Dias, born in Lisbon in 1930, lived in Angola from 1957 to 1960; José Quintão, born in Quelimane in 1940, lived in Angola from 1970 to 1974.



- A Colégio de Henrique Carvalho  
Jacinto e Silva Dias  
Saurimo, 1958-1961  
Climate zone: Aw  
(in use)
- B Liceu Almirante Lopes Alves  
Francisco Castro Rodrigues  
Lobito, 1963-1970  
Climate zone: Bsn  
(in transformation)
- C Faculdade de Medicina Veterinária  
Vasco Vieira da Costa  
Huambo, 1970-1974  
Climate zone: Cwb  
(in ruin)

**Case studies location**

[adapted from LEAL, F. (coord.)  
(1955) O Clima de Angola, Luanda:  
Serviço Metereológico de Angola]

passive design practices.

The case studies were also selected based on their present state of conservation. It was considered relevant that each school corresponded to different conditions - abandoned, in use and in transformation - in order to mirror the diversity of the country's contemporary situation in school infrastructure. The first case, Saurimo's school, is still working today in a neglected and overpopulated building that has undergone only a few minor transformations over the years. Lobito's building has been used as a school since the 1960s, but it was totally refurbished in 2015. The latter case, Huambo's building, is in its original state but has been abandoned in the 1970s and is today in an advanced state of decay.

Looking at how these buildings have been used and transformed over the years aims at assessing the successes and failures of the original architectural design. Furthermore, understanding the schools' real environmental performance will provide not only a critical reading on Angolan climate-responsive design but will also inform contemporary architectural practice. Ultimately, the research aims at boosting the discussion on natural versus artificial systems of environmental control within Angola's diverse sub-climates.





# **Colégio de Henrique Carvalho, Jacinto e Silva Dias, Saurimo, 1958-1961**

Antonieta Jacinto and Francisco Silva Dias designed a school in Saurimo (former Henrique Carvalho) between 1958 and 1960, while both lived in Angola. Although they began before the War of Independence started and new colonial education policies were established, its construction process began only after 61. The school complex was initially designed as a boarding school for the children of diamond mining workers in the Lunda region, but was eventually used as a public elementary school between 1963 and 1975.

The school facilities built in early 1960s are still functioning today, notwithstanding the changes in Angolan society over the years, particularly after the country's political independence in 1975. Currently, the school is struggling with overcrowding, having more than 60 pupils per class and operating in two shifts.

The school is an unpretentious building located in a remote area of the country, for which it remained virtually unknown until 2007, when it was published at Manuela Fonte's thesis on Angola's urbanism and architecture and at Silva Dias monograph (Fonte, 2007; Ribeiro, 2007).

Therefore, this research is almost exclusively based on primary sources such as the original documents of the project, drawings and writings, located at the architects' personal archive. Simultaneously, several interviews were performed both in Portugal and Angola in order to draw up the context for the school's foundation and its use up until nowadays.

Extensive survey on-site allowed identifying modifications that were included during construction phase and other later additions, such as the school extension built in early 1970s by the local public works department.

Inquiries with both architects confirmed that climate responsiveness was a dominant issue they discussed during the design process. However, their knowledge on the topic was uneven. For Antonieta Jacinto, school's climate responsiveness to tropical climate was an interest area, which she developed in her graduation thesis.

While she knew firsthand the various Angolan climates, Francisco Silva Dias was foreign to tropical locations. However, he quickly developed an interest in learning analytical design methods from his international architectural references.

## A Boarding School in Far Northeast Angola

In 1957, the Governor of Lunda, Eduardo Martins Soares, was planning the foundation of a boarding school in the northeastern province of Angola. His plan was to build new educational facilities in Saurimo (former Henrique Carvalho) with the support of the Public Works Department and the financing of the national diamond company (Diamang).<sup>1</sup>

Although Lunda was the richest diamond region in the country it was, at the same time, one of the most deserted areas of Angola. A growing number of mine workers were living in small urban settlements, far away from Malanje and Luanda, which were the closest cities where their children could get secondary education in religious boarding schools. Consequently, Diamang considered supporting the construction of a secondary school with male and female dormitories in the capital city of Lunda Province.

Saurimo had a central position in the region. The city acted as a strategic stop-over between Luanda – Angola's capital, located at the shore –, and Dundo (former Portugália) – a small town, just next to the northern border, which housed the headquarters of Diamang. Moreover, Saurimo was located halfway between Dundo and Luena (former Luso), which was the closest town with access to the Benguela railway (CFB). Being the crossroad of the two axes, Saurimo naturally became an important trading area and the administrative centre of the whole region.

The city was laid out on an orthogonal grid on a plateau 1000 metres above sea level. Although an urban settlement had existed there since the beginning of the 20th century, Saurimo only became the capital of Lunda in 1917 and a city in 1956.<sup>2</sup> A few public buildings were organized around the central square – the city hall, the governor's house, the post office and the church. The new lyceum was to be built nearby, just behind the church, in an unoccupied quarter. The large plot was halfway between the city centre and the Christian mission, which, at the end of the 1950s, were two of the most structured areas of the developing city.

The project of building a boarding school in Saurimo was carried out through a public-private partnership that would benefit both the province's develop-

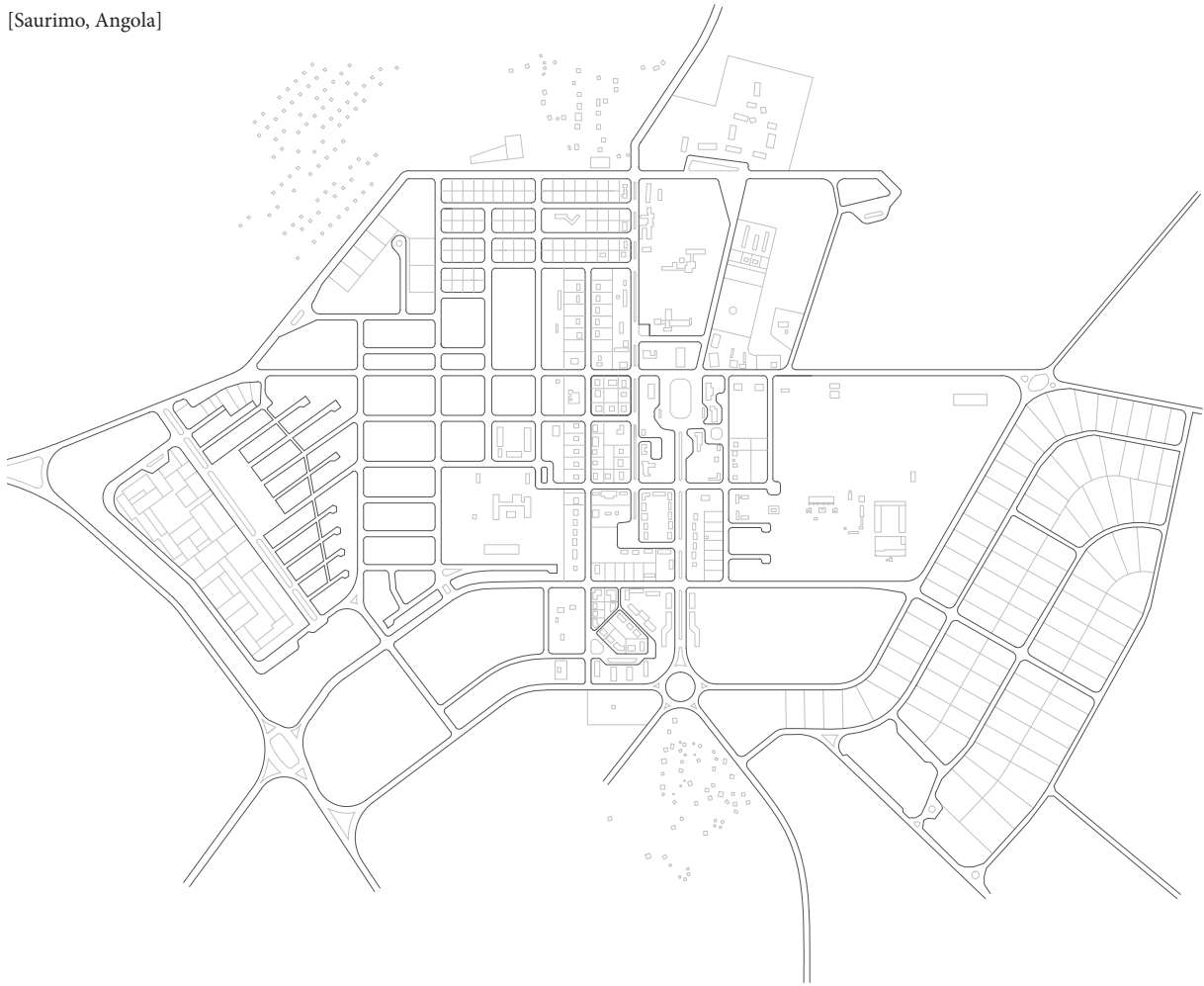
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<sup>1</sup> Diamang (Companhia de Diamantes de Angola) was established in Angola in 1917 with Portuguese, Belgian, French and American resources. The company had a colonizing mission of the Lunda region and received many privileges from the Portuguese colonial government. In order to develop the mining industry, the company created and fostered many social and cultural departments (such as Healthcare, Education, Urbanism and Culture, amongst others) and built basic infrastructure, urban settlements and welfare buildings. Manuel Areia, "Introdução", *Diamang: Estudo do Património Cultural da ex-Companhia de Diamantes de Angola*, Coimbra, Museu Antropológico da Universidade de Coimbra, 1995, p. 7-10.

<sup>2</sup> The town of Henrique Carvalho became a city in May 28, 1956 (Diploma Legislativo 2757).

**Location**

[Saurimo, Angola]



**Urban Plan, Saurimo, 1961**  
[redrawn, Manuela Fonte, 2007.]



**Site plan, Saurimo, 1965**  
[IICT.]

ment and the diamond company's welfare. In order to get the agreement of the Governor of Angola, the local administration urgently needed technical advice to endorse their intentions.

They approached Antonieta Jacinto and commissioned her to design the boarding school. She was a young architect who had newly graduated in Lisbon and was back in her home country to join the Public Works Department (DSOPTA). In spite of Jacinto's official title, this was a private assignment that she managed directly with the Governor of Lunda.<sup>3</sup> She immediately developed a schematic architectural design for the school, which was much inspired by her thesis project.<sup>4</sup> Francisco Silva Dias, her future husband, joined the process a few months later and together they designed the final master plan for the Saurimo School Complex.

Antonieta Jacinto and Francisco Silva Dias practiced architecture in Angola only for a short period of time, from 1957 to 1960. However, their contribution is particularly relevant as much as the timing of their stay in the country is critical. In fact, Antonieta Jacinto was the first female architect hired by the public works department in Angola, shortly after graduating in Lisbon.

She was born in Huambo, in 1930, and lived in several different locations in Angola during her childhood. Her family moved to Angola in 1928 because her father was performing botanical surveys of Lunda. Later, he directed an experimental station in Cuima and, in 1940, was named Director of the Agriculture Department in Huambo region.

In 1950, Antonieta Jacinto moved to Portugal to study architecture. During 6 years she lived in Lisbon to complete her studies at the School of Fine Arts (ESBAL) and travelled to Angola once a year to visit her family. The "Imperial Air Route"<sup>5</sup> connected Lisbon, Luanda and Maputo (former Lourenço Marques) in a 12 days journey with several stopovers along Africa. Travelling home allowed her to visit several African cities and some left strong impressions on her, particularly Algiers in mid 50s.<sup>6</sup>

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<sup>3</sup> A state architect engaging in a private commission was a legitimate and common practice in the country due to the scarce number of architects living in Angola at that time.

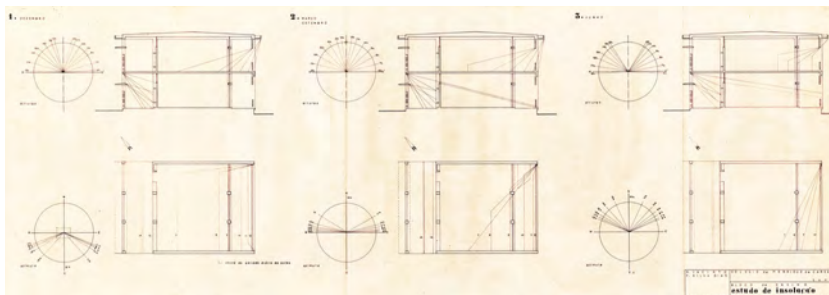
<sup>4</sup> Antonieta Jacinto, CODA: "Um centro escolar num país tropical", Lisbon, ESBAL, 1956.

<sup>5</sup> The Portuguese airline TAP was founded in 1945 and the first two air routes were established in 1946: Lisbon-Madrid and the "Imperial Air Route", connecting Lisbon, Luanda and Maputo (former Lourenço Marques). The experimental journey in 1946 had 11 stopovers: Lisbon, Rabat (Morocco), Nouadhibou (former Port-Etienne, Mauritania), Banjul (former Bathurst, Gambia), Freetown (Sierra Leone), Roberstfield (Liberia), Accra (Ghana), Lagos (Nigeria), Libreville (Gabon), Luanda (Angola), Lubumbashi (former Elisabethville, Democratic Republic of the Congo), Livingstone (Zambia) and Maputo (former Lourenço Marques, Mozambique).

<sup>6</sup> Antonieta Jacinto interviewed in Lisbon, 13th June 2014.



Traditional architecture in Angola  
photographed by Francisco Silva  
Dias, 1960  
[Francisco Silva Dias archive.]



Shading studies, 1958  
[Francisco Silva Dias archive.]

TEMPO CONTINUO REGISTRADO NA ESTACAO METEOROLOGICA DE BENICULOS DE CASTALHO DURANTE OS ANOS ABASTO 1952-1958

M E S E S	1955			1956			1957			1958			1959		
	Temperatura	Humidade	Velocidade	Temperatura	Humidade	Velocidade	Temperatura	Humidade	Velocidade	Temperatura	Humidade	Velocidade	Temperatura	Humidade	Velocidade
JANUÁRIO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
FEBRÁRIO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
MARÇO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
ABRIL.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
MAYO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
JUNHO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
JULHO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
AGOSTO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
SETEMBRO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
OUTUBRO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NOVEMBRO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
DEZEMBRO.....	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Wind chart, 1958  
[Francisco Castro Rodrigues  
archive.]



As an architect working at Luanda's office of public works, she travelled often to the county's inland, since she was involved in different projects, from urban planning to architectural design.

Francisco Silva Dias arrived to Luanda a few months after Antonieta Jacinto and they soon got married. It was his first time in Africa, since he was born in Lisbon and also graduated in architecture at the ESBAL. He worked for the Luanda's municipality office for a few months, but he was shortly dismissed after publishing a newspaper article on urbanism that freely expressed his modern view on the subject.<sup>7</sup> Afterwards, he established an architectural practice and continued publishing on local newspapers and getting involved with the petite cultural elite in town.<sup>8</sup>

Despite their different backgrounds, this short period was very intense for both architects, who started their practice in Angola and developed an array of challenging projects with different typologies and locations.

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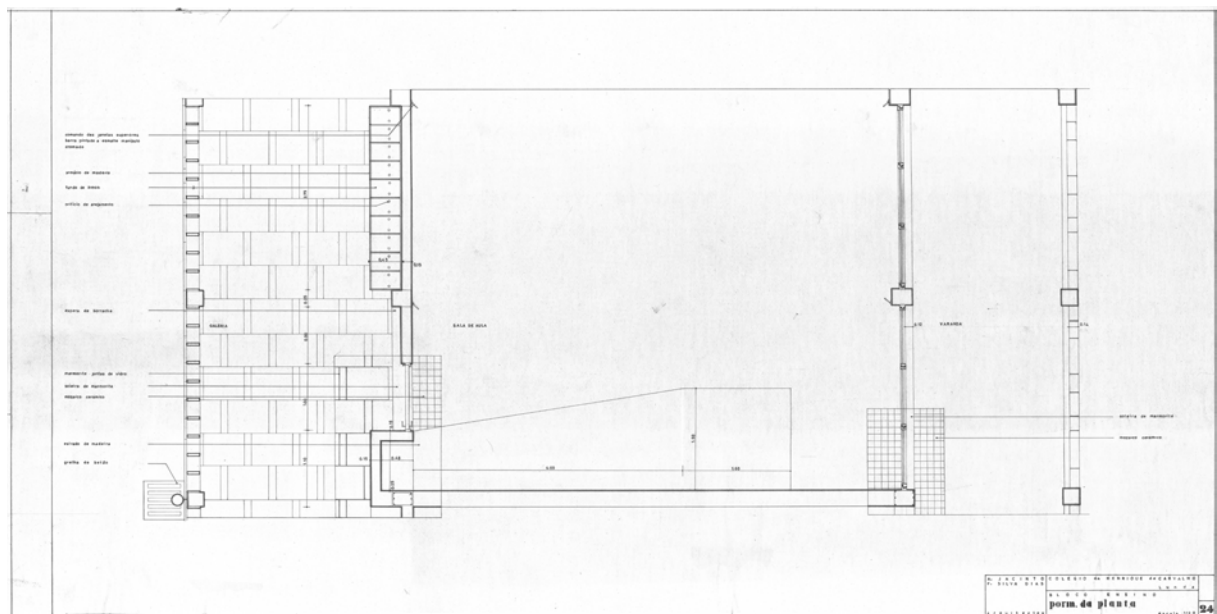
<sup>7</sup> DIAS, F. S. (1959) "As Cidades – Os urbanistas", *A Província de Angola* 6 February, Luanda, p.6; DIAS, F. S. (1959) "Ainda as cidades e os urbanistas", *A Província de Angola* 3 April, Luanda, p.6.

<sup>8</sup> He presented lectures at the *Sociedade Cultural de Angola* and published at *Cultura* magazine.

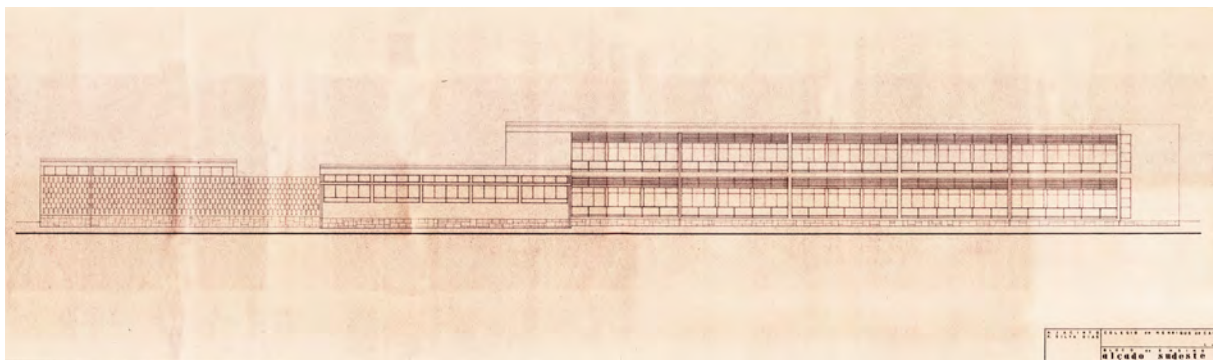
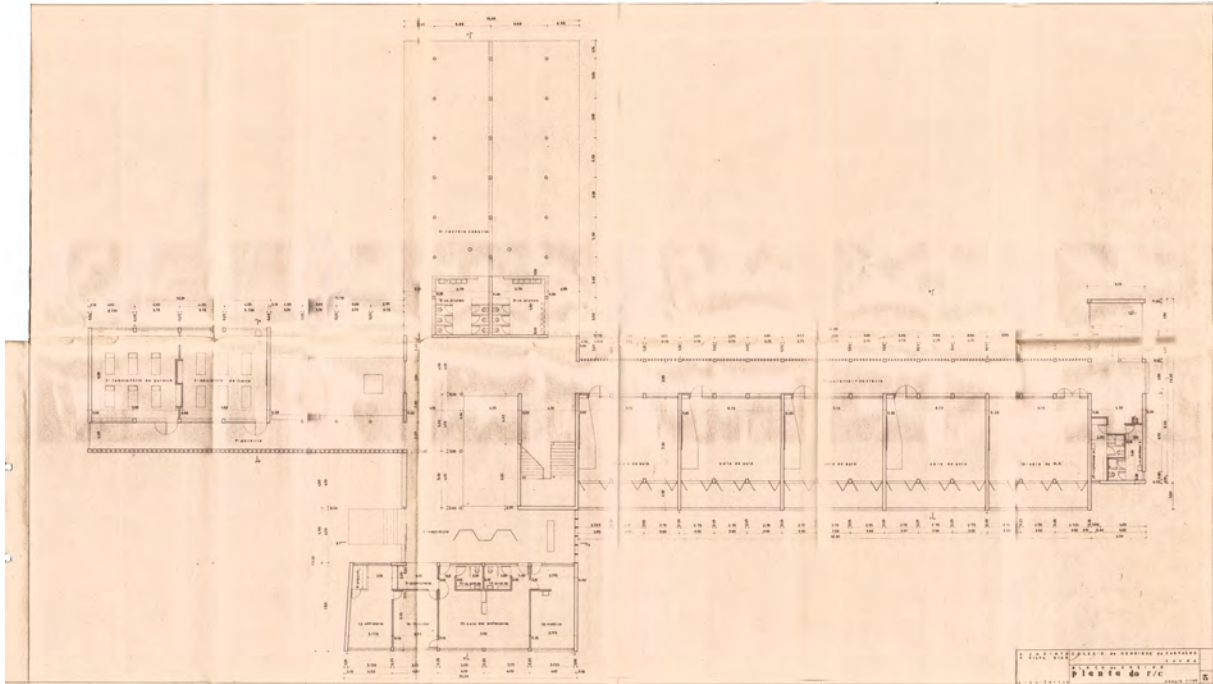




School under construction, 1960  
[Manuela Fonte, 2007.]



**Classroom, 1958**  
[Francisco Silva Dias archive.]



**Grandfloor plan and elevation**  
[Francisco Castro Rodrigues  
archive.]

## Architectural Project vs. Construction

Jacinto and Silva Dias' project envisioned an ambitious school complex, which included several buildings in a project of 5,000 square metres overall. The architectural scheme included a lyceum, male and female student dormitories, a chapel, an indoor sports pavilion, an outdoor swimming pool, four playing fields and large gardening areas.

According to the financial planning regime established by the Governor of Lunda, the construction works had to take place in two phases. The design was to be adaptable to an expected growth of school population but, at the same time, all technical solutions ought to be as "inexpensive as possible".<sup>9</sup> In addition to financial restrictions, there was also only a restricted range of building materials available in the region. Even the simplest ones - such as brick, cement, or sand - had to be brought from Luso or Malanje, and were overcharged for transportation.<sup>10</sup>

Therefore, urgency and economy of means were the most significant aspects of the whole process and constituted the basis of the architectural design. The architects developed a straightforward structural system and very simple technical devices to shape the entire school complex. Modularity and repetition were the key strategies to overcome the economic constraints and maximize the area of the school facilities.

In 1959, the architects delivered the site scheme and detailed plans of the lyceum and the dormitories. The drawings were to assist the immediate construction of the two buildings, while the developments foreseen for the later phase were only articulated on a very small scale. The works started very promptly, that same year, but only the lyceum was built in accordance with the original design.<sup>11</sup>

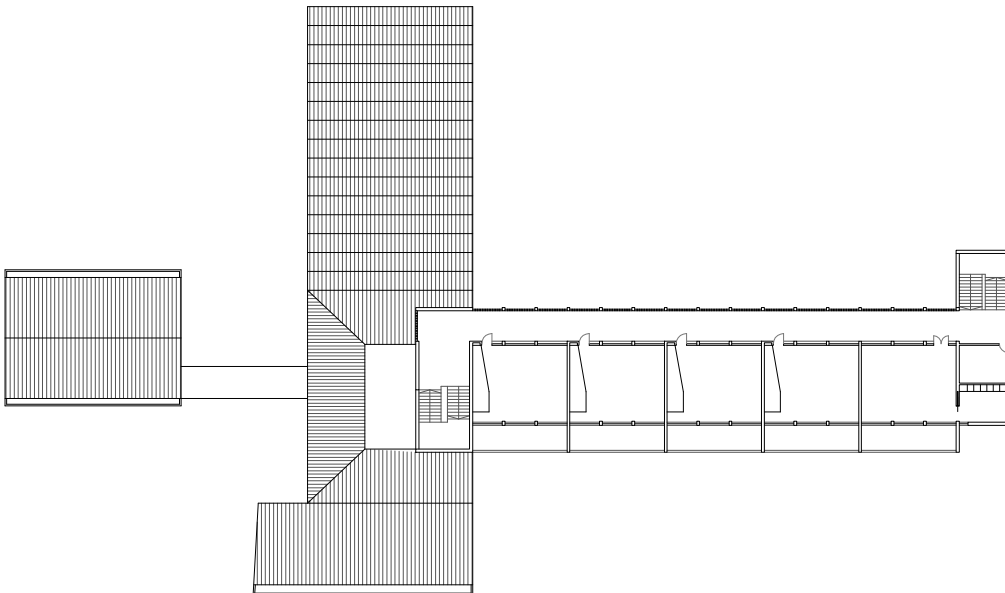
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<sup>9</sup> Free translation: "a verba com que inicialmente se poderá contar é de 5000 contos para toda a obra, razão por que convém estudar uma construção a mais económica possível sem contudo prejudicar a eficiência dos diferentes serviços." Eduardo Martins Soares, "Algumas Directrizes para a Elaboração do Projecto de Construção de um Colégio-Internato em Henrique Carvalho", Governo do Distrito da Lunda, Henrique Carvalho, 6 de Janeiro de 1958, p.3.

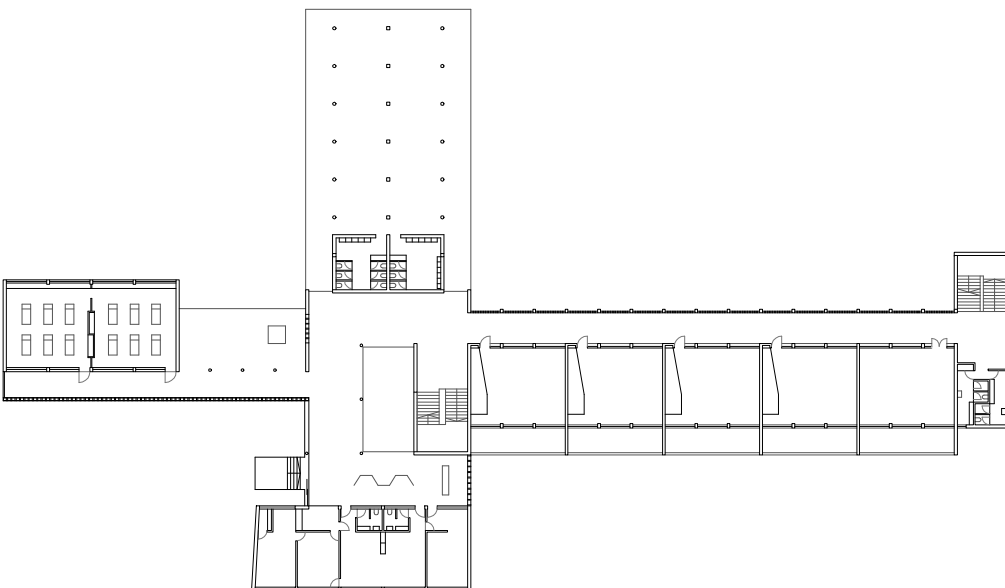
<sup>10</sup> Idem, p. 4.

<sup>11</sup> Francisco Silva Dias supervised the construction of the lyceum (Interview with Francisco Silva Dias and Antonieta Jacinto, Lisbon, 15th May 2014). The division of the Public Works Department of Moxico managed the construction of the dormitories in 1964, performing some critical changes to the initial design (Bloco de Internato do Colégio-Liceu de Henrique Carvalho, DPSOPT Moxico, 1964).

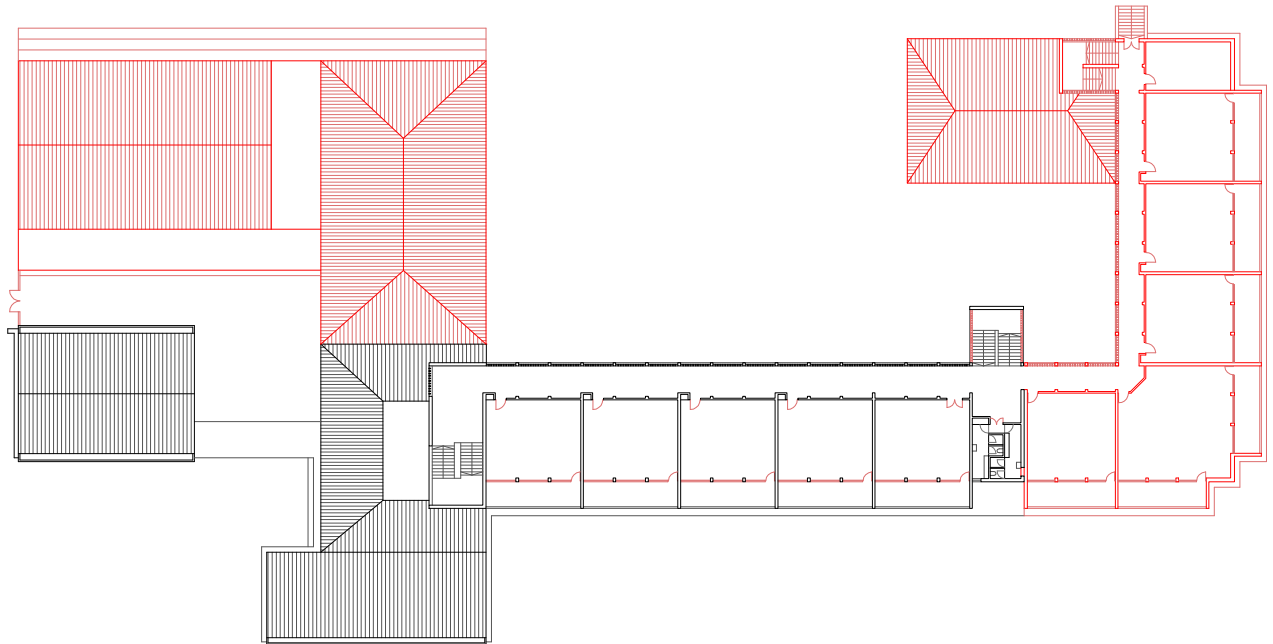
**1st floor**  
[project]



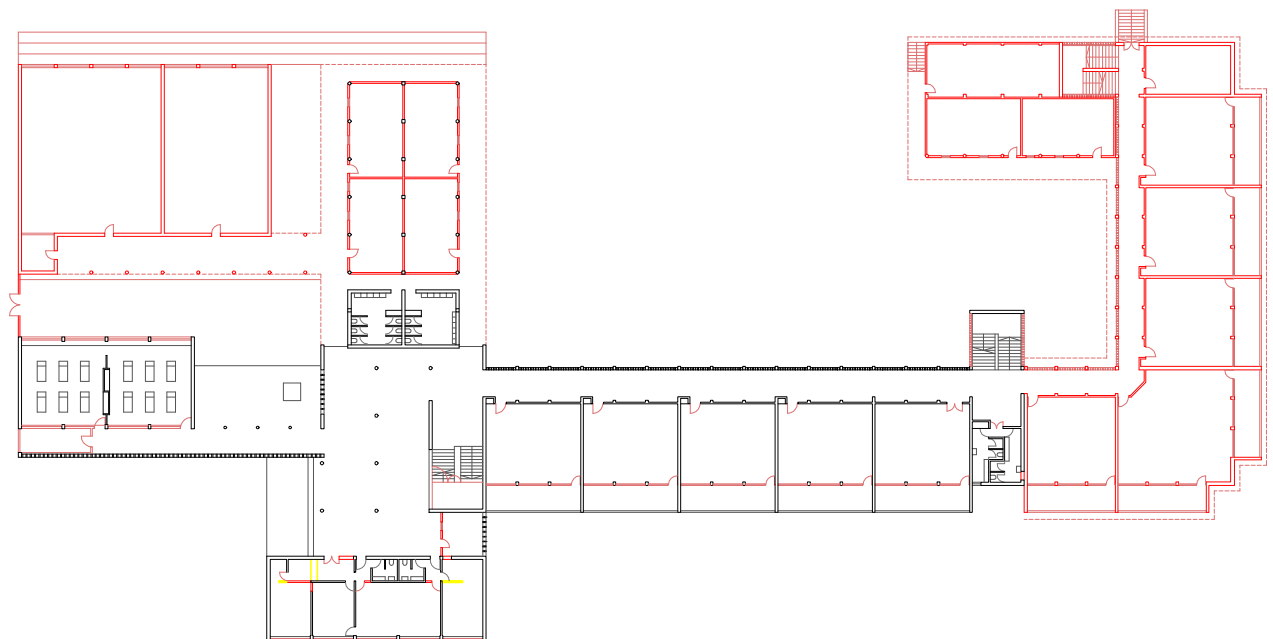
**Ground floor**  
[project]



[as built]



[as built]

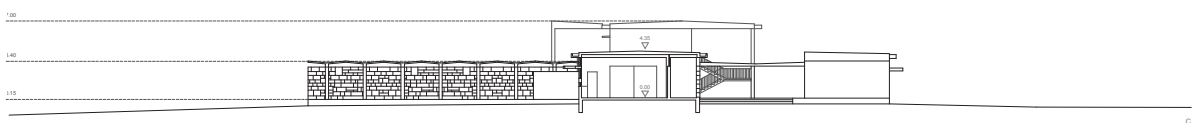
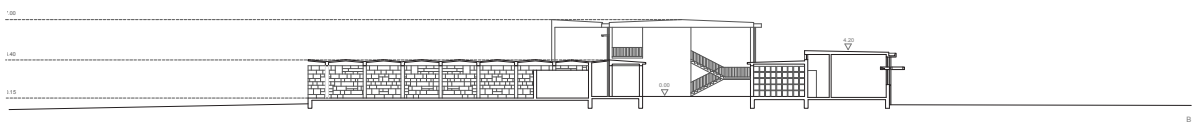
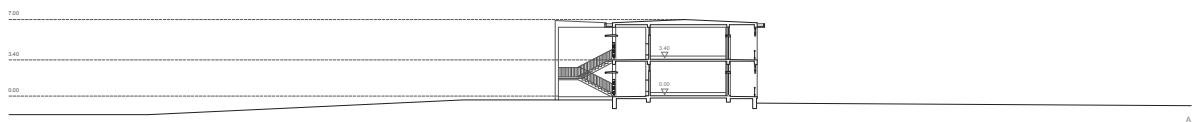






**Entrance**  
[Margarida Quintã, 2014.]

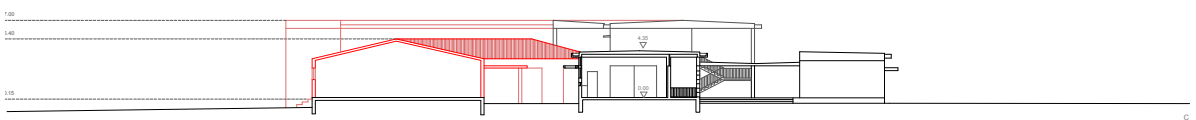
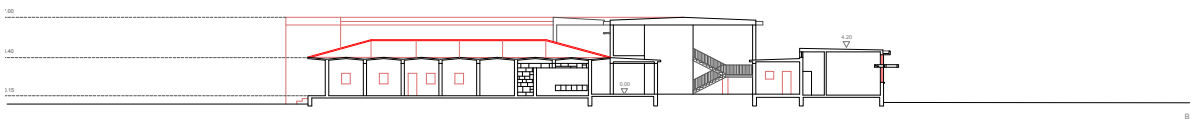
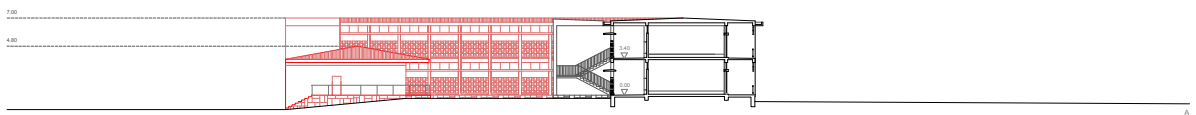
**Sections**  
[project]





**Playground**  
[Margarida Quintã, 2014.]

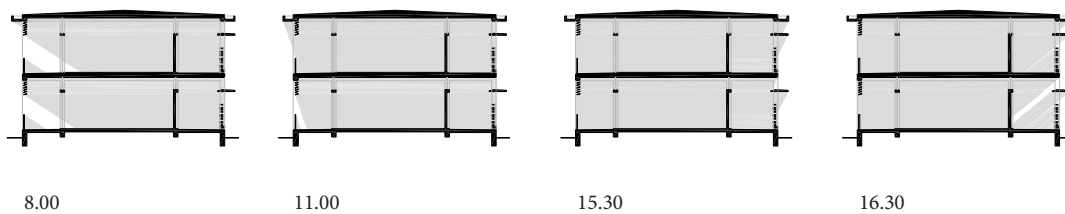
[as built]





**Gallery**  
[Margarida Quintã, 2014.]

**Sections**  
[summer solstice, december.]



## Environmental Design

Local climate was one of the first constraints the architects considered relevant in developing the school design. They not only studied the meteorological data of the region but also included these in their project presentation.<sup>12</sup> Dominant winds and temperature reports informed the architectural design from the start, by influencing the building's orientation and its form.

The influence of climate in architecture was a topic of interest to the couple. They were familiar with Fry and Drew's work in sub-Saharan Africa and their books on the subject. The manual *Tropical Architecture in the Humid Zone*, published in 1956, was instrumental in the earliest developments of Silva Dias and Jacinto's careers in Angola.<sup>13</sup>

However, their involvement with tropical climates was not purely academic. Antonieta Jacinto had an empirical understanding on the variances in Angolan climates because she had lived in different regions of the country during her childhood. Francisco Silva Dias was also fascinated by this subject as a result of his contribution to the "Inquiry into Popular Architecture in Portugal".<sup>14</sup> From that experience, he learned how small deviations in geography produced significant formal changes in Portuguese vernacular architecture.

The school they developed together in Saurimo echoed this awareness and introduced several passive design strategies. The building is a pragmatic and plain response to a particular place, from which they collected relevant information and to which they tailored precise architectural solutions.

The lyceum has a cross-shaped plan oriented by the city's urban grid. An inner courtyard connects four pavilions, each containing different parts of the school programme.<sup>15</sup> According to the architects, the formal arrangement favours health and hygiene purposes, by bringing additional natural light and airing into indoor spaces.<sup>16</sup> Nonetheless, the school is essentially an open-air structure. Circulation areas are shaded and widely ventilated, and only classrooms are enclosed.

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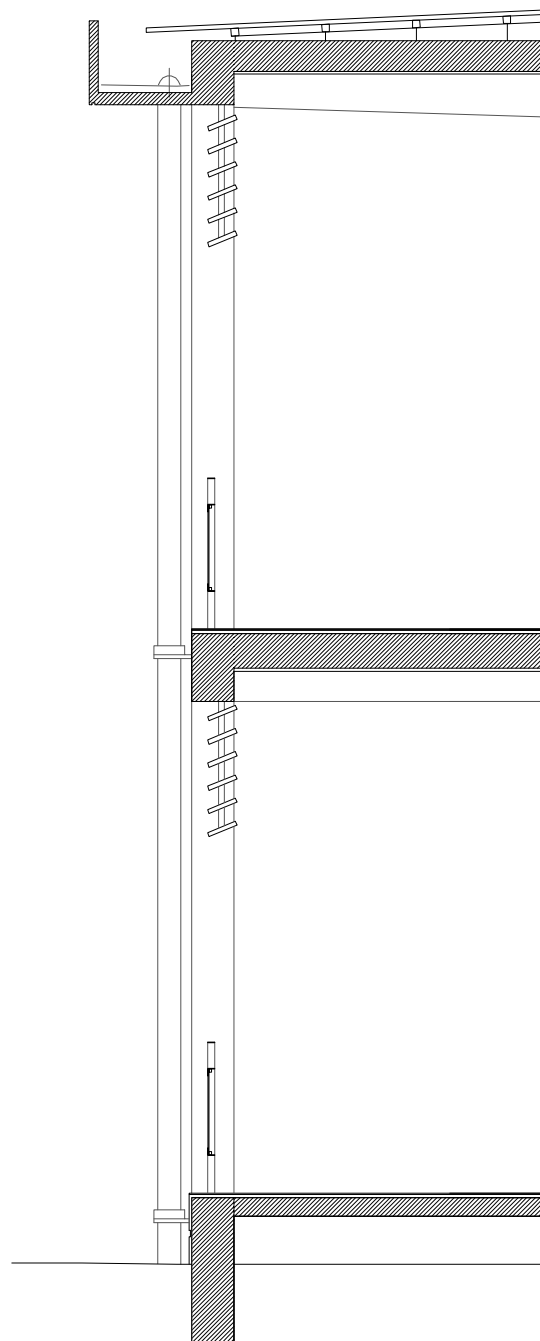
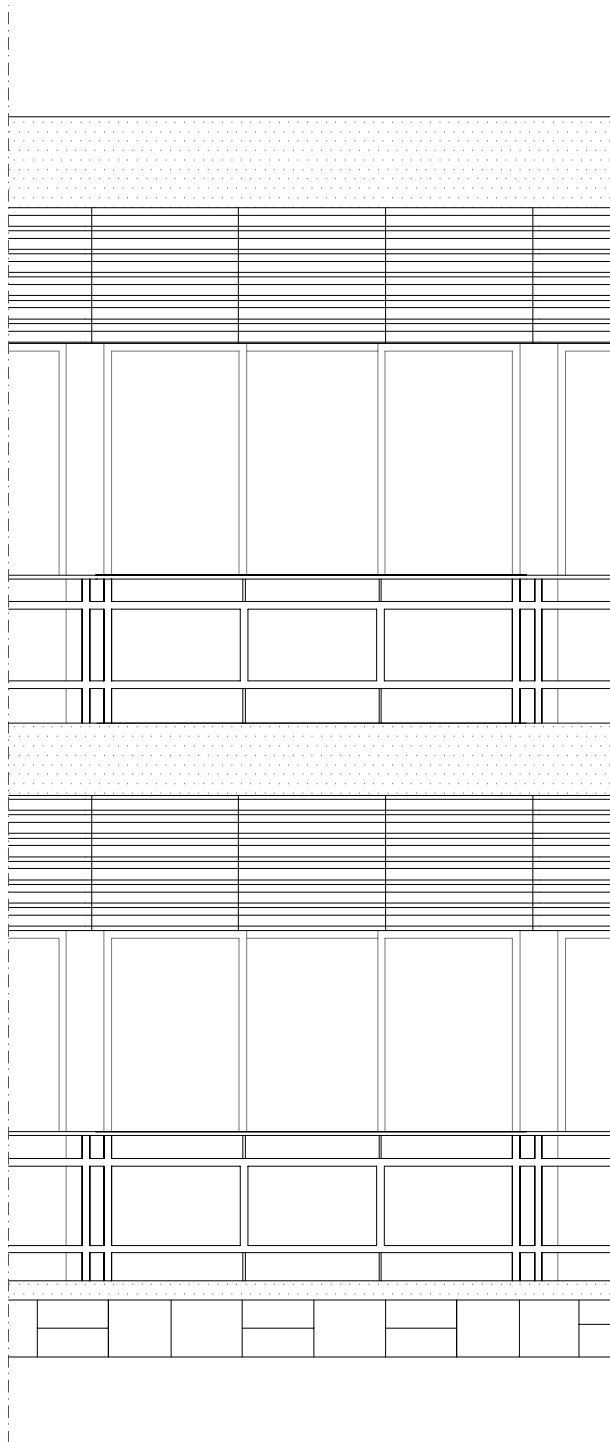
<sup>12</sup> "Ventos dominantes registados na estação meteorológica de Henrique Carvalho nos anos 1953-1959" and "Temperatura registada na estação meteorológica de Henrique Carvalho nos anos 1953-1959", Silva Dias Archive.

<sup>13</sup> Interview with Francisco Silva Dias and Antonieta Jacinto, Lisbon, 15th May 2014.

<sup>14</sup> The Inquiry into Popular Architecture in Portugal was a groundbreaking study on vernacular architecture in the country. The fieldwork performed by several architects started in 1955 and led to the publishing of the book *Arquitetura Popular em Portugal* in 1961.

<sup>15</sup> Administration services; covered playground; laboratories; classrooms.

<sup>16</sup> Antonieta Jacinto, Francisco Silva Dias, "Memória Descritiva e Justificativa do Colégio de Henrique Carvalho", Luanda, s/d, p. 2. Silva Dias Archive.





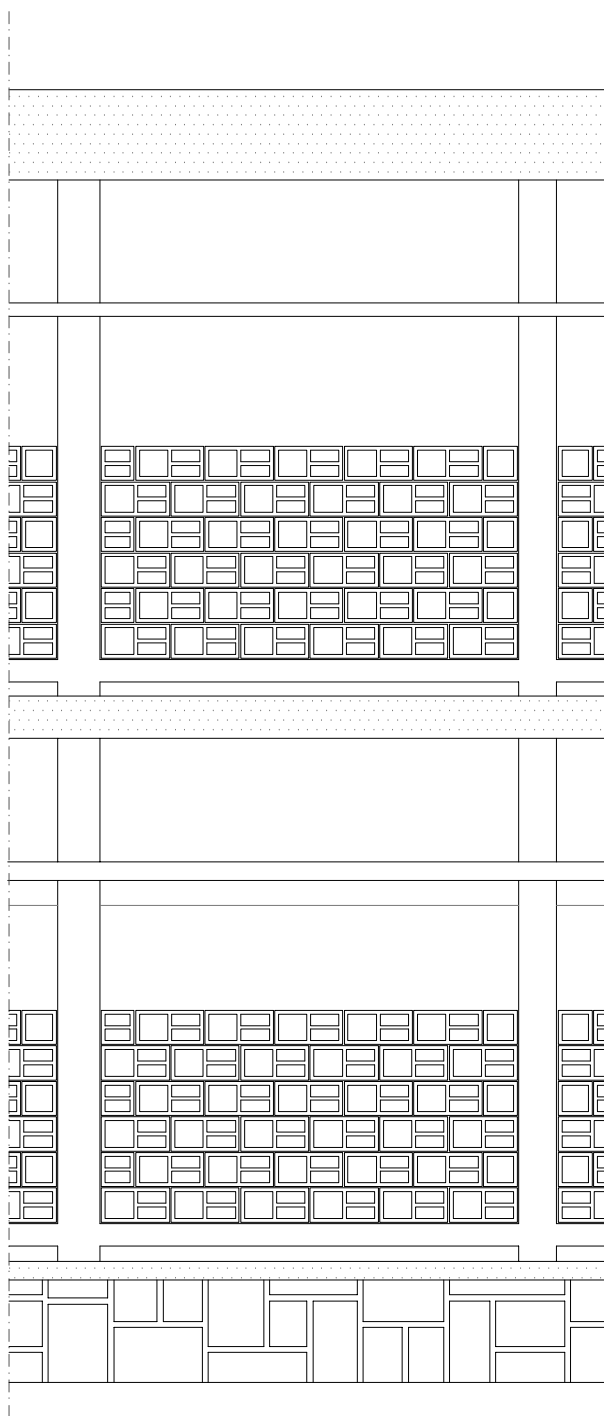
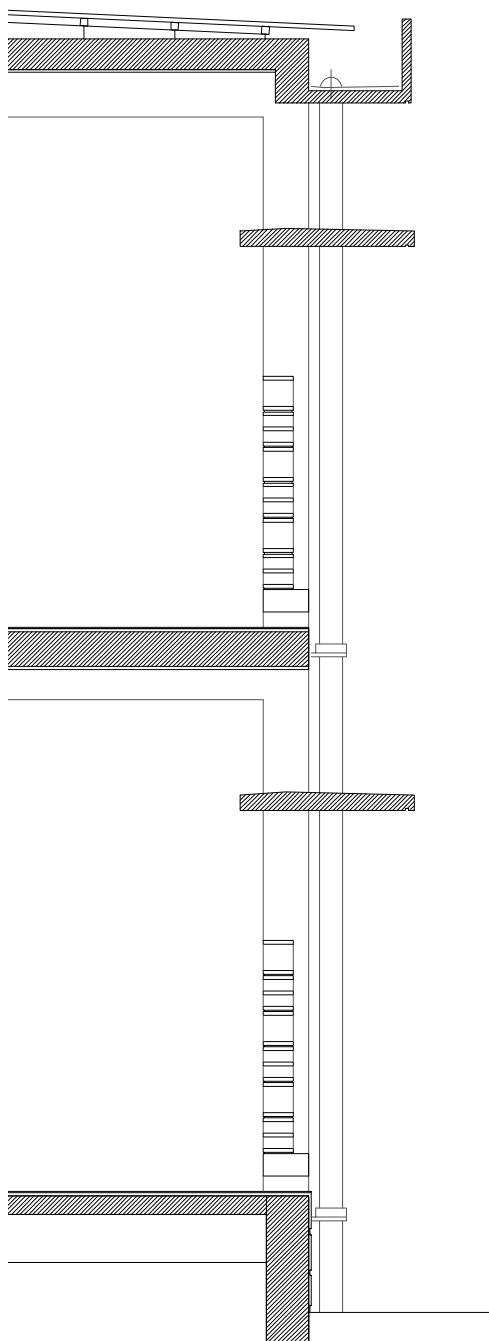


**Southeast facade:**  
elevation, section and photo  
[Margarida Quintã, 2014.]

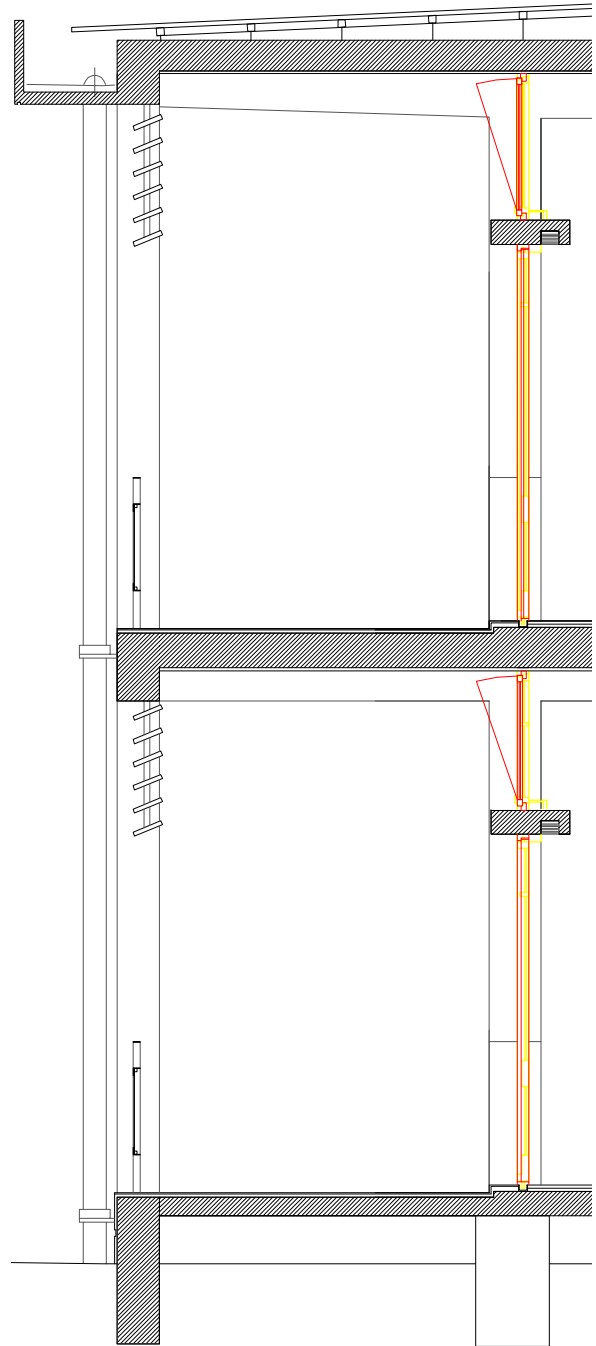
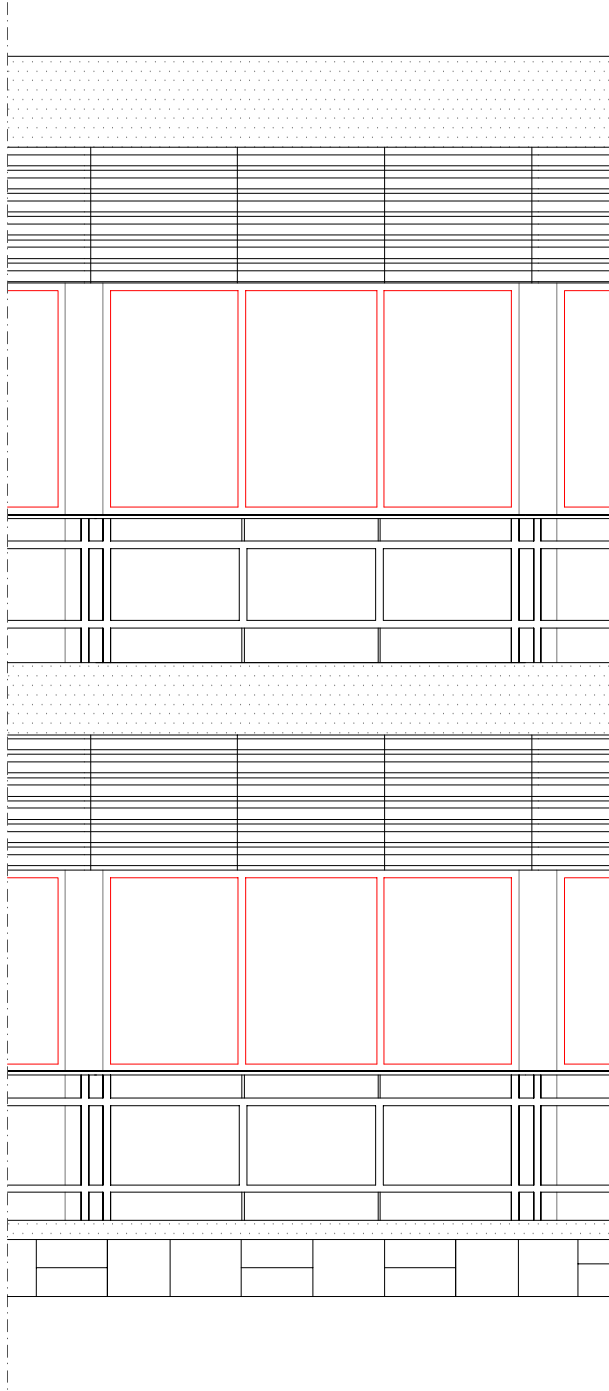


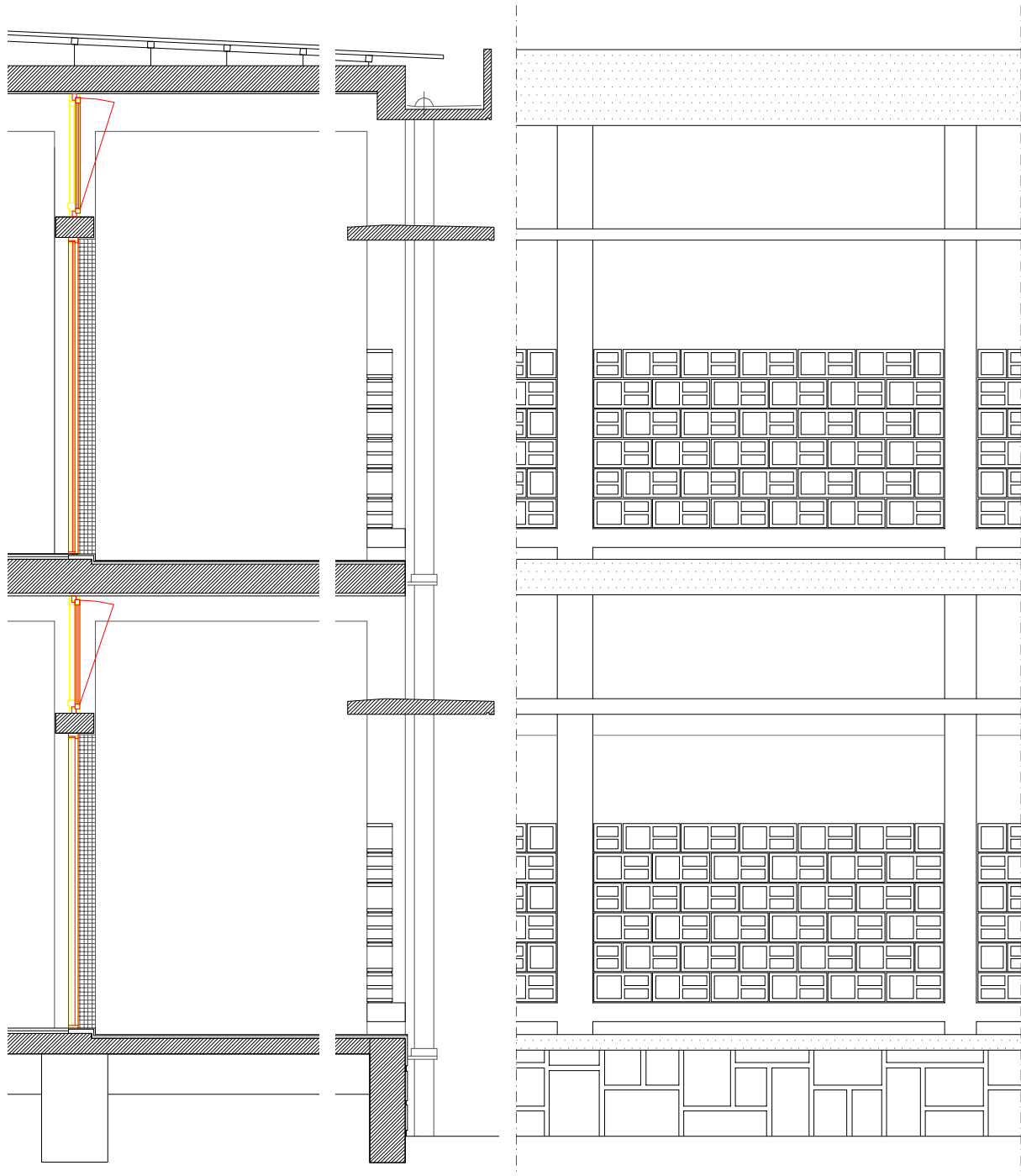
Northwest facade:  
elevation, section and photo  
[Margarida Quintã, 2014.]





**Details**  
[as built]





**Southeast and Northwest facades**  
[as built]

0 1 m  
| | | | |

The ten classrooms are organized in a two-storey pavilion, with five rooms per floor. An access gallery and large verandas act as buffers in all interactions with the outside, working together as cooling devices for the classrooms.

The building section was designed using the solar diagram, which allowed development of efficient shading solutions to both facades. To the northwest, a concrete grid divides the corridor from the outside; to the southeast, a wooden brise-soleil prevents direct sun from entering the classrooms early in the mornings.

The facades were conceived as interfaces that would address the local climate. Fixed shading devices made from durable materials provided a low-cost and long-lasting building envelope. The reinforced concrete structure, with short spans, is shown in the elevation's regular composition and on the organization of modular spaces designed to fit the school functions.

The construction was completed rapidly, after two years of work. Building the school simply involved moderately skilled staff, a restricted number of building materials and customary technical solutions.<sup>17</sup> However, the exceptional nature of this operation lies precisely in its plainness. The building shows great clarity in responding to functional demands, thermal comfort and budgetary constraints. It presents a consistent architectural discourse using the greatest possible economy of means. Limitations fostered rationality and facilitated the design of a modern building of ascetic beauty.

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<sup>17</sup> Interview with Francisco Silva Dias and Antonieta Jacinto, Lisbon, 13th June 2014.

## Extensions, Pathologies and Minor Renovations

The school opened in 1961 and is still operating today, despite all the dramatic ups and downs in Angolan society ever since. However, new challenges are currently provoking discussion, since the Ministry of Education is carrying out a school infrastructure development program.

Preparing the building for these upcoming demands calls for a close reading of its history. It is essential to understand the original principles and, likewise, the succeeding transformations that took place during the last 55 years. In order to assess the building's performance today, it is crucial to apprehend how the physical transformations responded to specific circumstances, by setting them into chronological frames.

During the first period, from the school's opening in 1961 to the country's independence in 1975, the building operated as a private boarding school. The master plan was never completed as originally foreseen but the dormitories were built in 1964 and the school facilities were extended in 1972.

Although the Colonial War also started in 1961, the immigration from Portugal was at a peak and continued growing over the following years. Access to education was increasingly widened as the Portuguese government tried earnestly to maintain its control over the colony. Strong investment in all development areas, and particularly in education, took place in this period.<sup>18</sup> For this reason, the school population increased significantly in Saurimo and the extension built in 1972 doubled the number of classrooms.<sup>19</sup>

Jacinto and Silva did not plan the new school extension. The architects had originally developed an elastic building, which was easily adaptable to growth.

<sup>20</sup> The new addition repeats the original facades and uses the same materials but, at the same time, presents significant changes in scale and proportion when compared to the initial structure. The modulation is altered, the gallery is narrower and classrooms have different proportions. Moreover, certain exceptional building parts of the new addition, such as the angle and the upper façade, include traditional features that are visibly incoherent in relation to the pre-existing architectural language. Furthermore, a particularly poor articulation of space in the corner and the use of the same façade in different solar orientations also show clear evidence of the new addition's lesser architectural value.

The new intervention clearly misunderstood the concept of the original proj-

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<sup>18</sup> SANTOS, M. (1970) *História do Ensino em Angola*, Luanda: Serviços de Educação.

<sup>19</sup> Ten classrooms and two laboratories were built in 1972.

<sup>20</sup> Antonieta Jacinto, Francisco Silva Dias, "Memória Descritiva e Justificativa do Colégio de Henrique Carvalho", Luanda, s/d, p. 3. Silva Dias Archive.

ect. It creates a poorer ensemble and, by using the same envelope, it strongly diminishes the clarity of the original building.

In 1975, Portuguese hegemony ended and Angola became an independent country. The new constitution provided for democratic access to education, which resulted in a tripling of the number of Angolan pupils between 1974 and 1980.<sup>21</sup> However, the Angolan Civil War also started in 1975, and would last for 27 years. Political and social instability produced enormous difficulties in the country, undermining its development in all areas. With regard to education, the lack of teachers and the destruction of educational facilities led to an exponential rise of children with no access to school.<sup>22</sup>

In Saurimo, the lyceum became public in 1975 and, despite the difficulties, it continued running during the long-term civil war. The building endured almost three decades of neglect, but no significant transformations occurred during that time.

The Angolan Civil War ended in 2002 and since then the country has been recovering from its wide-ranging effects. New schools are under development and renovation of many existing facilities has taken place so far as part of the national reconstruction plan. However, the operation has not yet reached all educational buildings in the country.

In fact, this is the case in Saurimo. Today, the building is a secondary school and is struggling with overcrowding, having more than three thousand enrolled pupils from the 7th to the 9th year.<sup>23</sup> Each class has more than 60 pupils, which far exceeds the limit of 45 pupils per class set by the Ministry of Education.<sup>24</sup>

During this period, the building only received insufficient and poorly executed maintenance works. Additionally, in 2010 seven extra classrooms were built on the covered playgrounds but offer the most inadequate learning conditions. Their area is too small (with a ratio of 0,7m<sup>2</sup> per student), natural light is scarce and cross ventilation non-existent. The use of electrical light is compulsory during the day and so is air-conditioning. Considering the school's budgetary limitations and the frequent breakdowns of public electricity supply, this is obviously an unsustainable solution.

In recent years new buildings devoted to different educational stages have

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<sup>21</sup> *Currículo do 1º Ciclo do Ensino Secundário*, Ministério da Educação da República de Angola Luanda, 2005, p.7.

<sup>22</sup> *Idem*, p.8.

<sup>23</sup> Saurimo's first cycle secondary school has 51 classes with 60 to 70 students per class, from ages 13 to 15 (Interview with the head teacher, Fernando Zeca, Saurimo, 8th October 2014).

<sup>24</sup> Interview with the Director of GEPE (Gabinete de Estudos Planeamento e Estatística do Ministério da Educação), Arq. Irene Figueiredo, Luanda, 25th September 2014.

been built on the plot.<sup>25</sup> Although the positioning and formal arrangement of new schools does not follow an articulated plan, school administrations do cooperate and promote a flexible use of shared space. This informality is evinced in the collective usage of outdoor spaces and, more explicitly, through the sharing of the secondary school facilities.

The secondary school operates only during the mornings, from 7.30 am to 1pm. Therefore, university classes<sup>26</sup> also take place in the empty classrooms during the afternoons. Additionally, people from different educational stages also use the facilities for studying during the weekends. In fact, the building operates as an informal open structure that is perceived as public space.

A contemporary democratic use of space is favored by the openness of the original building and its comfortable environment. Despite all the changes we have traced above, the school has shown a remarkable ability to accommodate transformation over the years. However, can it continue to do so much longer? How can contemporary architectural intervention, in a post-colonial society, cope with this complex legacy?

It has been shown that the premises of the school's original architectural design – thermal comfort, economy and durability – are still up-to-date. However, as we saw, subsequent interventions were based on misinterpretations of the original form, which undermined the overall architectural quality of the school. Moreover, low-cost works carried out as remedies for immediate problems have proved to be inefficient and even counterproductive.

Today, as before, the original school is a low-maintenance and environmentally-friendly structure that provides appropriate learning conditions.<sup>27</sup> Nevertheless, school occupancy levels could be improved through a more efficient use of the school campus, especially if taking collective informal uses into account. Considering that 20th century schools account for the largest share of the country's educational resources,<sup>28</sup> re-designing them represents a major task for contemporary architectural practice. However, the latest demands for modernization cannot be fully achieved without practical research on building materials, construction techniques and passive systems of environmental control. Once again, resilience is the first challenge that must be met.

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<sup>25</sup> Second cycle of secondary school and higher education.

<sup>26</sup> These classes are smaller, with 10 to 15 students.

<sup>27</sup> Even despite excessive occupation, students and teachers perceive good comfort conditions in the original classrooms (Results from interviews in October 2014).

<sup>28</sup> Currently more than 60% of school facilities were built from 1945 to 1975 according to Arq. Irene Figueiredo. Interview with the Director of GEPE (Gabinete de Estudos Planeamento e Estatística do Ministério da Educação), Arq. Irene Figueiredo, Luanda, 25th September 2014.





# Liceu Almirante Lopes Alves, Francisco Castro Rodrigues, Lobito, 1963-1970

Lobito's Lyceum is one of the most famous buildings designed by Francisco Castro Rodrigues. The architect of Lobito designed a "school with no walls"<sup>1</sup> that has been coined by scholars as a tropical modern building and celebrated by its experimental qualities on environmental design practices.<sup>2</sup> The building's response to local climate has been the subject of previous academic research and these studies established how the school reacts to local weather, namely through radical ventilation systems (Quintã 2007; Magalhães, 2009; Almeida 2012). So far, these readings had been established using the existing buildings as the main source of information, since the location of the original architectural drawings was unknown. Nonetheless, during the course of this research the process of Lobito's Lyceum was located at the National Historical Archive (AHN) in Luanda, which brought new evidence on the aims and chronology of the project, on the buildings' original design and on the exchanges between the architect, the public works department (DPSOPT) and the education services (Serviços de Instrução).

This chapter proposes to further investigate the notion of climate-responsiveness by using the new materials; drawing from primary sources such as the original architectural design, in its many stages, project

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<sup>1</sup> DIONÍSIO, E. (2009) *Francisco Castro Rodrigues - Um Cesto de Cerejas - conversas, memórias, uma vida*, Lisboa: Casa da Achada, p. 400.

<sup>2</sup> See, for instance: Tostões (2013), Magalhães (2009), Fernandes (2002), Fonte (2007), Almeida (2012), Ferreira (2016).

descriptions and letters, articles from local press and interviews with the architect. Furthermore, a complete survey on the building's current state has been developed and is additionally presented here. The building has recently undergone renovation works (2014-2016) for the first time since its completion in the 1960s. Overlapping the different information – original project, amendments during construction works and contemporary transformation – enables a comprehensive reading on the building performance and allows identifying successes and failures, with a particular focus on the building's envelope and using climate responsiveness as the object of this assessment.

## National Commission, Local Endeavor

The *Liceu Almirante Lopes Alves* was established in 1961<sup>3</sup> in the framework of the reforms implemented in Angola by Adriano Moreira.<sup>4</sup> Lobito was one of the few Angolan cities in which a lyceum was created immediately at the start of war, as a response to persistent and longstanding demands of the local population of white settlers. At that time, Lobito was one of the largest and most industrial cities in the country,<sup>5</sup> but the only lyceum in the region was located in the city of Benguela. Therefore, creating a new school in Lobito was not only fulfilling a critical necessity, but was also bringing additional prestige to the second town of Benguela's region.

A local newspaper covered the lyceum's inauguration in September 20, 1961, and published the speeches of local representatives of the government. Following the most orthodox and patriotic statements, the president of the municipality acknowledged that the Lobito's lyceum was a "fair and old aspiration of the people"<sup>6</sup> but draw the attention to the precarious facilities in which the school would operate. In fact, although the inauguration was a relevant political event, he pinpointed that building a lyceum in the city was an undertaking that was only about to begin.<sup>7</sup>

The task would engage several local institutions, such as the public works department, Lobito's administration, the educational services and the national youth organization (Mocidade Portuguesa). The DPSOPT managed the commission through the Benguela's office, which subsequently reported to the central department in Luanda. In the past, the office had received school building designs from the GUC (Gabinete de Urbanização Colonial), namely in the case of the Liceu de Benguela (1956-61), and only had had the charge of managing the construction process. It was unprecedented for the local institution to manage a project from the beginning, including gathering inputs from the educational services and hiring a local architect.

Following the 1961's reforms, local institutions enjoyed growing autonomy but had still very scarce budgetary and human resources. As a result, and although urgency was a main concern, it still took five years to build the lyceum's first block. In the meantime, the school functioned in provisional

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<sup>3</sup> DL Ministerial n° 26, B.O. n°20, I série de 18 de Maio de 1961.

<sup>4</sup> Further information on this subject is presented in the section 3.1 of this thesis.

<sup>5</sup> Particularly due to the Port of Lobito and the Benguela railway that had been established in the city in 1903. See: CASTRO, E.G.A. (1966) *Angola, Portos e Transportes*, Luanda: Obra Política-Económica de Consulta e Divulgação.

<sup>6</sup> Fernando Alves Aldeia quoted in: VINAGRE, G. (1961) "A inauguração do Liceu do Lobito", *O Intransigente*, 20 Setembro 1961, p.1-2.

<sup>7</sup> "Passamos agora a ter legítimas e fundadas esperanças de que o funcionamento em condições precárias como as actuais, deste estabelecimento de ensino, dê lugar em breve à sua transferência para o edifício a construir apropriado funcionalmente para a sua específica finalidade", Idem.



23-9-966

## Inaugurada a primeira fase do Liceu Nacional Almirante Lopes Alves

ARQ. F.C.R. (NÃO UMA VEZ NÃO SE REFERIRIA O NOME DO ARQUITECTO)

23-9-66 — A fim de presidir às sessões de abertura do novo ano lectivo nos Liceus do Lobito (e inauguração das novas instalações ao Compo) e Benguela, deslocou-se a esta cidade o sr. Secretário Provincial para a Educação, dr. Pinheiro da Silva.

Estas cerimónias foram bastante concorridas. Entretanto, o Município está a proceder a diversos trabalhos de beneficiação, tidos como absolutamente necessários, com vista ao ajardinamento, iluminação e asfaltagem de determinados espaços.



1



2



3



4

- 1—A benção das instalações
- 2—S. Exa. o Secretário Provincial da Instrução Dr. Pinheiro da Silva proferindo o seu discurso
- 3 e 4—Um aspecto da assistência e o Digno. Reitor quando efectuava a sua allocução

QUATRO ASPECTOS  
DO ACTO INAUGURAL

School's opening, 1956  
[Francisco Castro Rodrigues  
archive.]

facilities in different locations in the city, having a total of 307 students enrolled in 1961 and reaching 550 students in the next year.<sup>8</sup>

Only in 1962 the educational services framed the preliminary program for a mixed gender lyceum with 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> cycles, and considered then a population of around 800 students.<sup>9</sup> The document outlined an ambitious program that included classrooms, laboratories, auditoriums, canteen, two gyms and an assembly room. Furthermore, it also requested facilities for the youth organization that should be divided in two blocks, one for each gender. The document was not very detailed on organizational issues and neither had any recommendations regarding floor areas. Nevertheless, it stressed that “tropical climate should be taken into account.”<sup>10</sup>

The school’s design was commissioned to Francisco Castro Rodrigues (1920-2015), who was a Portuguese architect that was living in Lobito since 1954. Since then, he had become the director of the urbanization and architecture services of the city but simultaneously worked as a liberal architect. At that time, he had already designed a number of public and private buildings in the region, such as the Municipal Market (1958-65), the Universal Building (1957-61) and the Flamingo Cinema (1960-63). Castro Rodrigues was well respected and eventually became known as “the architect of Lobito,”<sup>11</sup> since he authored all urban plans and the most significant buildings in town.

In 1963, Castro Rodrigues concluded the design of the 11 blocks that formed the new lyceum, and building works started immediately. Although it began as a rather ambitious project, the construction process of the school was ultimately slow and intricate. Building works dragged for more than seven years and only a part of the school complex was completed. Along the way, the architect was asked to change his initial design several times, in a never-ending simplification process. Ultimately, the four buildings that form Lobito’s lyceum are the result of long negotiations and many compromises.

The lyceum opening took place in September 23, 1966, following the completion of the first block of classrooms. The lyceum would operate for the first time in the academic-year of 1966/67, but the rectory block was still under construction and no other developments were foreseen at that time. Nevertheless, the ceremony was a public occasion that gathered a large audience and was widely broadcasted by local press.<sup>12</sup> It was a major event

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<sup>8</sup> “Programa fornecido pelos Serviços de Instrução, 12 Fevereiro 1962”, in Castro Rodrigues, F. (1963), “Memória descritiva geral do Liceu Almirante Lopes Alves”, Junho 1963.

<sup>9</sup> Idem.

<sup>10</sup> Idem.

<sup>11</sup> MILHEIRO, A. (2009) “Castro Rodrigues, o arquitecto do Lobito”, *JA 234 Ser populista*, p. 13-15.

<sup>12</sup> (1966) “Inaugurada a primeira fase do Liceu Nacional Almirante Lopes Alves – 23



in town that was headed by the provincial secretary of education and all representatives of local institutions.

Right after the school's opening, the building enjoyed very positive feedback in local press and was broadcasted as a modern "open-air lyceum."<sup>13</sup> Its unusual architectural solution, with widely open classrooms, was said to be well adapted to local climate and to Lobito's contemporary living. Canhão Bernardes considered that the lyceum was a source of pride and "a symbol of the city"<sup>14</sup> and, therefore, the complex's full completion should be instigated by the citizens as a way of contributing to the cultural development of the region.

At the same time, local press started spreading the idea that the lyceum might be forever an incomplete work.<sup>15</sup> In 1967, a plan of the whole plot was published in the local newspaper so citizens would be informed that the existing building wasn't the entire lyceum but only a small part of it. Back then, there was no funding to start more construction works or even to complete gardens, playgrounds and sheltered areas. The facilities were noticeably insufficient to meet the demands of a growing school population, so the government supported the construction works of a new block in 1969 and a gym in 1970.<sup>16</sup> The gym was the last construction at the lyceum premises, but the promise of finishing the set was never reportedly abandoned by the education services or the public works department. As a result, the school complex remained incomplete, as an ongoing construction site, with four buildings and barely any landscaping works.

Even though the complex was never fully completed, Lobito's lyceum was an epic effort of the local government and turned out to be a particularly unique architectural venture. For the first time, building a national lyceum was a local endeavor that engaged all relevant institutions in town, in one of the greatest achievements of the post-61 period in Lobito. Despite the late and precarious investment, the new high school would finally contribute to bring new opportunities to the youth and the city's development. Furthermore, it was the first time that a public school was designed in Lobito and, hence, it brought the chance of displaying a new architectural language in an official building. Until then, lyceums had been designed in Portugal and aimed at representing the Portuguese supremacy in the colonies using a nationalist style (Milheiro, 2012, p. 380). At that time, Lobito's colonial society had many aspirations and

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de Setembro de 1966", *Divulgação – Boletim da Câmara Municipal do Lobito*, 1º e 2º semestre 1966, p. 128-130.

<sup>13</sup> BERNARDES, C. (1967) "Um liceu ao ar livre", *Província de Angola*, 11 Abril 1967, p.10-11.

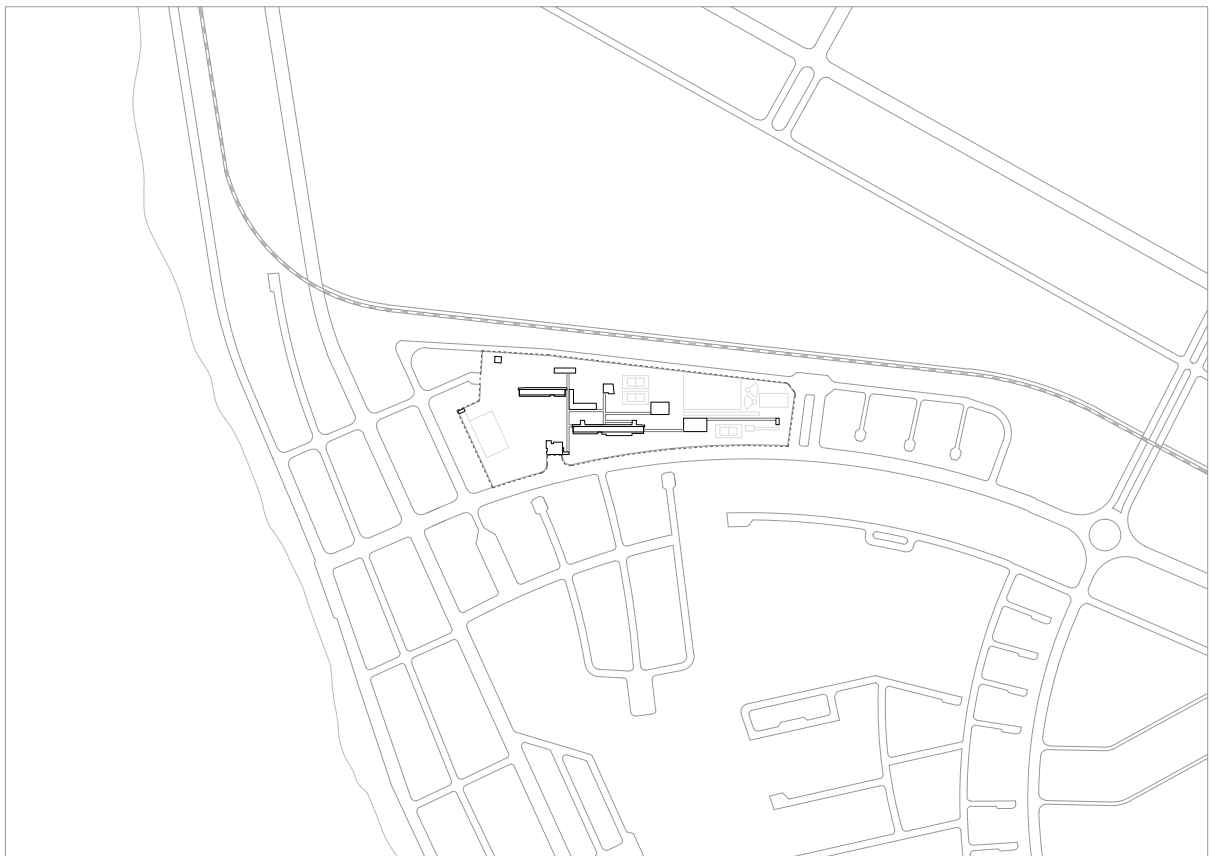
<sup>14</sup> Idem.

<sup>15</sup> (1967) "Liceu do Lobito – obra incompleta", *O Lobito*, 1 de Junho de 1967, p.1-2.

<sup>16</sup> Chronology of construction works: first block of classrooms, 1963-66; rectory block, 1965-67; second block of classrooms, 1969-70; gym, 1970.

the new architectural language developed by local authors, and particularly by Castro Rodrigues, denoted this emerging local culture. Apparently, local institutions could finally set the tone for their future and their expectations, and choose Castro Rodrigues as the main interpreter of this new train of thoughts.

**Project site**  
[Lobito, Angola]



### ***“Economy and Urgency in Construction Practices”<sup>17</sup>***

As outlined in chapter 1, in 1961, Angola was undergoing a tense political crisis with the start of the Independence War. The events that took place in Luanda on February 4 marked the beginning of the armed struggle and were followed by the UPA’s massacres<sup>18</sup> in the north on March 15. The first contingent of Portuguese troops only arrived to Luanda on May 1, and significant changes in Portuguese colonial policy would follow.

In Lobito, news from the north arrived late and local press underestimated the struggle for independence.<sup>19</sup> In the following months, some small notes on the “unfounded rumors of terrorism”<sup>20</sup> were published while hopeful news on Angola’s economic progress made the front page. In April, the overhaul of Portuguese government, with Salazar taking over the ministry of defense, was broadcasted in all newspapers promising “life, work and peace for the people in Angola.”<sup>21</sup> Thereafter, the new minister of the Overseas implemented some long awaited social reforms, but the first demonstrable response to the Angolan crisis was the construction of new school infrastructure. In Benguela’s region, the decision of building Lobito’s lyceum was perceived both as a sign of Portuguese hegemony and a promise of social peace.

In September 1961, the speech of the Governor of Benguela at the lyceum’s inauguration was one of great joy. Despite some subtle references to the undergoing war, the official discourse meant to encourage progress and stability of the Angolan colonial society by stressing the need for a cultivated youth.<sup>22</sup> Building a suitable lyceum for the “active and magnificent city”<sup>23</sup> was

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<sup>17</sup> Subtitle from Castro Rodrigues’ project description, in CASTRO RODRIGUES, F. (1963) “Memória descritiva e justificativa do Liceu Almirante Lopes Alves -anteprojeto”, Janeiro 1963, p.7.

<sup>18</sup> UPA (União dos Povos do Norte de Angola) was a guerrilla movement lead by Holden Roberto. It gave place to the FNLA (Frente Nacional de Libertação de Angola) in 1961, which became a political party in 1992.

<sup>19</sup> “Reina a calma em Angola apesar dos últimos acontecimentos ocorridos em Luanda e provocados por agitadores.” in (1961) “Os Acontecimentos de Luanda: As populações de Angola confiam nas forças da ordem”, *O Intransigente*, 8 February 1961, p.1/6/8.

<sup>20</sup> See, for instance: (1961) “Capitais metropolitanos a investir em Angola”, *O Intransigente*, 8 April 1961, p.1.; “Instantâneo”, p.1.

<sup>21</sup> “a defesa eficaz da Província, a garantia da vida, do trabalho e do sossego das populações.” In (1961) “Angola na base da remodelação ministerial”, *O Intransigente*, 15 April 1961, p.1-2.

<sup>22</sup> “os tempos mudaram e, hoje, se a Pátria precisa de heróis, e de santos, e de guerreiros, e de nautas destemidos, e de portugueses valentes e audazes, precisa, sobretudo, de gente esclarecida, de uma mocidade culta, de uma juventude estudiosa e sabedora, de um escol de jovens dos dois sexos, que possam ombrear na ciência, na técnica, na cultura, com as mais adiantadas nações do mundo actual.” Hortênsio Estevão de Sousa, Governor of Benguela, in: VINAGRE, G. (1961) “A inauguração do Liceu do Lobito”, *O Intransigente*, 20 Setembro 1961, p. 2.

<sup>23</sup> “Urbe activa e magnífica de que Angola inteira se ufana”. Idem.

understandably necessary given the circumstances, and should materialize as soon as possible. Therefore, the local public works department had the difficult task of reconciling the lack of government funding with the settler's expectations of grandeur.

### **Simplification and Over Simplification**

Castro Rodrigues presented the preliminary study for the school's master plan in January 1963. His design included 11 buildings with different functions, which promoted a phased construction process and simultaneously favored immediate start of building works. The scheme for the school complex consisted of the following pavilions: administrative services; classrooms for the 2<sup>nd</sup> and 3<sup>rd</sup> cycles; museum, library, party room, covered playground and female facilities of the youth organization; classrooms for the 1<sup>st</sup> cycle; male facilities of the youth organization; canteen; music room; female gym; male gym; guardhouse; lavatories. All pavilions were connected with covered galleries that organized outdoor paths and served as shelters from the sun. In total, the school would have a gross floor area of around 8,000 square meters in a 57,400 square meter plot.

In his first project description, Castro Rodrigues considered that, while additional expenses may result from dividing the program into so many buildings, it would uphold a realistic and efficient construction process. At the same time, the volumetric dispersion of his design was drawn from an idea of total integration between nature and architecture. He rejected the "majestic and sumptuous, or monumental, cold, hieratic features"<sup>24</sup> that he noted in earlier schools built in the country. Therefore, he was now designing a didactic school complex that would, first and foremost, please the students and promote openness to experience both nature and modern life:

**"Terá uma ambiência peculiar; será concebido à escala das idades que o frequentam, abandonando-se a ideia do majestoso e sumptuoso, ou monumental, frio, hierático; criar-se-á atmosfera de cor, alegria, vida e luz. Com um máximo de contacto com a natureza, (...) ajuda-se a elevação do espírito juvenil sobre tudo o que é belo, verdadeiro e superior, o céu azul, as nuvens, o jogo das árvores na paisagem, as flores, o comboio, até o carro que passa, são estímulos e apoio à elevação do espírito."**<sup>25</sup>

The public works department of Benguela endorsed the project design only a few months later, and commissioned the detailed planning for each building to Castro Rodrigues. The largest classrooms' block should be built immediately to gather all the students in the same educational facilities but would have to

<sup>24</sup> CASTRO RODRIGUES, F. (1963) "Memória descritiva e justificativa do Liceu Almirante Lopes Alves, anteprojecto", Janeiro 1963, p.5.

<sup>25</sup> Idem.

suffice temporarily, since administrative areas and additional services could only be developed at a later stage due to budgetary constraints.<sup>26</sup>

Castro Rodrigues was surprised with the prompt consent given to his design, since he believed the public works department would prefer a more conservative and condensed architectural arrangement. Despite his astonishment, in 1963 he noticed that there was already a new tendency in the country regarding school facilities:

**“Felizmente; assim teremos no Lobito (e sabemos igualmente noutros casos recentes, como no Liceu Paulo Dias de Novais) um estabelecimento de ensino aberto, franco, rasgado à paisagem, às brisas, criando ângulos e espaços úteis à jardinagem, ao recreio, à contemplação”**<sup>27</sup>

The Lyceum Paulo Dias de Novais, designed by Sabino Correia and built in Luanda in 1969-72, also corresponded to a new type of high school, both by its pavilion-based solution (in this case, three parallel blocks connected by a transverse volume) as well as by its innovative architectural language (Milheiro, 2012, p. 415). Moreover, both lyceums were amongst the first to be commissioned to locally based architects as part of the post-61 policies to enlarge the existing school network.<sup>28</sup> Apparently, as highlighted by Castro Rodrigues, the traditional secondary schools with compact and monumental compositions that had been developed until then were being replaced by progressive designs with the support of local authorities.

### **Ethics of the Construction Process**

Given the unstable political background, the domestic policy regarding the construction of public works was mainly guided by economy and urgency rather than by concerns with style. Castro Rodrigues was responsive to the prevailing ethics, so he designed an efficient school complex and simultaneously envisioned a sustainable construction process. In his project description, he declared that his “sense of responsibility” impelled him to “limit his creative spirit” and develop a reasonable and plain architectural solution, with everything reduced to the minimum and no superfluous expenses.<sup>29</sup>

However, the budgetary limitations did not result in a design with constricted

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<sup>26</sup> DPSE (1967) “Letter to DPSOPT Luanda”, August 17.

<sup>27</sup> CASTRO RODRIGUES, F. (1963) “Memória descritiva geral do Liceu Almirante Lopes Alves”, Junho 1963, p.1.

<sup>28</sup> The other lyceums founded immediately after the outbreak of war were the *Liceu Almirante Américo Tomás* (Moçamedes) and the *Liceu Adriano Moreira* (Malanje).

<sup>29</sup> CASTRO RODRIGUES, F. (1963) “Memória descritiva e justificativa do Liceu Almirante Lopes Alves, anteprojecto”, Janeiro 1963, p.7.

floor areas. Castro Rodrigues believed that the school population would increase significantly in a few years, so he proposed an extensive complex made by several blocks, where each building had singular functions or was destined to different age groups. This planning promoted a phased construction process, which was endorsed by the public works department since it allowed allocating expenses and starting construction works immediately. Furthermore, the architect considered that the school would become immediately obsolete if each building was a closed and hermetic structure. In his vision, classrooms should be generous and have a flexible organization scheme in order to accommodate a growing school population. He has made an effort, mainly through construction solutions, to base the design on economic criteria. Castro Rodrigues presented a “modern, efficient and simple school” and he was aware of “certain limitations to the free expansion of his creative spirit.”<sup>30</sup>

### Local Materials

Despite the official directives, Castro Rodrigues designed a building with generous floor areas and made no concessions to the architectural devices that made a climate responsive building. Instead of undermining of spatial qualities, Castro Rodrigues believed that economy and urgency could be enablers of a sustainable construction practice. He considered that using current structural systems and locally manufactured materials would be the most efficient solution to build an affordable school. Therefore, he used a limited range of materials from local productions, specifically from the Benguela’s region, which reduced transportation costs to the minimum and simultaneously favored local economy.

In mid 1960s, the existing resources in the area were mainly cement-based products. The cement factory *Cimenteira do Lobito* was located in the city, next to the port, and supplied local companies and manufacturers. Therefore, hydraulic tiles, concrete blocks, cement artifacts and fibrocement products were produced in the region in a range of 50km.

Lupral was a fibrocement factory located in Benguela that supplied the vent blocks and coating panels for the school’s façades. Instead of just selling the products, the company provided technical support and designed custom-made solutions to this building, establishing a collaborative process with the architect. They produced a grid that combined different molds of vent blocks and window frames, delivering a unique façade layout. A few years later, Castro Rodrigues reused the exact same pattern in Sumbe’s Lyceum (former Novo Redondo, 1970-71).

The building’s reinforced concrete structure was cast in place and the concrete

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<sup>30</sup> Idem, p.7.



was left unfinished. The visible structure in raw concrete was combined with exterior walls made of bricks, which were manufactured in the neighboring city of Catumbela.<sup>31</sup> The two contrasting materials did not require any further treatment, like the traditional cement rendering or painting, thus creating a durable and low maintenance solution.

Hydraulic tiles were used for floor coverings since there were several local producers in the Benguela region,<sup>32</sup> which made it the most current and inexpensive solution. At the same time, marble floors from a quarry in the south were foreseen in the administrative building.<sup>33</sup>

In the architect's words, the ideology of "economy and urgency" was only influential in his choice of standard materials and constructive methods. Thus, affordable solutions were achieved "without neglecting the pedagogical principles and the architectural composition of the whole scheme".<sup>34</sup> Although these pragmatic values influenced the architectural design from the beginning, during construction works the classrooms' block was simplified and the buildings developed afterwards were also revised to attain cheaper solutions. The budgetary limitations of the public enterprise impelled the architect to a continuous simplification of the school design in order to cut expenses and shorten the construction works.

This procedure took place from 1963 to 1970, when the last building was completed. By the end of 1963, the design development phase of the 11 buildings was finished, but only one block of classrooms was built subsequently and followed the original scheme. Three more blocks were built a few years later and, each time, the budgetary limitations forced further depuration of the architectural designs. However, the buildings are efficient devices, making the most out of the least, while responding to the dominant ethics of economy of means. In the next section, the design procedure of simplification and oversimplification of these blocks is described in detail, following a chronological scheme.

### **Building the First Block of Classrooms (1964-1966)**

The lyceum's construction works started in 1964. The phased construction scheme initiated with a block of classrooms destined to the second and third cycle of high school.

At that time, high-school was divided in three cycles: the first cycle was 2

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<sup>31</sup> MARQUES, W. (1962) *Problemas do Desenvolvimento Económico de Angola*, Luanda: Junta de Desenvolvimento industrial, p.369.

<sup>32</sup> Idem, p.373.

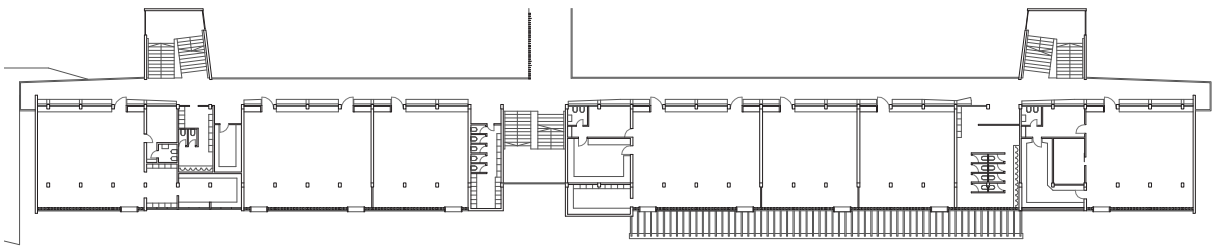
<sup>33</sup> Interview with Francisco Castro Rodrigues, April 16, 2014, Azenhas do Mar.

<sup>34</sup> CASTRO RODRIGUES, F. (1963) "Memória descritiva e justificativa do Liceu Almirante Lopes Alves - anteprojecto", Janeiro 1963, p.7.

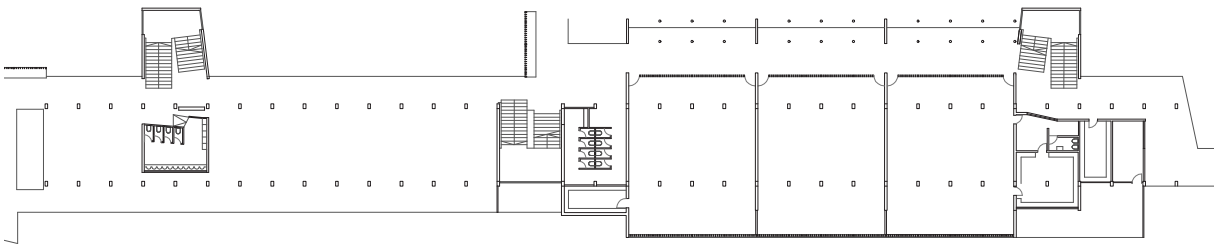


**1st block**  
[Francisco Castro Rodrigues archive.]

**1st floor**  
[project]



**Ground floor**  
[project]



years (students aged 11 to 12); the second cycle was 3 years (students aged 13 to 15); and the third cycle was 2 years (students aged 16 to 17).<sup>35</sup> After a short time, the educational reform of 1964 decreed 6 years of compulsory schooling and that led to the creation of the preparatory cycle in 1967.<sup>36</sup> These measures had repercussions in the construction of Lobito's high school, since the first cycle of high school ceased to exist while the building works were still undergoing. Some of the changes that the architectural project suffered were caused by these educational reforms, but most were the result of budgetary constraints or concerns about environmental comfort.

The detailed planning of this block was completed in October 1963 and the public tender was launched immediately, so the contractor could start the works in the beginning of 1964.<sup>37</sup> However, building the foundations took a long time given that the plot had a poor soil at shallow depth. It was a standard condition in the area, but the structural project was only completed after geotechnical surveys, which confirmed the need of building deep foundations even if the building was only three-stories high. After the inspection, the structural engineer Jorge Abreu conceived a well foundation system, which was a recurrent constructive practice in Lobito.<sup>38</sup>

The classrooms' block had reinforced concrete frame structure, with 7 meters beam span between columns and 2.5 meters cantilever beams at each end. The structural bay was only 3 meters length, so one-way slabs could be built using precast beams arranged in a single direction and interspersed with hollow ceramic blocks. Then, a thin concrete cover, of 5 cm, was laid in situ.

This regular grid formed a structural layout with 99 x 12 meters, but 3 bays were cut from the original project during construction works, so the existing building has only 90 meters length.

The structure, in spite of its extreme plainness, was dimensioned and designed in a meticulous manner. For instance, the pillars have a different section on each floor due to the dissimilar structural loads and the cantilever beams have an elegant triangular section for the same reason. All structural elements, such as columns, beams and slabs were built with formworks made of soft

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<sup>35</sup> Since the 1947 high-school reform and its 1948 version for the colonies: Decreto-Lei 36508, 17 Setembro de 1947 (Estatuto do Ensino Liceal); Portaria Ministerial 12238, 9 Janeiro de 1948 (Estatuto do Ensino Liceal aplicado ao Ultramar).

<sup>36</sup> Decreto-Lei 45810, 9 Julho de 1964; Decreto-Lei 47480, 2 Janeiro 1967

<sup>37</sup> Castro Rodrigues, F. (1963) "Memória descritiva e justificativa do Liceu Almirante Lopes Alves, anteprojecto", Janeiro 1963, p.17.

<sup>38</sup> "O terreno aconselha fundações por poços descidos e por simples gravidade. É solução de boa prática local e já qualquer empreiteiro a generalizou no Lobito, havendo técnicos especializados, contudo com profundo conhecimento das características do solo." CASTRO RODRIGUES, F. (1963) "Memória descritiva e justificativa do Liceu Almirante Lopes Alves, anteprojecto", Janeiro 1963, p.18.



**1st block**  
[Francisco Castro Rodrigues  
archive.]

timber from the region and were left in raw concrete. It was fundamental to the design that the concrete structure was visible and contrasting with the brick walls and fibrocement elements.

Single-gender education was a common practice in the Portuguese educational system, but in Angola both genders attended most public high schools.<sup>39</sup> Even though Lobito's lyceum was a mixed-sex school, the architectural design foresaw some separate facilities, like the gym and the leisure areas for the youth organization. Simultaneously, male and female students attended separate classes and used separate playgrounds, which influenced the block's design by doubling vertical accesses and organizing independent paths.

The block, with 90 x 12 meters, is comprised of three floors. On the ground floor, there are three auditoriums and a covered playground area. The auditoriums correspond to four structural modules and occupy the total width of the building. Each one of them has an adjacent courtyard on the south-west façade, where there is a covered garden with a pergola and sheltered by a fibrocement grid.

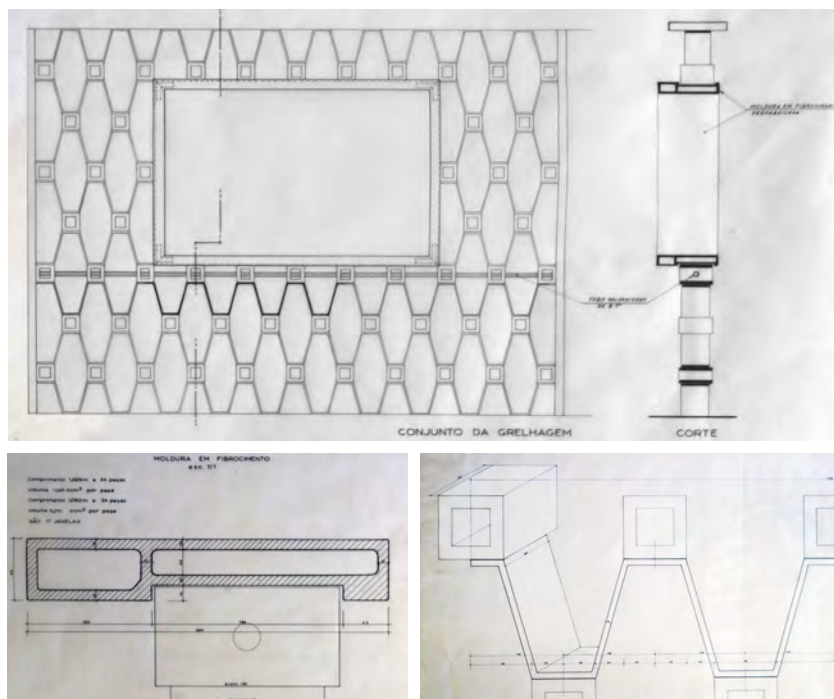
On the two upper levels, there is a sequence of classrooms displayed along the south-west façade and an exterior gallery with access through the northeast side. The standard classrooms have an equivalent dimension of three structural modules, whereas the special rooms, such as laboratories or drawing rooms, are comprised of four modules. The structural system as well as the façade, repetitive, allow for great flexibility when organizing each floor. Although they are almost identical, on level 1 there are 7 rooms, whereas on the level 2 there are 8. This difference is perceived on both façades.

There are 3 vertical communications, equidistant: 2 staircases attached upstream of the gallery, and a vertical access inserted in between the centre of the classrooms. The placement of 3 vertical accesses was justified by questions of gender division, allocating the eccentric staircase to boys and the central staircase to girls. The central staircase is an exterior space that transversely crosses the volume. This vertical communication is therefore visible on the south-west façade and determines a section of the fibrocement grid's continuity, which draws up the classrooms' façade. Such uniformity is also discontinued by two blocks destined to sanitary facilities placed on the same alignment as the male's staircase.

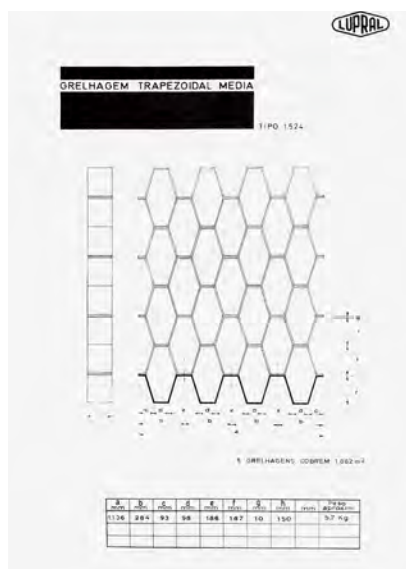
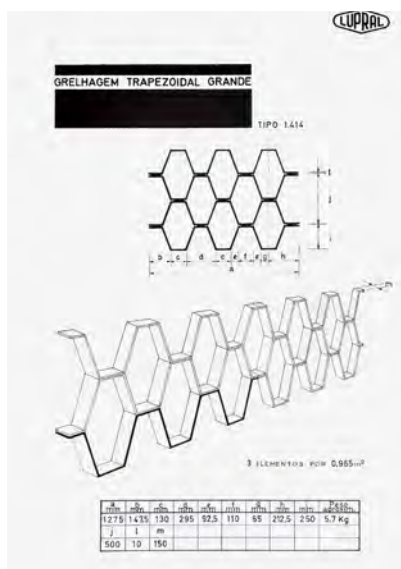
The standard classrooms are 60 square meters and were destined to 30 students, but all rooms have an additional space of 20 square meters, close to the southwest façade, that was meant to seat 10 extra students. The architect

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<sup>39</sup> The only exceptions being the male high-school Paulo Dias de Novais and the female high-school Guiomar Lencastre, both located in Luanda. DIREÇÃO PROVINCIAL DOS SERVIÇOS DE EDUCAÇÃO (1964) *Angola - Panorama do Ensino*, Luanda: CITA, p.14.



**Façade detail**  
[Lupral archive.]



**Vent blocks catalogues**  
[Lupral archive.]



considered that this flexible area was necessary to respond to a hypothetical rapid growth rate of school population, but only as a fallback solution. In fact, this open space was firstly designed to distance the learning area from the façade, and protect students from direct sunlight in the afternoons.

The classrooms are 8.75mx6.65m, which results of the addition of three structural modules of 3x7m. The additional space next to the façade occupies the classrooms' total width and it has an extension of 2.5m, which corresponds to the console.<sup>40</sup> The larger classrooms, destined to laboratories or drawing rooms, occupy four structural modules and therefore have a width of 11.75m. Thus, the classrooms are around 80m<sup>2</sup> to 100m<sup>2</sup>, and an unobstructed height of 3.5m. Northeast, the classrooms are limited by the wall that divides them from the access gallery, in which are placed a continuous one-meter high cabinet and two levels of windows with glass blades for air admission. To the southwest, facing the street is the fibrocement openwork.

The southwest façade was designed by the architect and by the design team of the fibrocement company, and it combined different pre-fabricated elements produced by Lupral.<sup>41</sup> The trapezoidal grid (model 1.524) was interposed with tubular elements, which created an original pattern that was later sold as a new model (C-1524).

The façade structure was also made of fibrocement elements that were attached to the floor and to the building's pillars. Therefore, vertical elements (6x10cm) were positioned every 3 meters, and a horizontal beam (6x15cm) was placed on top of the grid, 2.2m high. A continuous mesh made most of these units (3 x 2.2m), but some had openings with a frame of 1.5 x 1m, centered with the structural bay. This window, with no glass, allowed an unobstructed view of the street, and each classroom had at least one opening.

The frames were always in the same cadenced position in both floors, but it resulted in different layouts for the classrooms. Although the regular structure and the lattice produce a monotonous rhythm to the façade, some variation can be perceived on interior spaces. The discrepancy is in the plan, which presents larger rooms in different positions, and introduces some complexity into an apparently repetitive scheme.

The narrow northwest and southeast façades were also covered with fibrocement products. In this case, since both façades had no openings, cladding panels with 1 x 1m (type C) were clamped to the exterior walls. These panels were somewhat sculptural, with a regular display of inclined surfaces that produced depth and shadow to the otherwise plain facades.

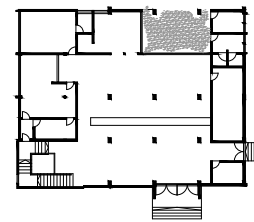
The classroom block is the most significant building of the complex, not only

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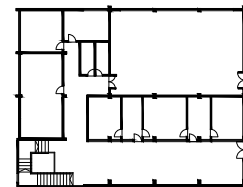
<sup>40</sup> Idem, p7.

<sup>41</sup> For further detail, see section 2.3.3.





**Groud floor**  
[project]



**1st floor**  
[project]

for being the first one built but also because it is the most true to the original project. The blocks built later on suffered greater amendments, although all of those alterations have been consented and redesigned by the architect.

In this case, a 9 meters reduction on the extension of the building is the only difference to Castro Rodrigues' project, which corresponds to the suppression of some service areas. It was also foreseen that the access galleries were detached from the classrooms, communicating only by small bridges aligned with each door.

Later on, when the building was already finished, some elements not originally planned were integrated into the south-west façade, namely a windowsill and glass slats. The complaints from the school's direction about the classrooms' comfort conditions generated an intense correspondence between the architect and the public works and education departments. However, one can question the climatic adequacy of these elements and it will be the subject of analysis in the next section.

### **Rectory Block (1965-67)**

Construction works of the rectory block started in 1965, while the first block of classrooms was still under development. The building's detailed planning had been completed in 1963 but the public works department asked for a cut-price version of the project, forcing Castro Rodrigues to develop a revised solution.

The program could not be reduced – the building contained the lyceum's rectory, administrative and secretary services, a teacher's room and medical aid facilities. Originally it had a total built area of 850m<sup>2</sup> divided in two floors, with the public secretary services located in the ground floor and private offices in the upper level. The block had been designed as the entrance building of the school, meant to be a public vestibule, where professors, students, parents and the general community could meet.<sup>42</sup> Next to the street, the southwest façade was a two-storey grid of fibrocement vent-blocks that extended the double-height atrium and provided a comfortable environment with natural light and open air.

The 1965's revised version proposed a simplification of the building's perimeter, eliminating some protrusions and cantilevered spaces, but cutting only 50 m<sup>2</sup> of total built area. The major change was the reduction of ceiling heights, which originally were 4 meters high, but were reduced to 3.2 meters. Building's proportions altered significantly with the lowering of its exterior elevation and, as a result, the atrium was slightly compressed and the main

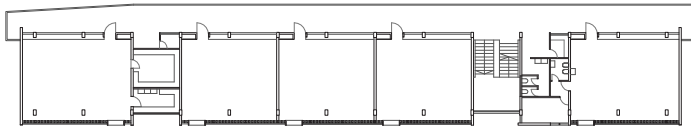
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<sup>42</sup> CASTRO RODRIGUES, F. (1963) "Memória descritiva do Liceu Almirante Lopes Alves - Bloco 1 (reitoria, administração, medicina escolar, professores)", Outubro 1963, p.2.

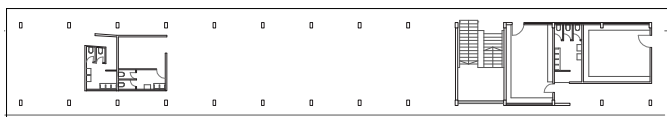


**2nd block**  
[Margarida Quintã, 2006.]

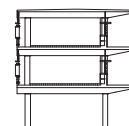
**1st floor**  
[project.]



**Groud floor**  
[project.]



**Section**  
[project.]



staircase was shortened. Relevant cuts were introduced to the covered areas and access galleries that surrounded the building, but those structures were never completed. Cost reduction also resulted in changing some covering materials, so that cement tiles replaced all wooden and natural stone flooring.<sup>43</sup>

Castro Rodrigues original masterplan meant to merge architecture and nature, with fluidity between inside and outside spaces, and a continuous course of shadowed areas. In the rectory's case, its oversimplification along with the absence of the surrounding sheltered areas resulted in a distorted architectural solution. Without these coupling elements, the condensed volume became isolated from the set, resulting in a disconnected block with functional and aesthetic losses.

In 1967, not long after the official inauguration, the rectory block was completed. The building's interior was fully exposed and could be perceived from the street. The openwork functioned as a ventilation tool, but had simultaneously ethical and aesthetical value. It created an open and abstract face to the modern school that Castro Rodrigues aimed at inventing: outward looking, with no walls and integrative.

### **Second Block of Classrooms (1969-1970)**

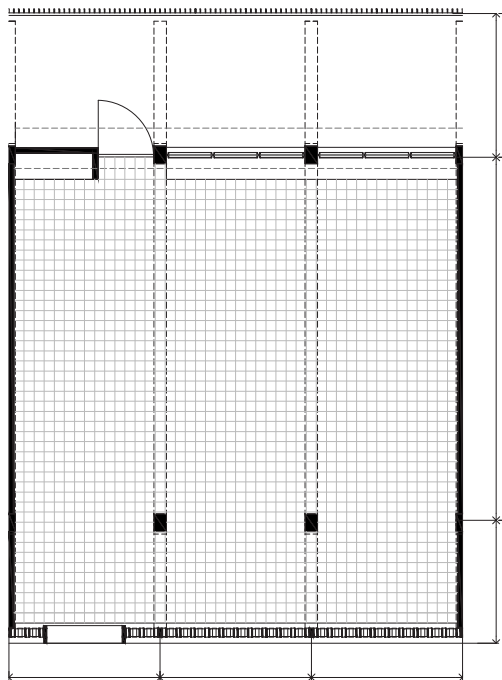
In 1969, a new block of classrooms was built. School population had increased enough, even though students with ages from 11 to 12 had been moved to the new preparatory cycle in the meantime. Therefore, the new block was destined to 3rd cycle students and the existing block would serve the more populated 2nd cycle.

The original project Castro Rodrigues developed in 1963 was edited in order to make the building less expensive. The block was similar to the existing one: it had the same orientation, it was also three stories high, had the same concrete structure, same materials and identical façades. However, it was 60 meters long instead of 90, which resulted in a different organization in plan. However, standard classrooms were exactly the same.

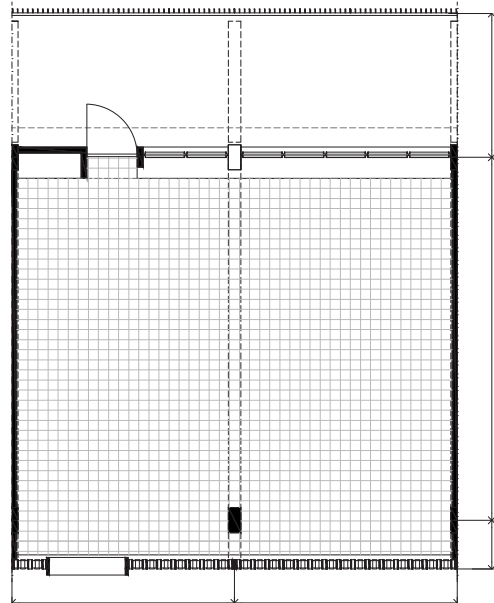
The most relevant change from the original design was on the dimensions of the structural grid. The bay was enlarged to 4.5m instead of 3m, in order to reduce the number of columns, and consequently of their deep foundations. This didn't have relevant implications on the building's layout since the classrooms were 9 meters large, and this dimension could be kept. Instead of 3+3+3m modules, these classrooms had 4.5+4.5m bays. Furthermore, the cantilever beams on the southwest façade were also reduced in its length from

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<sup>43</sup> CASTRO RODRIGUES, F. (1965) "Memória descritiva do Liceu Almirante Lopes Alves - Blocos 1, 3 e 5", Outubro 1965, p.3.



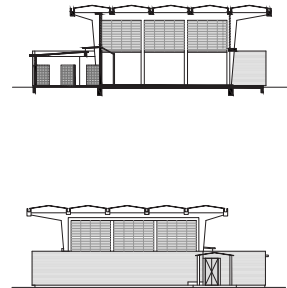
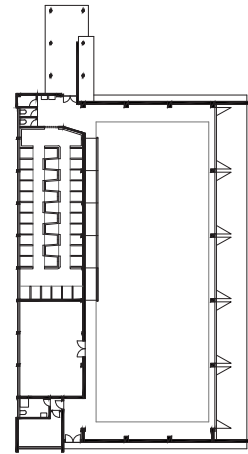
**classroom block 1**  
[plan and façade.]



**classroom block 2**  
[plan and façade.]



**Classroom**  
[Castro Rodrigues archive.]



[Margarida Quintã, 2006; IICT.]

**Gym**  
[plan and sections]



2.5m to 1m. In this new solution, the hybrid space between the portico and the façade disappeared. Consequently, the building became narrower: it is 10.5m instead of 12m.

The exact same façade pattern of the first block was used in this building, though it was slightly distorted to adjust to 4.5m structural bays. In this case, the vertical elements got further apart and the window frames, with the same size, became off centered.

Even though the amendment to the building's structure represented relevant savings,<sup>44</sup> another important cut was introduced. The original version foresaw the construction of two staircases, one for each gender, which were placed on both ends of the gallery. Similarly to the other block, the girls' staircase was inserted along the classrooms and the boys' stair was placed outside the gallery. The building's cut-priced version removed the external staircase, but kept the other in an eccentric position on the building. This peculiar arrangement, which might look like a design error, was in fact the result of yet another over-simplification of the original project.

### Gym (1970)

The gym was built in 1970 and was the last building to be completed. In 1963, Castro Rodrigues had designed two gyms, one for each gender, which in fact responded to a specific demand of the official program.<sup>45</sup> The original project foresaw two similar buildings but with different lengths – the girls' gym was smaller, with 500 m<sup>2</sup>, while the boys' gym was 600 m<sup>2</sup>.<sup>46</sup> Although the detailed architectural design was completed back then, there was no funding to build the sports facilities immediately. Therefore, sports classes took place outside for a few years, and only in 1970 the project was again resumed.

At that time, the education services decided to build only the largest gym for both genders. Boys and girls would use the facilities in different schedules since building separate gyms wasn't affordable. The Portuguese youth organization *Mocidade Portuguesa* was called to examine the architectural design and imposed relevant changes to the initial project. In a report dated from May 27, 1970, the local commissariat considered that the gym had "serious design errors that interfered with sports activities".<sup>47</sup> In their opinion,

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<sup>44</sup> CASTRO RODRIGUES, F. (1969) "Memória descritiva do segundo bloco de aulas", Outubro 1969, p.2

<sup>45</sup> "Ambos servem a prática de exercícios físicos, ginástica livre e aplicada, jogos de salão, saltos em aparelhos suecos, e no tapete, etc.", in "Programa fornecido pelos Serviços de Instrução, 12 Fevereiro 1962", in CASTRO RODRIGUES, F. (1963), "Memória descritiva geral do Liceu Almirante Lopes Alves", Junho 1963, p.1.

<sup>46</sup> CASTRO RODRIGUES, F. (1963) "Memória descritiva do Liceu Almirante Lopes Alves - Blocos 8 e 9 (ginásios feminino e masculino)", Agosto 1963, p.2.

<sup>47</sup> "O projecto apresenta graves erros de concepção, que a concretizarem-se tornarão o

the roof was too sloped, and this created an asymmetrical interior space that was unsuitable for games. Furthermore, they considered that the open layout of the locker-room promoted “nudism”,<sup>48</sup> so they recommended individual cabins for showers and changing rooms.

Following this report, and although construction works had already started, the project was adapted to incorporate the new demands. Castro Rodrigues designed a revised version of the concrete frame structure to accommodate a leveled roof and altered the locker-room plan.<sup>49</sup> Moreover, since his original design consisted of a shed simply hanging over an outdoor space,<sup>50</sup> the architect was forced to enclose the sports hall and transform it into a more conventional building.

The gym consists of two juxtaposed volumes with different plan dimensions and heights. The largest and tallest one corresponds to the sports hall and is adjacent to a slimmer and lower unit, which contains the locker-room, toilets and storage. The front elevation combines a continuous brick wall, 3 meters high, with a tall concrete structure, 7 meters high, which emerges from behind the wall.

The reinforced concrete structure of the sports hall is similar to the other existing buildings, with a structural frame with only two columns and cantilever beams in both ends. In this case, the span between columns is larger, with 12 meters, and columns are 6 meters high. The structural frames are placed 6 meters apart to support 6 perpendicular precast beams and the roof structure. The roof was made of fibrocement panels, and was divided in five dual-pitched segments, separated by the longitudinal beams that also serve as gutters.

On the overlap of the light structure with the basis rests a wide space for natural ventilation. This continuous void around the sports hall, 4 meters high, grants natural light and crossed ventilation to the gym, even though glass louvers were installed to control the airflow inside. To the northeast, a set of five folding doors opens the space completely to the outside, and favours

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edifício absolutamente inoperante. (...) O telhado está projectado em forma inclinada, de modo que apresenta dum lado uma altura de 3,80 m e do outro lado 6,5. Tal disposição impossibilita radicalmente a prática desportiva.” COMISSARIADO PROVINCIAL DA MOCIDADE PORTUGUESA (1970) “Parecer sobre o projecto do ginásio do Liceu Nacional Almirante Lopes Alves”, Maio 27, p. 2.

<sup>48</sup> Idem, p.3.

<sup>49</sup> CASTRO RODRIGUES, F. (1970) “Memória descritiva do ginásio”, Setembro 1970, p.1.

<sup>50</sup> His original project description reads: “Dois corpos distintos, resguardados das vistas inoportunas, um para rapazes outro para raparigas, este com módulo mais pequeno, mas qualquer deles ampliável. Abertos, ao ar livre, mas cobertos.” CASTRO RODRIGUES, F. (1963) “Memória descritiva do Liceu Almirante Lopes Alves - Blocos 8 e 9 (ginásios feminino e masculino)”, Agosto 1963, p.1.

a fair relationship with outdoor training areas.<sup>51</sup>

The combination of concrete and brick and the interplay between solid surfaces and void spaces are consistent with the other blocks' design. However, the gym is a bulky mass, on which the balance between materials and surfaces do not seem to establish harmonious balance. The concrete structure is distanced from the base of the building, but creates a void that is taller than the height of the brick wall. This apparent disproportion is the result of changing the slope of the roof, which was a relevant amendment made to the original project during construction works.

A flat interior ceiling was required in order to address a functional demand for the interior space. However, a low-slope roof would cause major problems given that rain in Lobito is always unpredictable and strong. Steep slope roofing was the original solution designed by the architect particularly because it was the most efficient rainwater drainage system. He later reached a compromise solution by dividing the roof into five linear segments, separated by continuous gutters, and subdivided in narrow dual-pitched slices. Again in this case, the amendments made to the original project created a more functional and optimized solution but simultaneously made a less elegant architectural form.

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<sup>51</sup> The original project included outdoor playgrounds and pools for several sports: volleyball, basketball, roller-skating, tennis, athletics, swimming and rowing. CASTRO RODRIGUES, F. (1963) "Memória descritiva e justificativa do Liceu Almirante Lopes Alves, anteprojecto", Janeiro 1963, p.15.



Frames from  
*Ensinando em Angola, 1970*  
[directed by Custódio Mergulhão,  
Cinemateca Portuguesa.]

## An Open-Air School in a Tropical Climate

Although the lyceum has been considered an avant-garde building in the local context, Castro Rodrigues' main architectural reference came from early twentieth-century European open-air schools. The architect's discourse resorted in many ways the modern precepts of sanitation and wellbeing, but with a tropical drift.

The international movement for open-air schools arose in Northern Europe in the beginning of the twentieth-century in order to treat pre-tubercular children (Châtelet, 2003, p.22). Open-air schools aimed at offering care based on climate therapy and physical exercise, while establishing a new kind of education. According to Châtelet, the movement initiated in 1881 in Germany but rapidly spread to neighboring European countries and the US. Several institutions for open-air education were founded in Europe between 1922 and 1939, but with the rise of the Second World War and the emergence of streptomycin in 1941 as a treatment for tuberculosis, the movement became less relevant. Afterwards, the post-war period saw a new distribution pattern that reflected each country's idea of the outdoors and its benefits. Even though the movement for open-air schools was not completely extinguished, it became more difficult to measure its extent and influence in large geographical and chronological scope.<sup>52</sup>

Even if the lyceum was designed in the 1960s, Castro Rodrigues was very much influenced by a 1939's thematic issue of *L'architecture d'aujourd'hui* on schools.<sup>53</sup> In this number, the article "La classe en fonction de l'air et de la lumière" gave advice on specific architectural solutions and explored the role of air, sunshine and movement as prerequisites for a new learning system.<sup>54</sup> Also in this number, the Suresnes open-air school, designed by Eugène Beaudoin, Marcel Lods and Jean Prouvé (1932-1935) and the Amsterdam's open-air school by J. Duiker and B. Bijvoet (1927-30) were published as groundbreaking references of contemporary architecture. Castro Rodrigues not only admired the 1930s modern architectural outcome but he also agreed on the design principles established back then. Additionally, whereas these central European buildings were completely open to inclement weather, Castro Rodrigues considered Lobito's climate was far more ideal for building classrooms without walls.

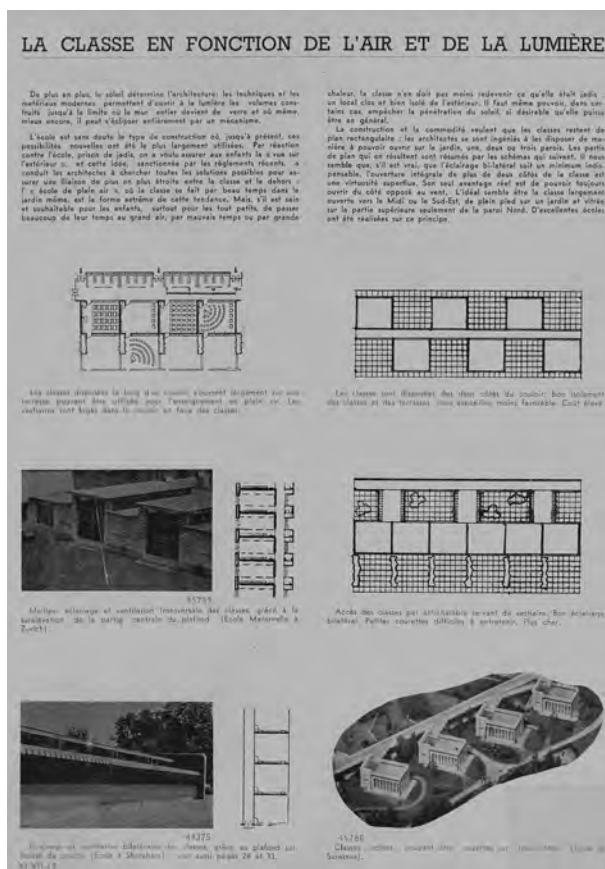
In his project description, he mentioned the benefits of being in contact with nature but also with the surrounding urban environment. In his words, a

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<sup>52</sup> Further information on the international movement for open-air schools in: Châtelet, A., Lerch, D., Luc, J. (eds) (2003) *L'École de plein air - Une expérience pédagogique et architecturale dans l'Europe du XXe siècle*, Paris: Éditions Recherches.

<sup>53</sup> Interview with Francisco Castro Rodrigues, April 16, 2014, Azenhas do Mar.

<sup>54</sup> "La classe en fonction de l'air et de la lumière" in *L'architecture d'aujourd'hui*, Écoles, n°11-12, 10 année, 1939, p.12.



L'architecture d'aujourd'hui,  
[Écoles, 1939.]

passing car or the train worked as stimuli for a broader understanding of the outside world:

**“Com um máximo de contacto com a natureza, (...) ajuda-se a elevação do espírito juvenil sobre tudo o que é belo, verdadeiro e superior: o céu azul, as nuvens, o jogo das árvores na paisagem, as flores, o comboio, até o carro que passa, são estímulos e apoio à elevação do espírito. A Escola permitirá assim a observação da vida exterior, pois a criança aprende também com a apreciação dos incidentes e aspectos da vida à sua volta.**

**Considerando o alto papel reservado à Escola na formação da mentalidade de um país, já regulamentos desde 1936 em França, sobretudo, impunham como princípio base a visão sobre o exterior: ‘É preciso ver para fora através das janelas, das grelhagens, com visão sobre pequenas extensões, embora árvores e flores serão os seus limites.’”<sup>55</sup>**

Similarly to the open-air school movement, Castro Rodrigues advocated for physical and moral regeneration of the youth through a new educational atmosphere. At the same time, he thought the city was a positive influence, which contrasted with the initial standards of the movement that considered urban surroundings unhealthy and immoral, and therefore not suitable for open-air schools. On the contrary, he believed the new school should merge with the city, without walls or other physical boundaries except for vegetation:

**“Não contamos com muros de vedação. Muros para quê? Simples lancis de betão para marcação dos limites e base de taludes ligeiros para ajardinar e arrelvar. Sebes vivas de plantas várias criarão os limites, pois não pensamos noutro tipo de muralhas.”<sup>56</sup>**

His optimism towards the city is understandable since he was the main architect and urbanist of Lobito from the 1950s to the 1980s. Furthermore, Lobito’s urban life in the 1960s had particular characteristics that were not comparable to any European city in the pre-war period.

### **Lobito’s Geography and Climate**

Lobito is a coastal city in Southern Africa that was exclusively built in the twentieth century, and whose urban development was mostly triggered by the construction of the Benguela railroad and Lobito’s Port in 1903.<sup>57</sup> The city was established in 1921, but the most relevant urban spread only occurred

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<sup>55</sup> CASTRO RODRIGUES, F. (1963) “Memória descritiva e justificativa do Liceu Almirante Lopes Alves - anteprojecto”, Janeiro 1963, p.1.

<sup>56</sup> CASTRO RODRIGUES, F. (1963) “Memória descritiva do Liceu Almirante Lopes Alves - Bloco 1 (reitoria, administração, medicina escolar, professores)”, Outubro 1963, p.2.

<sup>57</sup> CASTRO, E.G.A. (1966) “Porto do Lobito”, *Angola, Portos e Transportes*, Luanda: Obra Política-Económica de Consulta e Divulgação, p.30-37.





**Aerial view. Lobito**  
[Castro Rodrigues, archive]

in the 1950s (Fonte, 2007, p-137-146). In late 1960s, Lobito was an industrial and modern town, but simultaneously had natural characteristics of a leisure resort.

The city had its urban core between the railway and the port, where most services and shopping areas were located. It spread to the north in a narrow sandbank that contained the city's civic center and the upper class residential area. To the south, some peripheral housing districts were developed around the mangrove swamps and salt evaporation ponds, particularly in the 1950s. Bordering popular neighborhoods and the vast informal city were scattered over the surrounding hills.

Lobito's lyceum was located in a new residential district next to the beach and south from the railroad. The Compão quarter was also the location for new public buildings such as the regional hospital and the Flamingo open-air cinema, in addition to the new school area.

Besides being in charge of the lyceum's architectural design, Castro Rodrigues also developed the urban plan for this district. In fact, the architect had enormous influence in the city's development since he was the first architect to settle in Lobito in 1954 and was, since then, in charge of the municipal urbanization office. He was also on the team that developed the city plan in 1949 (while working in Lisbon at the colonial urbanization office) and the main author of the 1972's general plan for the city.<sup>58</sup> His knowledge on the physical and human characteristics of the place was gradual and enthusiastic. Lobito's particular geography and mild climate was the main reference for his work, so he continuously tried to learn more about the physical constraints and the use of analytic design methods.

Upon his arrival to the city in 1954, he requested the installation of a meteorological station at Lobito's sandbank that would provide weather data for all his upcoming projects. At that time, he also used a device developed by Arménio Losa<sup>59</sup> to create solar shading diagrams (Dionísio, 2009, p.243). His acquaintance with these methods was only pursued in Lobito, where he realized that building comfortable environments would require a thorough understanding of the local weather parameters.<sup>60</sup>

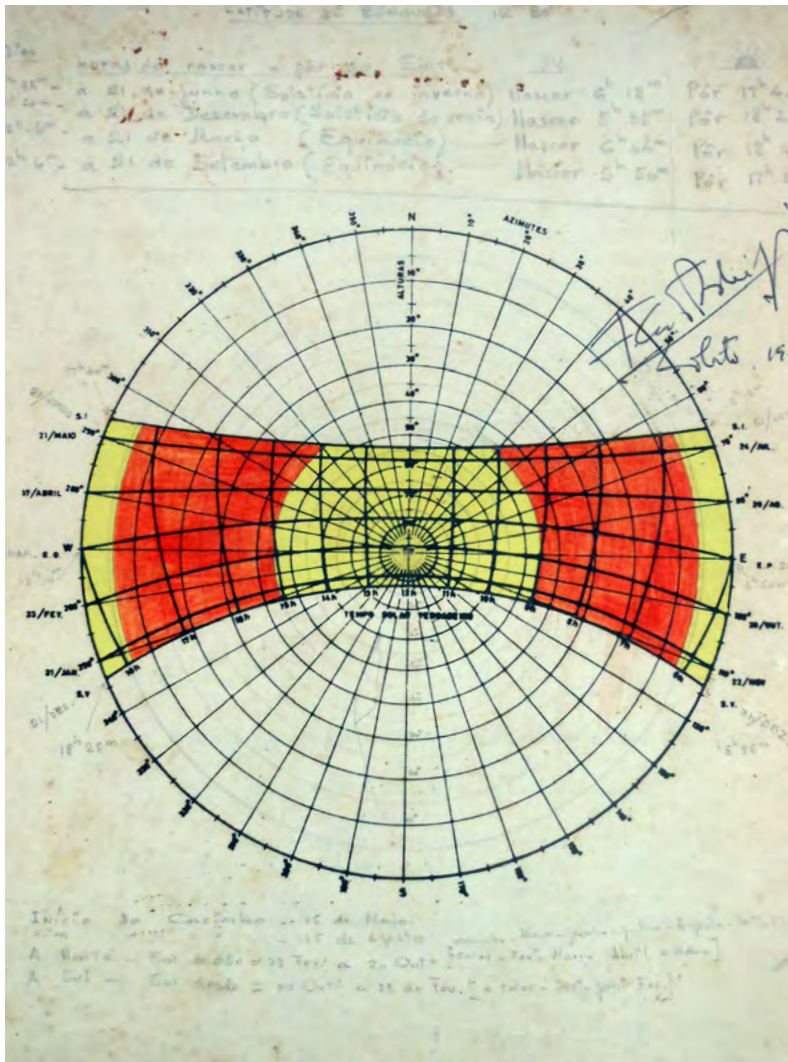
According to the contemporary studies performed by the Meteorological

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<sup>58</sup> Plano Geral de Urbanização do Lobito, Gabinete de Urbanização Colonial, João Aguiar e Castro Rodrigues, Lisboa, 1949; Plano Director do Lobito, Gabinete de Urbanização da Câmara Municipal do Lobito, Castro Rodrigues, Lobito, 1969-1972 in FONTE, M. M. (2007) *Urbanismo e Arquitectura em Angola - de Norton de Matos à revolução*, Thesis (PhD), Faculdade de Arquitectura da Universidade Técnica de Lisboa.

<sup>59</sup> Arménio Losa (1908-1988) was a Portuguese architect, based in Porto. He was part of the ODAM (Organização dos Arquitectos Modernos) between 1947 and 1952, and he established a long lasting collaboration with Cassiano Barbosa.

<sup>60</sup> Interview with Francisco Castro Rodrigues, April 16, 2014, Azenhas do Mar.



**Solar Chart**

[anotated by Francisco Castro Rodrigues.]



**Ventilation sketch**

[Francisco Castro Rodrigues, archive.]

Services of Angola, Lobito is considered a hot-semiarid climate (BSh), notwithstanding its coastal location. This classification is due to the city's very low precipitation rates but, at the same time, has high relative humidity and high temperatures all year long.<sup>61</sup>

The city is located at latitude 12.37° S and longitude 13.56° E. Its proximity to the equator makes the sun move north or south depending on the season. The sun is always close to the vertical and reaches the zenith twice a year in February and October. More precisely, from February 23 to October 20 the sun moves north and from October 20 to February 23 the sun moves south.

This information on the sun path can be read directly from the solar chart and is fundamental to building orientation. Castro Rodrigues had a 12°S chart on which he added some notes on the period of daytime throughout the year. Daylight is rather constant and high all year long, close to 12 daylight hours on the equinoxes, from 6am to 6pm. However, at the winter solstice, in June, days are shorter, from 6.30am to 5.30pm. On the summer solstice, in December, the days are a little longer, from 5.30am to 6.30pm.

The year is only divided in two seasons: the hot period and the *cacimbo*,<sup>62</sup> that ranges from May 15 to August 15. In other regions in Angola, the *cacimbo* corresponds to the dry season, and occurs in winter, while the rainy season occurs in summer. In Lobito there is no such division because precipitation levels are extremely low all year long, but similarly to the other locations, the *cacimbo* corresponds to a dry period, with the lowest air temperatures and highest air humidity. However, the temperature range does not differ much along the year, since the hottest month is April, with medium temperature of 27°C, and the coldest month is August, with 20°C.

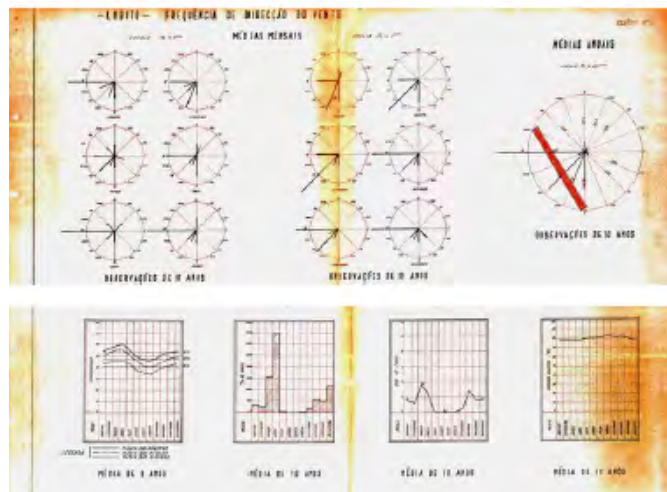
### Designing for Lobito's Climate

The characteristics of Lobito's hot-semiarid climate instigated the open-air solution that Castro Rodrigues developed for the lyceum. According to his first project description, the most important aspect of the school's design was building responsiveness to climate. Lobito's weather conditions were extensively described in the text, with precise information grounded on scientific data from the local meteorological station, which provided the figures of the previous 10 years. The architect gave detailed information on each weather parameter and explained the challenges they represented to building physics. He then validated all his architectural choices using technical arguments.

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<sup>61</sup> SILVEIRA, M. M. (1962) *Climas de Angola*, Luanda: Serviço Meteorológico de Angola, p.12.

<sup>62</sup> Cacimbo is an Angolan word that means dense and humid fog.



Lobito climatic charts  
[AHN archive.]



He considered that air humidity was the most relevant constraint, “due to its permanent and depressive presence.”<sup>63</sup> In fact, relative humidity values were around 80% all year long, with daily variations between 78% and 85%. The architect pointed out that these conditions, complemented with high temperatures, could cause great discomfort and fatigue to the students. Therefore, he proposed a building that would provide wide natural ventilation of interior spaces in order to reduce these insalubrious effects with “permanent transverse air currents”.

As previously outlined, air temperature was high during all year, with a mean annual temperature of 23.5°C and an annual range of only 7°C.<sup>64</sup> The hottest season was from January to May, with maximum temperature of 33°C in April, while the annual minimum temperature was 17°C in August. At that time, the school calendar was the same as in Portugal, so the ‘summer holidays’ took place during the coldest months – July and August –, when temperatures were between 17°C and 23°C. Therefore, Castro Rodrigues was mostly concerned with the challenges presented by the warm season, and he didn’t consider the possibility of thermal discomfort due to air currents in the classrooms during the *cacimbo* period. Besides, his open-air school arose from the European models developed for extreme weather conditions so, in his judgment, feeling cold in Lobito was never an issue to be pondered.

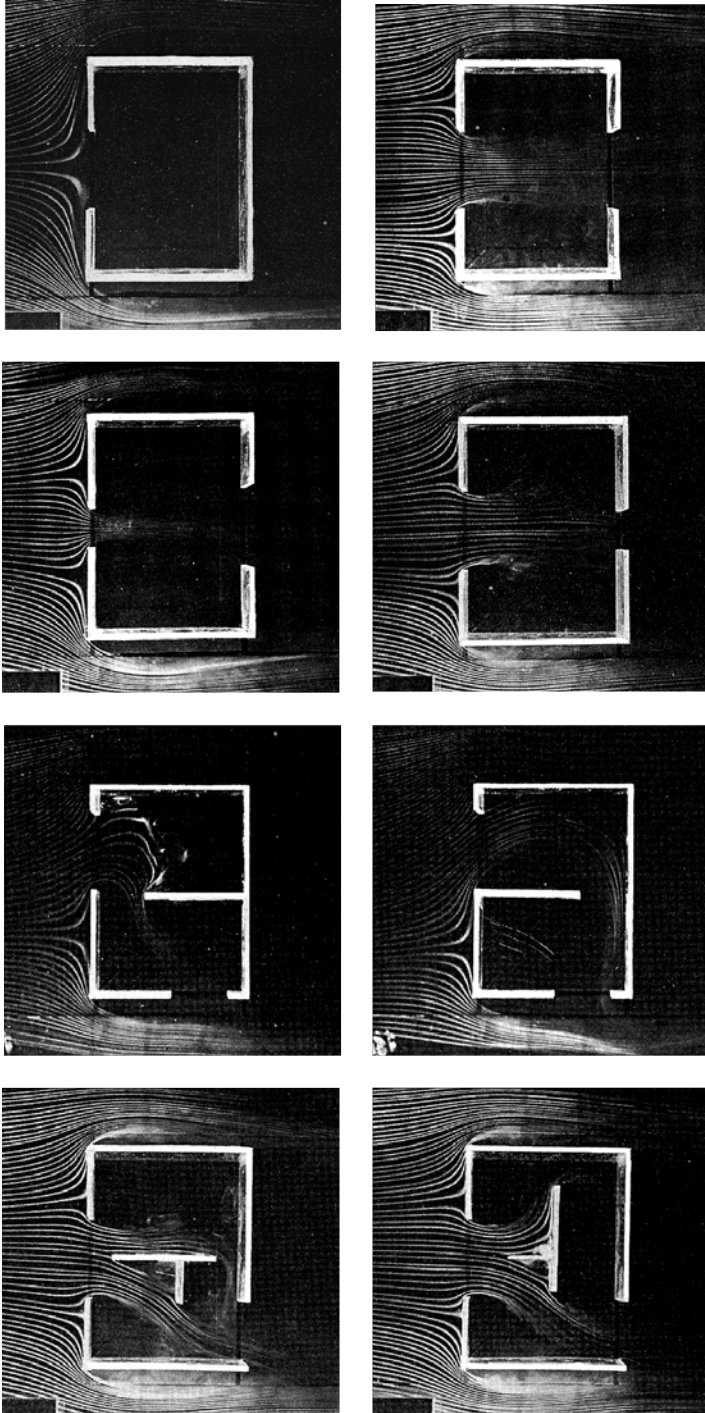
The architect also presented Lobito’s wind rose indicating the distribution of wind speed and direction in each month of the year. The prevailing winds in the city came generally from the west (W), but from July to November winds were mainly blowing from southwest (SW) and south-southwest (SSW). Therefore, the annual wind rose showed that dominant winds came only from the southwesterly quadrant, mainly from the west during the day and from the south during nighttime. Lobito’s prevailing winds came to be a continual validation for the lyceum’s project. Even though it was the form and direction of the plot that mainly influenced the lyceum’s linear composition and the orientation of its several volumes, Castro Rodrigues considered this positioning beneficial for ventilation purposes.

The plot was northwest-southeast oriented and consisted of a long and narrow irregular trapezoid, with 450m in its longest side, facing the main street. In the back, it was separated from the railway, at the northeast, by a 30m no-building area. The lyceum’s long and narrow blocks are parallel to the street and follow the main direction of the plot. Since the blocks’ longitudinal axis is northwest-southeast oriented, the façades facing the street are exposed to the prevailing

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<sup>63</sup> “No Lobito há que ter em conta os factores importantes impostos pelas condições climáticas. É sobretudo importante, por sua acção constante e deprimente, o problema da humidade.” CASTRO RODRIGUES, F. (1963) “Memória descritiva e justificativa do Liceu Almirante Lopes Alves - anteprojecto”, Janeiro 1963, p.1.

<sup>64</sup> The mean annual temperature range is the difference between the mean temperature of the warmest (27°C in April) and coldest (20°C in August) months of the years.



Ventilation behavior  
[MIT, 2007.]



winds coming from the southwesterly quadrant. Then, the architect decided that this façades should be as open as possible in order to benefit from the constant winds during the hot season. According to his description, the opposite façades were more enclosed since northern winds were associated with rainstorms.

In fact, precipitation was very low but unpredictable. Most of the rain occurred during a short season and summed, on average, only 38 precipitation days a year. The annual maximum rainfall was 350mm in March and April, which were simultaneously the hottest months of the year. Even though rain was scarce and sporadic it could be very intense, so the architectural design incorporated this information by enclosing the building on his northern face and designing appropriate storm sewers and drainage systems to face the episodic heavy rainfall.

Even though the building's orientation was convenient to the direction of dominant winds, it was less efficient in relation to the impact of solar radiation on the façades. According to the conclusions of Olgyay's sol-air approach, the best building orientation in hot climates near the equator is always somewhat close to the east-west axis (Olgyay, 1963, p.53). Furthermore, while north and south façades are easier to shade due to the sun's high angles, orientations close to east and west are necessarily less favorable.

Despite being familiar with Olgyay's approach, Castro Rodrigues was certainly more influenced by the Portuguese author Ruy José Gomes. The engineer wrote a report on thermal comfort on tropical and subtropical climates that was published by the LNEC (Laboratório Nacional de Engenharia Civil) and by the LEA (Laboratório de Engenharia de Angola) in 1967. The study compiled the contemporary knowledge on the subject, using references such as Fry and Drew, Olgyay, and Dreyfus, amongst others, but also made specific remarks to the Portuguese context and the African colonies. Gomes stressed that ventilation is key for environmental comfort and suggested that benefiting from the dominant winds could actually justify a different orientation from the conventional EW axis (Gomes, 1967, p.51).

Castro Rodrigues was in line with this reasoning and, furthermore, he always argued on the benefits of having natural sunlight inside the buildings:

**“Fui sempre da teoria que o sol deve entrar nas casas. Comandado. (...) Portanto, ventilação transversal e entrada de sol comandada. Quando começar a ser incómodo fecha-se. A minha prática foi sempre assim.”**<sup>65</sup>

Lobito's lyceum, and specifically the classrooms block, being northwest-southeast oriented, has large façades towards the northeast and the southwest, so both sides of the building receive direct sunlight all year long. In fact, the

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<sup>65</sup> DIONÍSIO, E. (2009) *Francisco Castro Rodrigues - Um Cesto de Cerejas - conversas, memórias, uma vida*, Lisboa: Casa da Achada, p. 243.



Report against direct sunlight  
[AHN archive.]

architect designed the classrooms to get natural light and ventilation on both sides, in order to comply with the salubrious principles of open-air schools. Following this orientation, he considered the classrooms would be well lit and well ventilated, but he overlooked some of the effects of having direct sunlight inside.

The northeast façade is exposed to direct sunlight all year long during the mornings: from 5.30am to 11.30am on the summer solstice (December 21), from 6am to 12.30am on the equinoxes, and from 6.30am to 1pm on the winter solstice (June 21). However, this façade has an exterior gallery that provides access to the classrooms and also works as an efficient solar protection. In fact, the 2.5 meters length walkway protects the exterior wall in the hottest hours, and the classrooms only get direct sunlight through the large windows before 8am in December and before 9.30am in June. According to Castro Rodrigues, early morning sunrays were not a serious problem since classes started only at 8.30am.<sup>66</sup>

On the other side, the building's southwest façade has incident solar radiation during the afternoons: from 11.30am to 5.30pm on the summer solstice (December 21), from 12.30am to 6pm on the equinoxes, and from 1pm to 6.30pm on the winter solstice (June 21). The classrooms have no solar protection, except for the fibrocement grid. Since the façade was wide open, with no windows, there were not relevant solar gains, but direct sunlight was uncomfortable for students and became a relevant dispute after the building's completion.

The plan of a typical classroom was clearly explained by the architect as a result from the structural grid of 3 x 7 meters. Two cantilevered spaces with 2.5 meters were then positioned on each end, which corresponded to the access gallery and to the veranda. Both the gallery and the veranda provided shade to the learning areas:

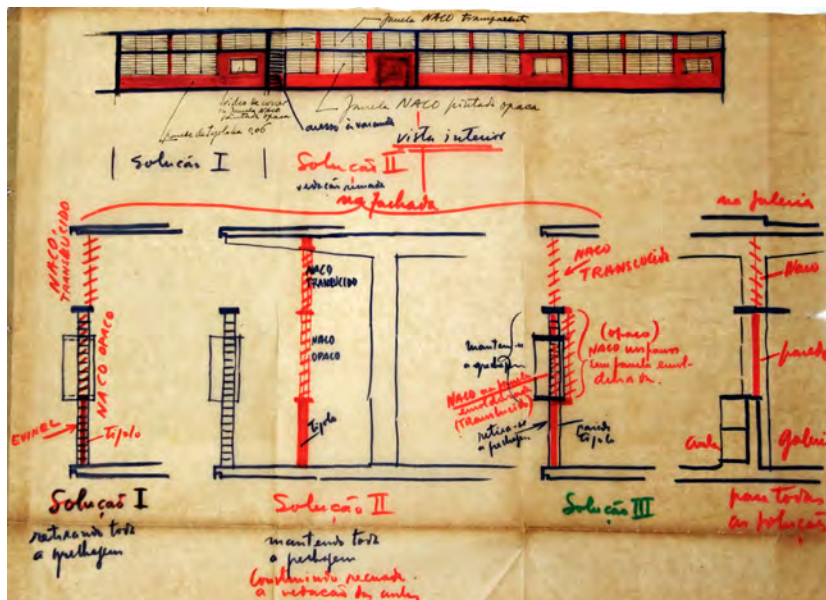
**“Partimos de um sistema cómodo com módulos de 3m por elementos de apoio e de vãos entre estes com 7m. Assim criamos as aulas normais com 8.75m x 6,65 metros úteis, tendo mais o aproveitamento do espaço com 2,5m na superfície sobre consolas. Este espaço é destinado a afastar os poucos raios solares infiltrados, do plano vertical teórico para limite da sala de aula, no lado oposto à galeria de acessos que utilizará a segunda ordem de consolas.”<sup>67</sup>**

The original scheme for the southwest façade was completely open, aiming at cutting expenses with glaze and window frames, with only a lattice dividing the classrooms from the outside:

**“É um espaço que convida ao ensino ao ar livre, ao mesmo tempo que evita toda**

<sup>66</sup> CASTRO RODRIGUES, F. (1963) “Memória descritiva e justificativa do Liceu Almirante Lopes Alves - anteprojecto”, Janeiro 1963, p.5.

<sup>67</sup> Idem, p7.



### Sketch with multiple façade solutions

[AHN.]

**uma parede com a dispendiosa caixilharia e o envidraçado normais. Terá um pano de grelhagem em betão de modelo e uso correntes na região, leve, transparente ao ar e à luz, que não atingirá o tecto.”<sup>68</sup>**

The space between the façade and the pillars was somewhat hybrid – the architect stated it was meant for solar protection but at the same time argued it could serve for siting 10 more students, in case of overcrowding. Due to the unusual character of this space, the contractor recommended placing sliding windows lined with the pillars in the classrooms, which would result in enclosing the rooms and creating a conventional balcony. This suggestion appeared when construction works were almost complete in April 66, and motivated an angry and unconditional comeback from the architect.<sup>69</sup>

In the letter Castro Rodrigues sent to the director of the public works department, he showed his objections to such an intrusive change to his design. He argued that classrooms shouldn't be “hot, closed, without air, light or views, sad, sick and insalubrious” and affirmed he had designed an original architectural solution that was exclusive to Lobito's climate:

**“(…) sempre sofri, como aluno e como professor, nas salas quentes, fechadas, sem luz, sem ar, sem perspectivas; tristonhas, doentias, insalubres. Pois neste caso procurei estudar qualquer coisa de diferente e sadio. Estudei uma obra com que o estado pudesse dotar, superiormente como convém, esta cidade do Lobito, com uma arquitectura do nosso tempo e digna. Estudá-la-ia para um só e determinado local; para uma precisa orientação e nunca me preocupando em fazer soluções de carimbo ou peças incaracterísticas que tanto servissem aqui como no planalto; no sul como no norte, nas zonas secas como nos climas de chuvas grandes. Não seria atitude inteligente, não, pois disso não viria a lucrar economicamente, não é verdade? Mas... eu gosto muito da Arquitectura e do Lobito.”<sup>70</sup>**

Attached to his letter, he sent climate data from the Meteorological Services of Lobito and Novais Ferreira's article on environmental comfort in Angola that had just been published by the LEA.<sup>71</sup> He gave detailed explanation on his architectural choices and described how the climate constraints interfered with his design.

Castro Rodrigues started his reasoning with air temperature. He argued that the weather was never too cold to stay outside, since the coldest months had temperatures between 17°C and 20°C with 80% of relative humidity. In

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<sup>68</sup> Idem, p7.

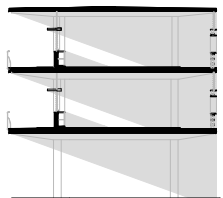
<sup>69</sup> CASTRO RODRIGUES, F. (1966) “Letter to Waldemar d'Orey (director of the DSOPT Luanda)”, April 26, AHNA, Luanda.

<sup>70</sup> CASTRO RODRIGUES, F. (1966) “Letter to Waldemar d'Orey (director of the DSOPT Luanda)”, April 26, AHNA, Luanda, p. 2.

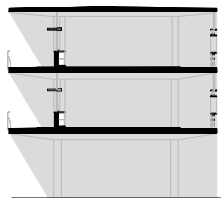
<sup>71</sup> NOVAIS-FERREIRA, H. (1965) *O conceito de ambiência climática aplicável aos estudos de edificios para habitação*, Memória LEA nº 101, Luanda: LEA

**Sections**

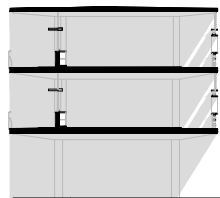
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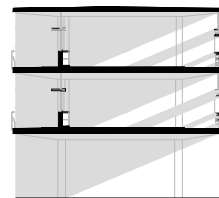
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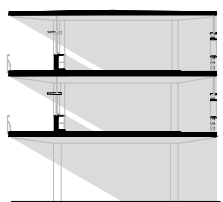
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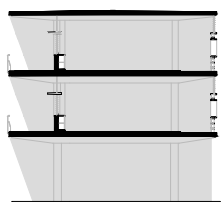
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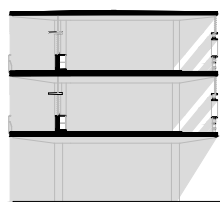
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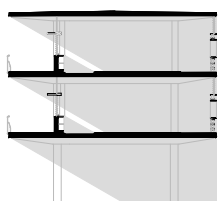
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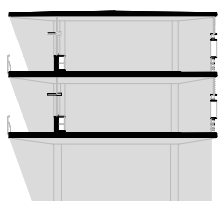
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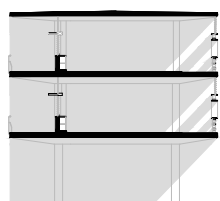
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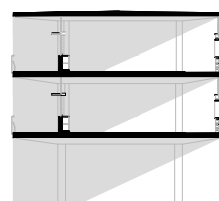
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order to prove that these were comfortable conditions, he presented Novais Ferreira's psychometric chart for inter-tropical regions that placed Lobito's coldest days in the comfort zone. Furthermore, the lowest temperatures occurred in July and August, which corresponded to the vacation period.

Therefore, the architect showed that enclosing the classrooms made no sense and would only present more challenges during the long hottest season, from January to May. Castro Rodrigues main concern was the period between 9am and 3pm, especially in April, when temperatures rise above 30°.

For this reason, he argued that only constant ventilation could have a beneficial influence in perceived temperature. In fact, the combination of the effects of air temperature, relative humidity and air speed all influence human thermal perception.<sup>72</sup> In order to create a more comfortable environment, the architect designed a façade completely open towards the dominant winds:

**“De um modo geral o vento em Angola é fraco (...) a velocidade média anual do vento não atinge 10 km/h. Em todo o território ocorrem, poucas vezes por ano, rajadas de vento forte de pequena duração que podem atingir os 100 km/h; estas rajadas têm direção muito variável e estão associadas a fenómenos de instabilidade atmosférica, como sejam aguaceiros ou trovoadas.”<sup>73</sup>**

Finally, in 1967 Castro Rodrigues writes his last reason writes the last letter justifying his architectural options, but accepts to introduce a wall and blinds fixed in aluminium on the southwest façade:

**“Caso do sol:**

**a) Devemos no nosso clima (segundo todos os teóricos e ver diagramas da obra “O conceito de ambiência climática” de H.N. Ferreira) procurar insolação. Naturalmente: é uma forma económica de equilibrar o teor higrométrico de um clima próprio para criar cogumelos.**

**b) Contudo, temos apenas cerca de 36 dias, em todo o ano, com relativa insolação, com algum sol nas aulas do nosso liceu; por construção; isto é, pela orientação escolhida – aliás muito consequência da forma e disposição do terreno.**

**Mas que sol? A fins de Fevereiro, cerca das 14.30h, começa a aparecer uma projecção de sol nas aulas, tendo a amplitude máxima entre 17 a 23 de Março, projectando-se em toda a superfície do pavimento e sob ângulo de 15°. Às 17 horas,**

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<sup>72</sup> “Uma pessoa sujeita a uma corrente de ar cuja velocidade seja 0,3m/s (1,08km/h) tem uma sensação de descida de temperatura de 1°C. Considera-se no entanto que não é conveniente que a velocidade do ar seja superior a 1m/s (3,6km/h) pois ultrapassa os limites da comodidade.” SERRA, R. (1999) *Arquitectura y Climas*, Barcelona: Gustavo Gili.

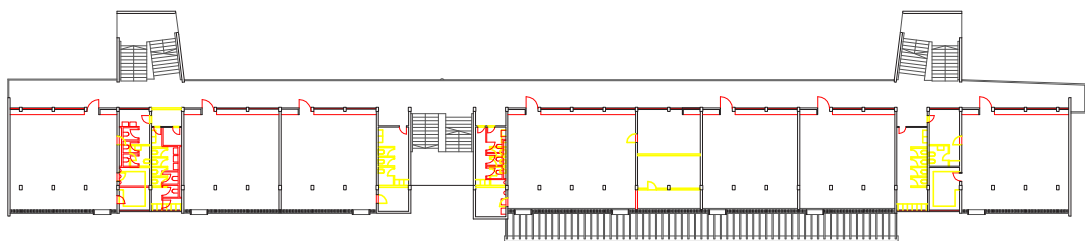
<sup>73</sup> SILVEIRA, M. M. (1962) *Climas de Angola*, Luanda: Serviço Meteorológico de Angola, p.11.



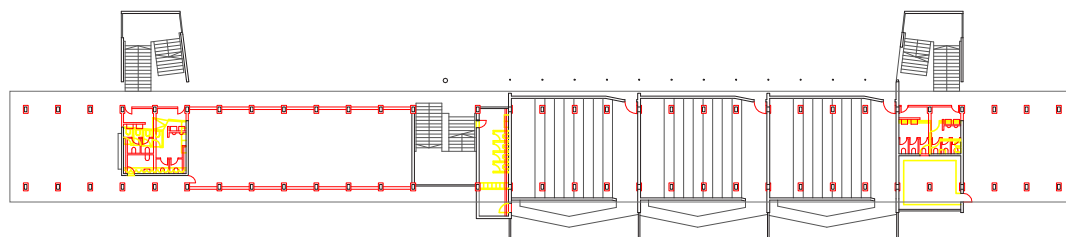


**1st block**  
[Margarida Quintã, 2014.]

**1st floor**  
[as built]



**Groud floor**  
[as built]



contudo. É o caso do solstício em que, a 21, o sol mais cai sobre o quadrante sul. Notar que as férias da Páscoa se iniciam a 15 deste mês.

c) Este sol é de resto coado pela grelhagem adoptada e, sabemo-lo todos nós como a partir das 16.30 h já não impressiona qualquer papel heliográfico. Portanto, podemos estar mais descansados ainda, neste capítulo.

d) Hoje, fins de Abril, não há o mais leve traço de sol que entre – mesmo tangencialmente – nas aulas do liceu, antes das 18 h, isto é, sobre o total poente.

e) O ensino liceal oficial no nosso país está determinado que se processe em condições normais, que se desejam, no período da manhã.

f) Num caso extremo, contudo, dentro do citado parâmetro dos 15 dias para um professor progressivo, com bastante senso prático, pedagogicamente evoluído, pode ainda ser pretexto para uma fuga para o ar ainda mais livre, na zona inferior a este bloco ora concluído, há largos espaços de sombra e frescura. (...)

Para satisfação total de entidades que ainda se preocupam (neste clima local!) com 15 dias de sol de tarde, em algumas horas, concorda o arquitecto em adoptar, sobre a grelhagem existente na fachada sul-poente do bloco de aulas construído, um sistema simples e económico de persiana fixa em alumínio. (...) Aceita-se este elemento [murete nas salas de aula] também mais como pormenor de complemento para um eventual proteção das pernas das alunas.<sup>74</sup>

### Environmental Comfort

The atrium is the core of the rectory building and, despite the mentioned cutbacks, still functions as the noblest space of the school. The building's interior is wide open to the street, with a two-storey grid separating it from the outside. Therefore, this permeable façade grants passive ventilation and shade, and operates as a cooling device for the whole building.

The hall not only contains circulation areas but also the secretary services on the ground floor. While the doors, the staircase, the mezzanine and the narrow double height are placed close to the grid, the working areas are 4 meters apart and have a lower ceiling. Therefore, even though the secretary is part of the continuous open space, the employees work in a protected area, sheltered from the outside weather.

Nevertheless, this interval is not enough to provide shade all year long. Considering the building's orientation and Lobito's solar chart, one concludes that this façade receives direct sunlight in the afternoons during the whole year, with maximum exposure hours on December 21 (from 11.30 to sunset). Even though the workplaces are put 4 meters apart from the façade, they're

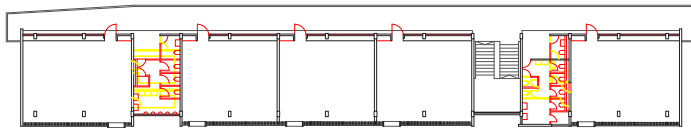
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<sup>74</sup> CASTRO RODRIGUES, F. (1967) "Letter to DSOPT Luanda", July 17, AHNA, Luanda.

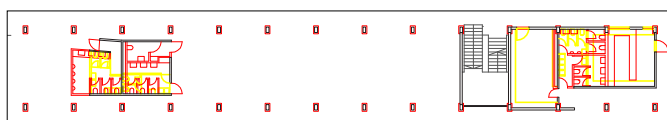


**2nd block**  
[Margarida Quintã, 2013.]

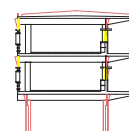
**1st floor**  
[as built]



**Ground floor**  
[as built]



**Section**  
[as built]



only protected until 4pm. Therefore, the secretary is always under direct sunlight in late afternoons, and since there is no operable sun-shading system, like shutters or curtains, the space fails to provide appropriate working conditions during this period.

Given that Castro Rodrigues was using analytical design methods, he was surely aware of this issue but he did not make any remarks on the project description. A similar problem appeared in the classrooms, which had the exact same orientation and a similar façade. However, in his letter to the director of the DSOPT from April 26, 1966, the architect argued that the school was designed to function only in the mornings, from 8am to 2pm, and that the situation would only get uncomfortable during a period of two weeks in March.<sup>75</sup>

As previously shown, Castro Rodrigues presented then a mistaken argument and, one year later, he was forced to design shutters to the classrooms. The architect used climate data as the main argument to convince the public institutions of his open-air school design, but he was not always exact when manipulating such information and communicating his scientific findings. For instance, in this case, he chose to overlook the effect of direct sunlight in the secretary workplaces during the afternoons. Presumably, these services only operated in the mornings, but this architectural solution is restrictive and severely limits building usage.<sup>76</sup>

Evidently, Castro Rodrigues' main concern was inventing a modern school to Lobito's weather, even though he was aware that it wasn't technically flawless in terms of thermal comfort. In fact, if he had been driven only by scientific design methods, we would have chosen a different orientation for the whole scheme, more close the east-west axis. Instead, he oriented the building's main façade to the street, following the longitudinal direction of the plot, which resulted in having the front elevation facing southwest. Façades in this orientation are particularly difficult to shade due to the lower angles of the sun in late afternoons, requiring preferably movable sun-shading solutions.

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<sup>75</sup> Castro Rodrigues (1966) "Letter to Waldemar d'Orey (director of the DSOPT Luanda)", April 26, AHNA, Luanda, p. 2.

<sup>76</sup> Even though the exchanges concerning sun shading in the classrooms occurred while the rectory was under completion, shutters were never requested for this building.



**Classroom**  
[Margarida Quintã, 2006.]



**Classroom**  
[André Almeida, 2011.]



**Classroom**  
[Margarida Quintã, 2014.]



## Contemporary Use, Pathologies and Transformation

Over the years, the building has been used as a school, even though the country's political and social conditions have changed considerably. Angola's independence in 1975 had a significant impact on widespread access to education, which represented an immediate increase of school population all over the country, tripling the number of high-school students between 1974 and 1980.<sup>77</sup> Simultaneously, the Angolan civil war that started after independence created an unstable background and blocked any sustainable development of the national education system. According to a 2005 report from the Ministry of Education, during the 27 years of civil war (1975-2002) there was an exponential rise of children with no access to school that was due to the lack of teachers and to the destruction of school facilities.<sup>78</sup>

In the post-independence context, Lobito's school suffered progressive wear and neglect, without barely any maintenance works during more than 40 years. Amongst the major deficiencies, the school had no water supply, at least over the last ten years.<sup>79</sup> This obviously had disastrous consequences because it inhibited the use of toilets, which were either destroyed or blocked. Furthermore, there was no furniture in the classrooms, except at the auditoriums, where the fixed seats were broken. All glass louvers had disappeared, which made the classrooms very uncomfortable, and, as a remedy, wooden panels were placed on the openings to stop the air-currents. The gym was out of use and it became an alternative toilet to all the students.

In addition to the described ruinous state, the façades presented some building pathologies, such as concrete corrosion and cladding detachments. The major building defects were the result of an obsolete sewer system and malfunctioning rainwater drainage.<sup>80</sup>

Nowadays, the former lyceum is named *Escola Secundária do 1º Ciclo Comandante Valódia* and is a 1st cycle secondary school, which corresponds to the 7th, 8th and 9th grades. The school has around 3000 students with ages between 13 and 15, whom are divided in 70 classes of about 45 students per class. Since the school only has 28 (18+10) classrooms, it operates in three periods – morning, afternoon and evening –, in order to maximize the use of the existing facilities.<sup>81</sup>

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<sup>77</sup> *Currículo do 1º Ciclo do Ensino Secundário*, Ministério da Educação da República de Angola Luanda, 2005, p.7.

<sup>78</sup> Idem.

<sup>79</sup> The described conditions were observed in several visits to the building since 2006.

<sup>80</sup> ABRANTES, V., SILVA, J.M. (2012) *Simplified Method for Building Anomalies Analysis*, Collection Livros d'Obra, Porto: GEQUALTEC/Cadernos d'Obra.

<sup>81</sup> Interview with José Haleca (Director of Escola Secundária do 1º Ciclo Comandante Valódia), November 4, 2014.

Even though the school was very neglected and in need of serious works, in 2011 the parents' committee sponsored some maintenance works, including painting the classrooms and buying 500 desks.<sup>82</sup> Before that date, classes took place with children either sitting on the floor or on plastic chairs they brought with them every day. In the same year, a group of students asked the director's permission to clean the gym and make a dojo for training karate. Although apparently minor, these developments show that, in recent years, the community engaged in saving the building or at least at making small improvements, despite having very little government funding.

### **Building Transformations**

In January 2014, renovation works funded by the government started. The ministry of education managed the project as part of a national ongoing plan for renovating and enlarging the existing school network. Lobito's project did not entail new constructions and focused exclusively on the renewal of the existing school facilities, in order to develop a controlled costs solution.<sup>83</sup> Therefore, the project did not question the organizational scheme or the architectural form. Works were merely solving functional and technical troubles that had been impairing the teaching conditions. Apparently, the building is perceived as an existing resource, and not as an object with aesthetical worth or ideological meaning.

Although a preservationist attitude was stimulated, it was merely on an economical basis. Even though other schools from the colonial period have been considered national monuments,<sup>84</sup> in this case there are no protective measures or heritage laws applicable to the building. The renovation project had the only goal of ameliorating the building in its technical aspects while expending the less money as possible.

Yet, according to the contractor, the project was incomplete and did not even respond to some of the most pressing needs. For instance, the project did not foresee independent water supply and electrical networks, since no water deposits and electrical generators were prescribed. Today these devices are indispensable since the urban network often fails to provide water and electricity to the building. As a result of project inaccuracies, the company in charge of supervising construction works made amendments to the

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<sup>82</sup> Interview with Evaristo Manjenje (President of the parents' committee Escola Secundária do 1º Ciclo Comandante Valódia), November 4, 2014.

<sup>83</sup> Interview with Irene Figueiredo (Diretora do Gabinete de Estudos, Planeamento e Estatística do Ministério da Educação), September 23, 2014.

<sup>84</sup> Such as the former Liceu Salvador Correia, built in Luanda in 1937, and considered a national monument in 1992 (Despacho nº 47, de 8 de Julho de 1992).



initial plan that represented 60% of additional works.<sup>85</sup> While some of these additions were unquestionably necessary,<sup>86</sup> some others were expendable and even destructive of the building's original qualities.

### Structure

Regrettably, visible transformations have been made to the building's structure, roof and façades. Alterations to the building's concrete structure included the enlargement of ground floor pillars of both classrooms' blocks. Their cross-section changed from 25 x 50 cm to 45 x 75 cm, which resulted in irreversibly disfiguring the original colonnade.

Before the works, only a few pillars actually presented spalling and corrosion,<sup>87</sup> which was most likely due to the thin layer of concrete covering the steel bars, and to the building's proximity to the beach. However, the building diagnosis didn't make clear what was the cause for degradation (if impact, excessive load, fire, chemical attack or reinforcement corrosion) and if the repair should be superficial or actually load bearing.

The solution that has been implemented only apparently aims at strengthening the columns on ground floor level, since the positioning of reinforcing bars does not comply with legal technical provisions to reinforce the existing structural elements.<sup>88</sup>

### Roof

Concerning the building's roof, the rectory and the classroom blocks had originally flat roofs, waterproofed with asphalt membrane, and with rainwater drainage being made through pipes within ducts or walls. The solution foreseen by the project was the repair of the waterproofing system and drainage, which included the asphalt membrane and drainage pipes' replacement. However, the supervision's team considered relevant to alter the system and to propose a solution, which they viewed as 'simpler with less maintenance costs'.<sup>89</sup> Thus, the flat roof slab was topped by a hip roof, built of metallic structure and covered by thermo-lacquered sheet. Contouring the roof slab, was placed a peripheral gutter and built a wall 30 centimeters high. Drainage pipes are now located on the façade and were set every 18 meters,

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<sup>85</sup> Interview with Mário Tavares (Engineer at Perfil Construções), November 3, 2014.

<sup>86</sup> Such as the mentioned water supply system that includes now two water deposits and the electrical network that depends on a 120 kW diesel generator.

<sup>87</sup> Observed in previous visits to the building in 2006, 2011 and 2013.

<sup>88</sup> According to Daniel Quintã (structural engineer working in Angola).

<sup>89</sup> Interview with Narciso Jorge (Architect at NJ Design), November 4, 2014.

adjusted to the building's structure.

This solution is also disfiguring of the original architectural solution and, in fact, does not represent a low maintenance solution, as it requires a periodical cleaning of the gutters. It represents, however, a considerable change on the buildings' top trim and on its façades that now include visible and protruding drainage pipes.

### **Pavements**

Most classroom' floors have also been destroyed to allow passage through them for electric cables. It surely could have been possible to find a less invasive solution, external, for the placement of new infrastructure, other than one that would implicate the total demolishing of the existing floors.

### **Walls**

External brick walls were also partially destroyed during renovation works. The existing brickwork was stained by graffiti and efflorescence (or salting) and so the contractor considered that the cleaning prescribed in the project wouldn't be sufficient. Thus, new brick slips (2cm thick) were glued to the façades and replaced the existing brickwork. The original bricks were cut 2cm deep in order to fit the new cladding into the same wall thickness.

### **Windows**

All the original single glass louver windows were broken and the steel frames damaged by corrosion. These frames were removed in all façades and replaced with sliding aluminium windows. In the northeast façade the existing windowsills were also removed and replaced with new ones in in grey speckled granite.

### **Vent-blocks**

Some broken and deteriorated elements were found on the fibrocement grids, as well as on the façade panelling and roof. It was only foreseen by the project to substitute the deteriorated elements by identical others. Naturally, this decision posed problems to the construction's execution, as it is not possible nowadays to produce the same type of fibrocement elements that were originally applied into the building. Lupral stopped the production of all pre-fabricated fibrocement elements, not due to a legal prohibition but because there is no asbestos extraction in Angola. In Angola, there is no legislation prohibiting the use of asbestos and there is lack of awareness on the material's harmful effects on health.

The contractor then suggested replacing roof elements and façade coatings with sandwich panels. As for the façade grids, the original grid was kept and were only substituted the ones that were damaged. For that reason, two of the

panels from the ground floor auditoriums were dismantled, which allowed for the repair of all existing grids.

However, beforehand, the company had suggested removing the fibrocement grid and replacing it with a new façade.<sup>90</sup> This option was not accepted only because several local actors opposed, like the school director, the parents' committee and the mayor, who were all in favor of keeping the existing grid. In this case, the assessment was motivated by an aesthetical judgment and by the desire of keeping the building's image.

### **Informal Conservation Strategies**

Apparently, the building is part of the collective memory of the inhabitants of Lobito, and particularly of the ones who studied there during the last 50 years. The school's community, backed by the mayor, decided that removing the vent-blocks was not an option since it would irreversibly change the face of the building. Even though there are no heritage rules, the community's mobilization somehow performed an informal practice that promoted the building's conservation.

Given that these were the first works that the building has undergone after decolonization, a preservationist approach towards the colonial legacy is perhaps thought provoking. Instead of promoting the building's demolition or subversion, both the Angolan government and the local community unite in its maintenance.

In fact, it could be said that official institutions did back a conservative approach. The government sponsored the building's maintenance and repair and local authorities even encouraged the preservation of the existing façade acknowledging its meaning and value. However, this procedure does not correspond to a clear philosophy nor the actual materialization of the building's renovation is coherent with this hypothetical stance.

The principle of minimum intervention was a prerequisite of the Ministry of Education's program, but only for budgetary reasons. However, the construction works carried out did not meet this principle and the budget was continuously enlarged. The contractor negotiated more works, favored by an incipient architectural project, and doubled his gains.

Nowadays, while new buildings boost the construction industry, renovation works present only small gains for contractors. Moreover, the industry operates in a way that allowed that all technical solutions described had been validated by the ministry, despite the initial intentions. Even though an independent technical advisor was assisting the process of decision-

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<sup>90</sup> Interview with Narciso Jorge (Architect at NJ Design), November 4, 2014.

making, the lack of established criteria and a scarce understanding of the original project and of its technical aspects lead to a faulty and incoherent architectural intervention.

Since the historical and cultural significance of the building has not been assessed, it is not possible to argue against the loss of material authenticity or the irreversibility of the works. However, it would have been promising to uphold the minimum intervention as an eco-friendly procedure that aims at improving the learning conditions of the students while spending as little money as possible.

A sustainable approach as such would, however, require a full and prior consideration of the original design and of the conditions of the existing building. Understanding the advantages and failures of the architectural design, and using the building as material evidence, would have been an ingenious method that, in this particular case, had good conditions for success. The typology of the building, the quality of the original design and construction, the passive environmental control systems and the general state of conservation of the building presented an appropriate case for establishing a working process for other contemporary interventions in twentieth century schools.

## Conclusions Towards Re-design with Climate

The primary sources that have been located during the development of this research allowed for detailed readings on the many stages of the lyceum's design. In addition to the technical drawings, architectural choices are described with detail in project descriptions and in correspondence exchanges between the local institutions and the architect. This new information presents further evidence that adequacy to climate was not only crucial to Castro Rodrigues but also to project managers and building users in late 1960s. The lyceum's response to local climate was a shared concern that was part of the institutional discourses and had strong influence on all project decisions.

The reading of those documents also showed that the project was fully developed and managed in Angola. Although it was a governmental commission, communications with Lisbon were scarce and were never related to architectural decisions. This demonstrates that the local government and local institutions enjoyed significant autonomy in post-61, and that local architectural production favored from this new administrative context.

At the same time, it became clear that the different actors engaged in the process of building the lyceum had diverse interests, often leading to misunderstandings, project amendments and construction delays. However, they all seemed to agree on the dominant discourses of 'economy and urgency', which simultaneously translated political ambitions and aspirations on architectural form. Efficiency and economy of means were, indisputably, the most frequently used lines of reasoning in any negotiation.

It was confirmed that building's response to local climate was a relevant part of discussions and often became the only asset of Castro Rodrigues. His technical knowledge on weather parameters and passive systems for environmental control allowed him to negotiate with local institutions and get their endorsement on radical architectural solutions. He often used meteorological data and technical reports as scientific proof to sustain his architectural design.

However, it was also shown that the architect chose to underestimate some of his findings and did not communicate them accurately to the colonial authorities. Instead, he manipulated technical information to argue against official requirements and present experimental architectural solutions.

Nevertheless, his letters and project descriptions demonstrate an evident inclination towards rational design methods. Self-imposed limitations to his 'creative spirit' came from his belief in a methodical approach to architectural design that should be logical, precise and technically perfect. This attitude shows his adherence to values of efficiency and modernity dominant in the colonial society in which he lived.



A



B



C



D



E



F



G



H



I

A, B

**Structural reinforcement**

[Margarida Quintã, 2014.]

C

**Concrete pathologies**

[Margarida Quintã, 2014.]

His writings also display a developing sense of place, arising from the identification with the landscape and climate, even though often deprived of social implications.<sup>91</sup> Due to the ongoing liberation war, colonial groups and institutions were forced to question its standards and aims. Only the place, in its precise geographical sense, seemed to establish common ground for any hypothetical understanding between parties. As a result, self-identification with the place can be read in recurrent expressions such as ‘our city’ and ‘our climate’. Climate is not described as tropical or exotic, but perceived through observation and personal experience,<sup>92</sup> as well as detailed meteorological records. Ultimately, building was a tool to deal with Lobito’s climate and to interpret it. The natural conditions of the place were apprehended, embraced and controlled, while a modern and local architectural language also developed.

Additionally, it was shown that the project endured multiple simplifications and compromises during the construction process as a result of a limited budget and continuous diminishing of government expenditure. Finally, this public school, which was designed by a local architect with the mediation of several local actors, is perhaps the first clear representation of this colonial society and of the post-61 politics on education in Angola.

D, E

**Window frames**

[Margarida Quintã, 2006, 2014.]

F

**Vent block detail**

[Margarida Quintã, 2014.]

G

**Roof renovation**

[Margarida Quintã, 2014.]

H

**Electrical infrastructure**

[Margarida Quintã, 2014.]

I

**Original materials**

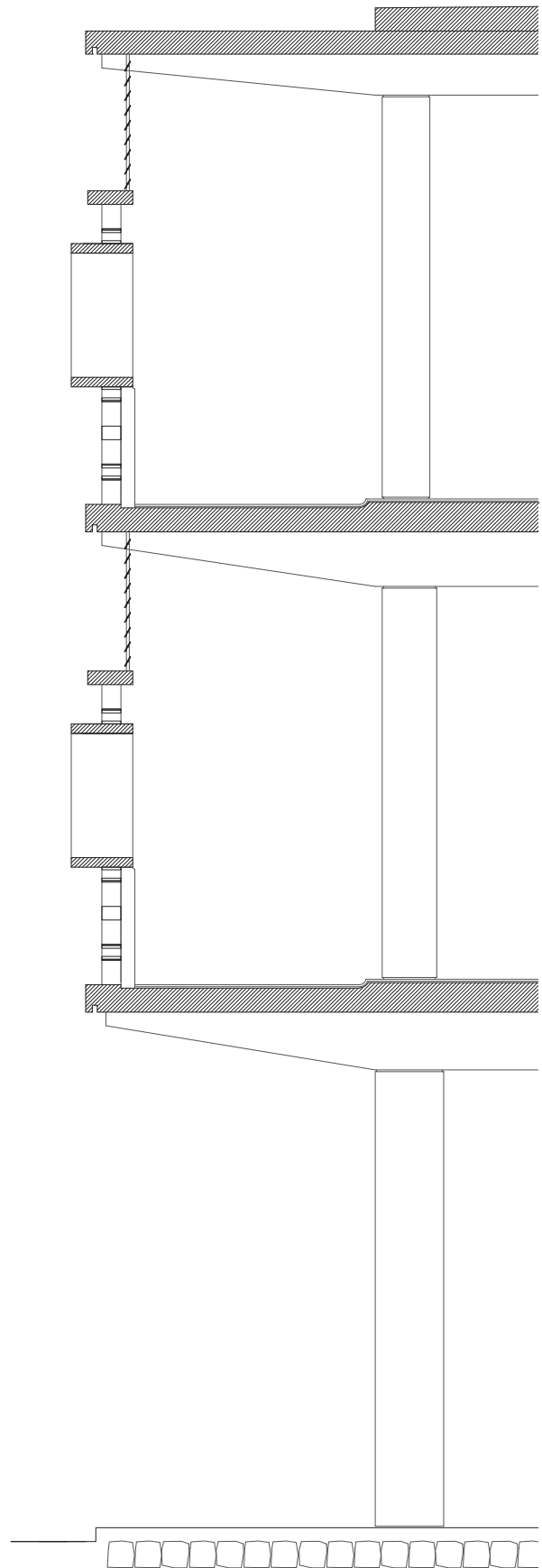
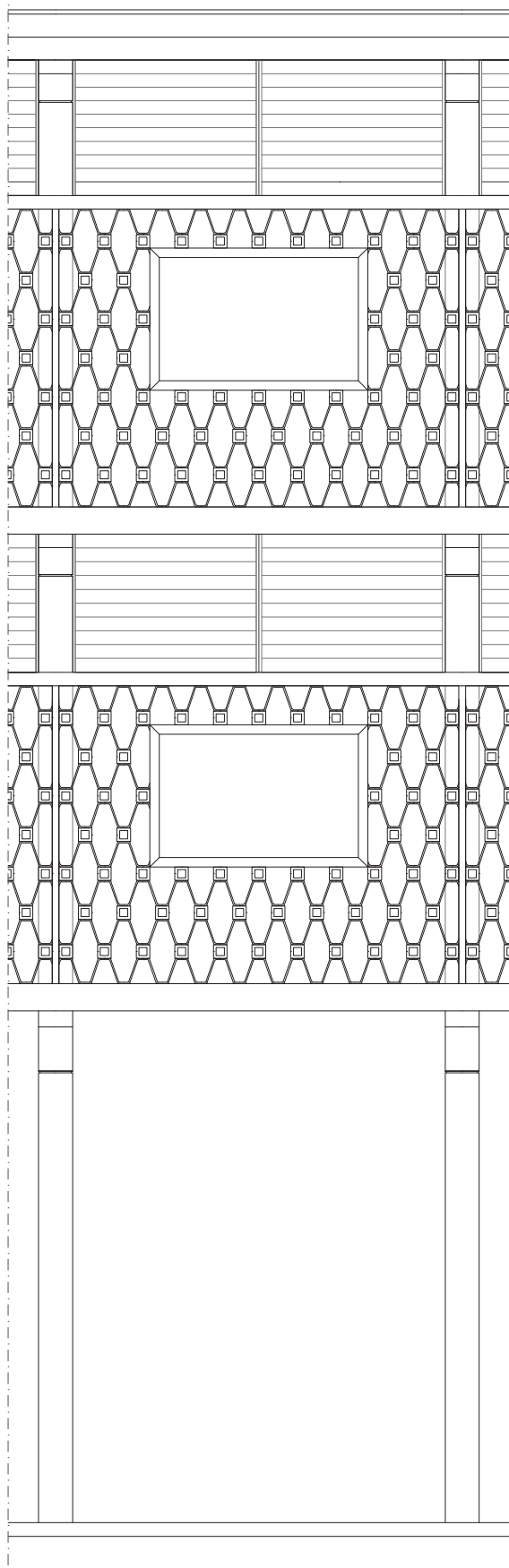
[Margarida Quintã, 2011.]

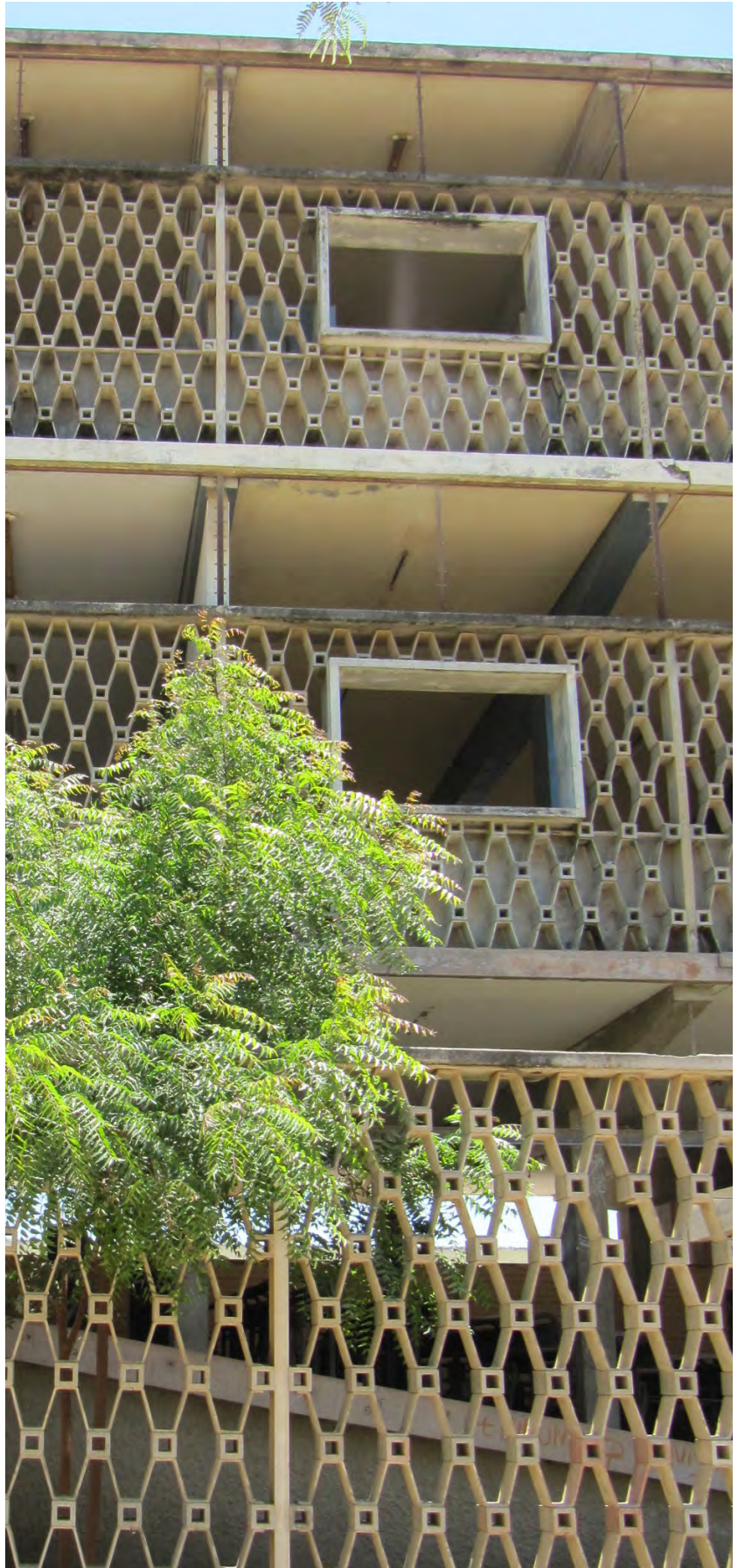
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<sup>91</sup> For example, racial issues have never been addressed in his texts, and no mention was made to the fact that the school would have an overwhelming majority of white children.

<sup>92</sup> Even though Castro Rodrigues was originally from Lisbon, he was living in Lobito for more than 10 years and had been involved in the city’s expansion during that time.

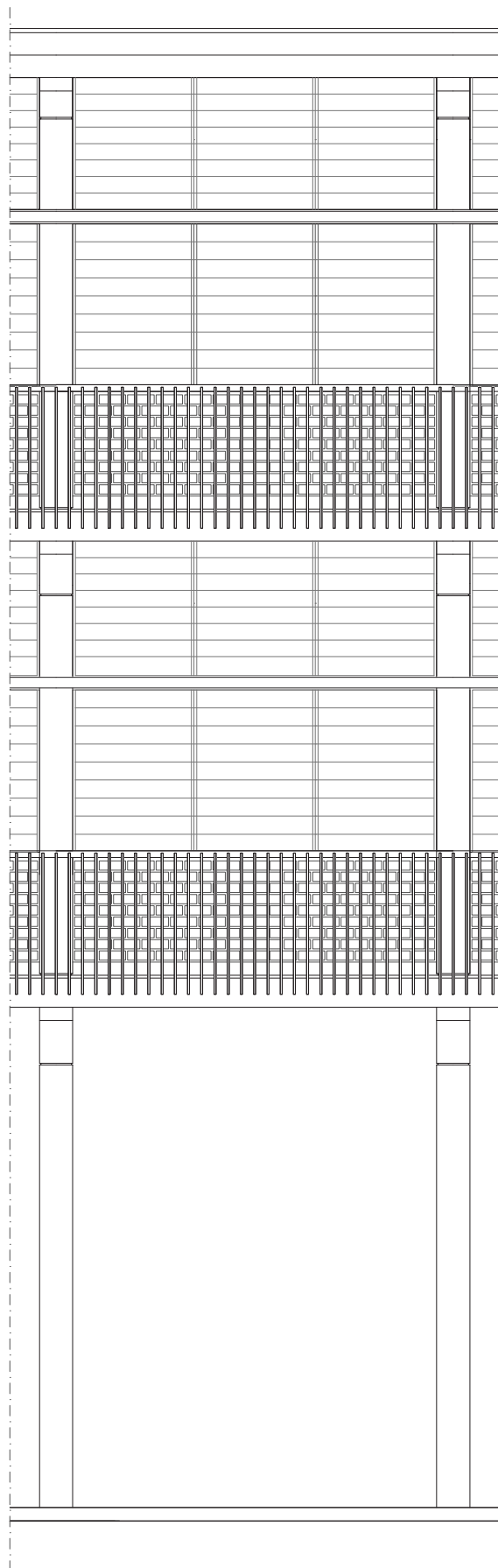
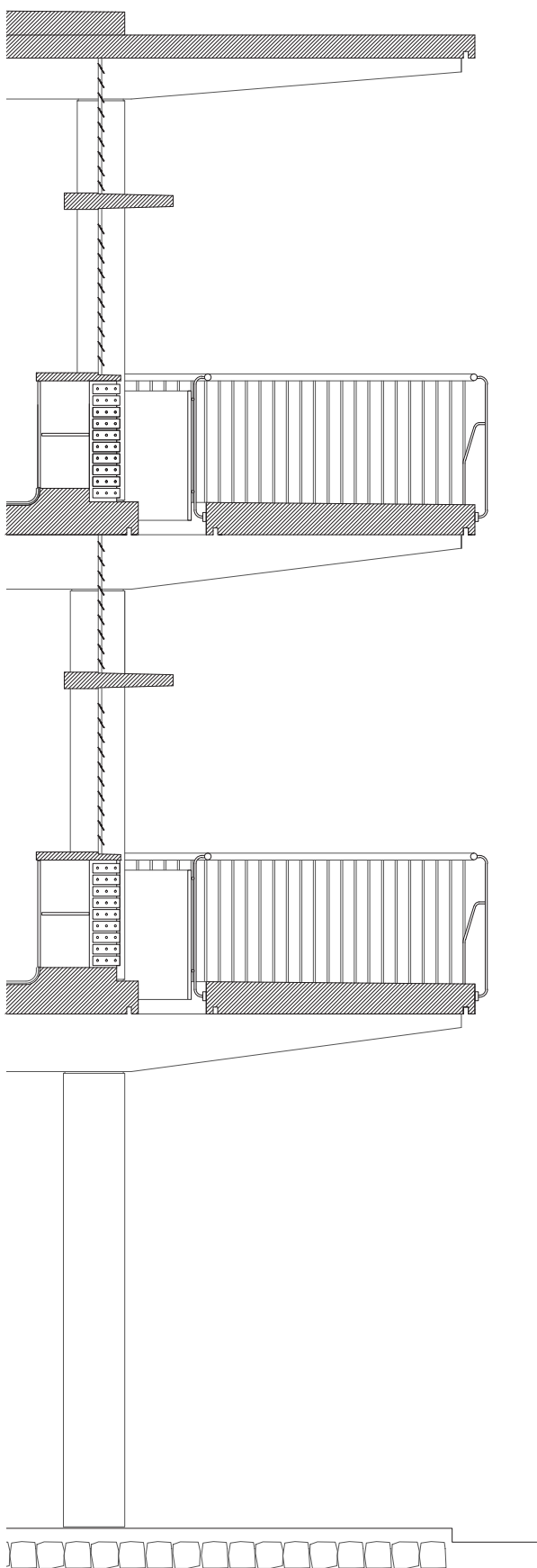


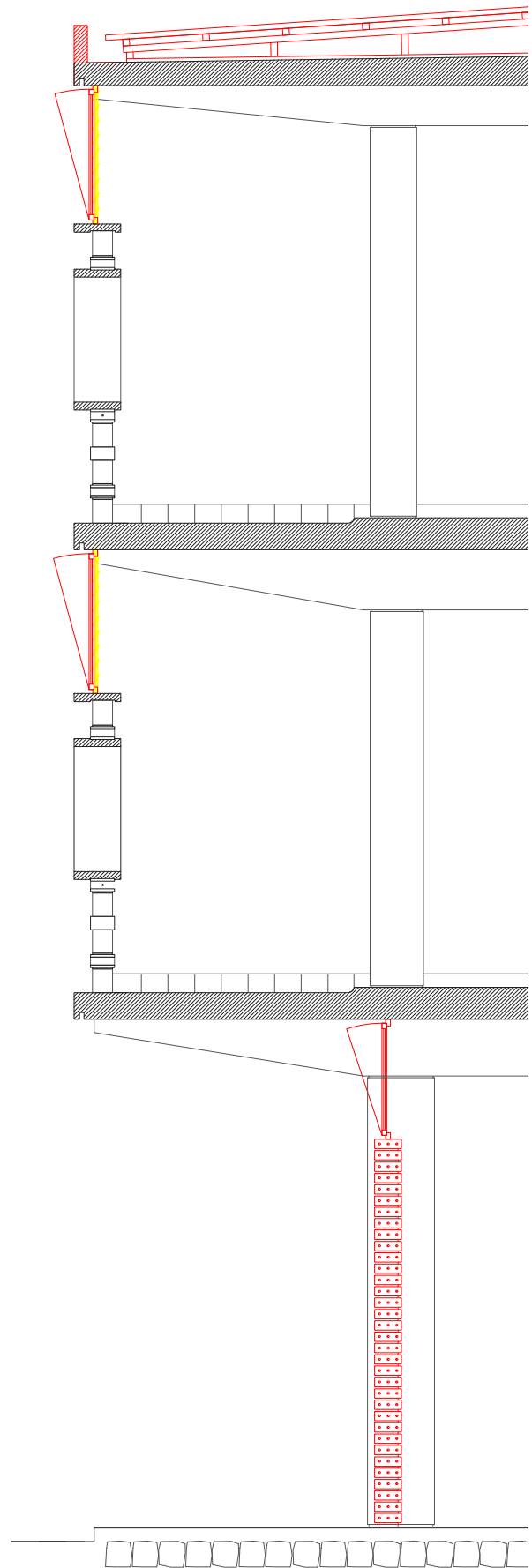
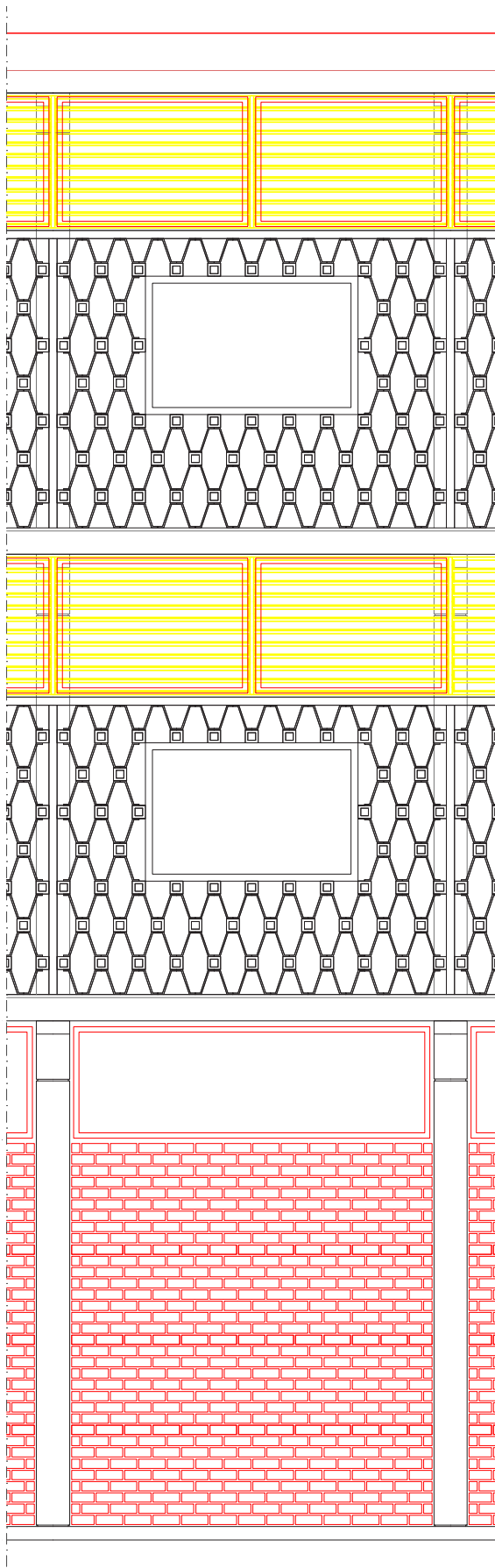


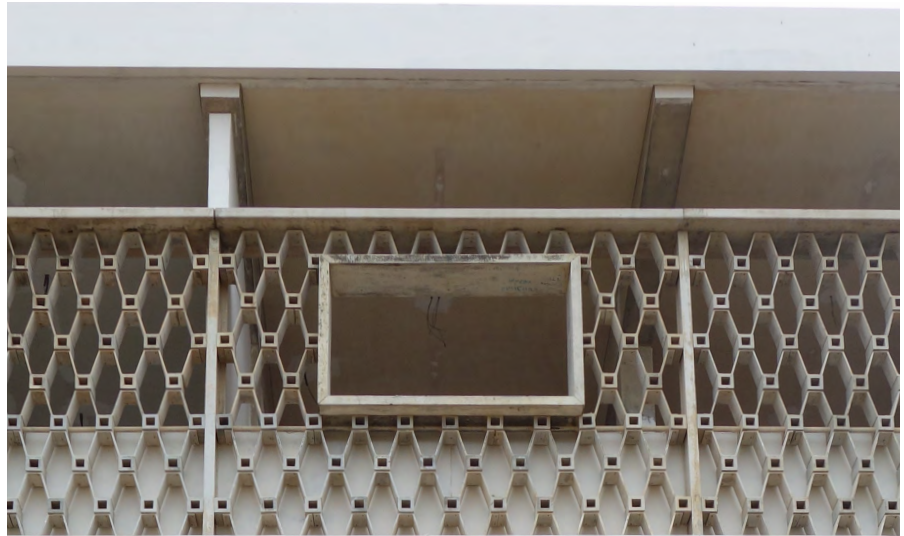






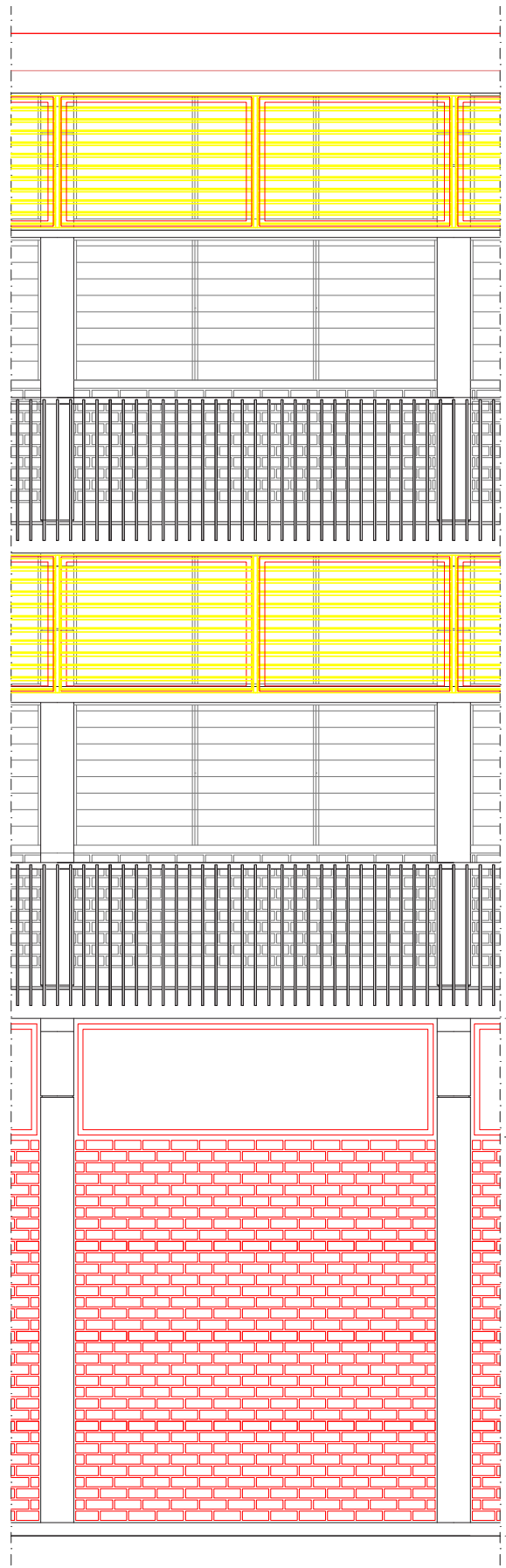
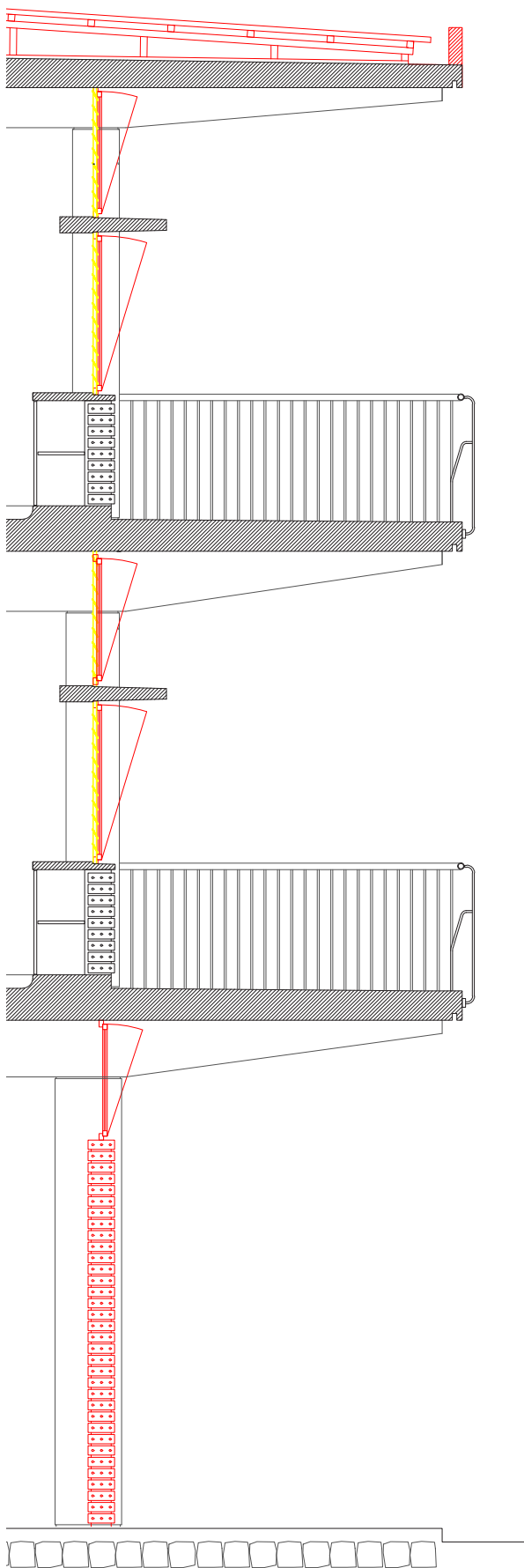














# **Faculdade de Medicina Veterinária, Vasco Vieira da Costa and José Quintão, Huambo, 1970-1974**

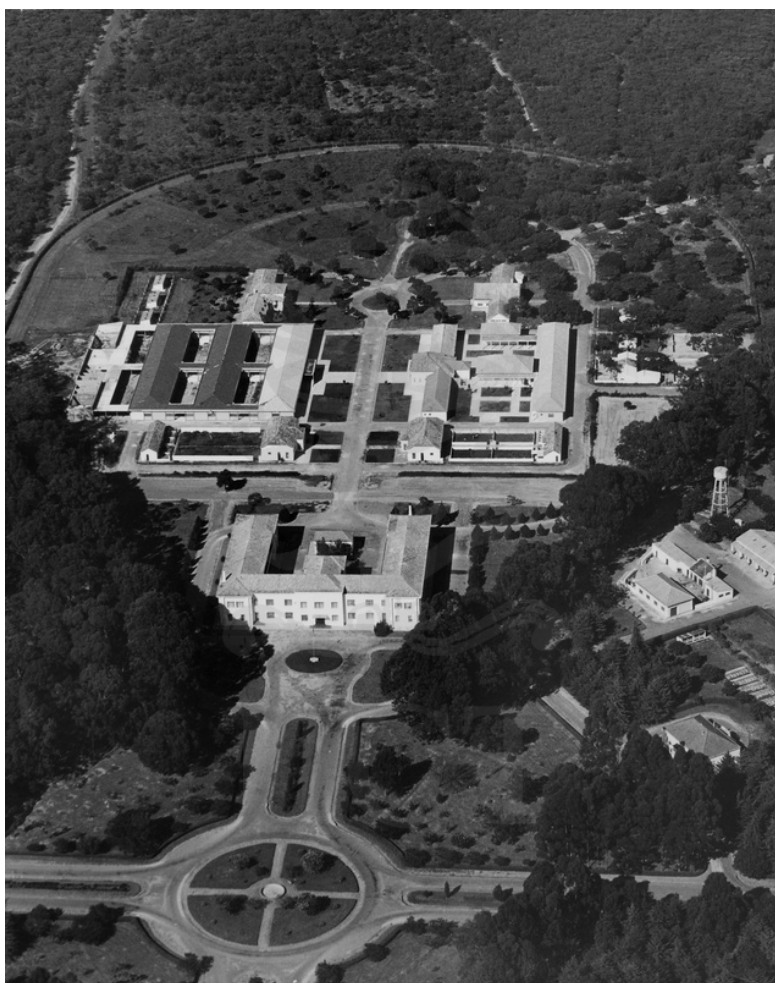
The veterinary faculty in Huambo was the most ambitious university complex developed in Angola in late 1960s. This major investment in the country's central plateau promoted the regionalization of college studies in an unprecedented manoeuvre to stimulate the agricultural development of the inland. The complex was erected progressively from 1969 to 1975 but the buildings that exist today represent only about 50% of the original plan.

The veterinary complex is representative of the last years of Portuguese colonialism and is simultaneously one of the greatest works by Vasco Vieira da Costa (1911-1982). At that time, he was a prominent architect in the country and had already completed some of the most modern and significant buildings of the capital city. Huambo's complex, and particularly the veterinary academic hospital, is one of the latest achievements of his career and the most noteworthy realization during the period in which he established a partnership with José Quintão (1940).<sup>1</sup> The natural conditions of Huambo promoted constructive and formal solutions that had never been tested by Vieira da Costa in Luanda. The work showed a clear brutalist tendency through the use of materials such as raw concrete and brick surfaces, which were unprecedented in his work.

In 1975, the construction of the veterinary faculty was interrupted by the rise of civil war that followed the country's independence. During the following

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<sup>1</sup> José Quintão and Vasco Vieira da Costa were partners from 1970 to 1973. He co-authored the Veterinary Academic Hospital (1971-1972).



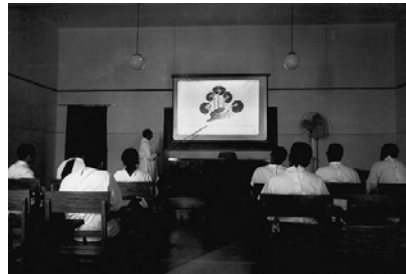
**IIVA Instituto de investigação  
veterinária de Angola**  
[IICT archive.]

decades, the buildings were abandoned and endured long lasting neglect due to the constant political instability. The country's central region was the main battlefield of the Angolan Civil War (1975-2002) and, additionally, the worst urban warfare occurred in Huambo in 1993, during the '55-day war'<sup>2</sup>. At that time, the complex was severely damaged and the veterinary academic hospital served as shelter for the population during the air strikes. The building was transformed into a military headquarters, alternately for the two opposing political parties, the MPLA and the UNITA. Although peace was restored in 2002, thirty soldiers are still nowadays living in the ruins to defend the building from vandalism. Nowadays, the complex is owned by the University José Eduardo dos Santos and its renovation is planned since the 2013 annual financial statement.

Since this complex was never previously studied in depth, this research is based almost exclusively on primary sources, such as project processes and descriptive memories held by Vieira da Costa's family, interviews with former students of the Angola's veterinary course and José Quintão, who co-authored the project for the veterinary hospital. At the same time, it was also important to go through Vieira da Costa's library in Luanda, which allowed me to learn more about his architectural references. I also consulted material catalogues, tender documents, and the architect's library of details currently in possession of the architecture faculty of the Agostinho Neto University, also brought data that allowed inquiring about the processes' systemization and constructive solutions. At the same time, the surveys performed locally in 2013 and 2014 enabled to verify in-situ the enforcement of the systems foreseen by Vieira da Costa and to detect some relevant transformations applied during construction. Posteriorly, drawings were introduced to identify and analyse those transformations. The work's reading presented here intends to offer a complete biography of the building, from the historic context that led to its construction, the project and building processes, culminating with this academic equipment's current situation description. However, what guides the reading is the building's response to Huambo's particular climate. Project options are observed, its pertinence is analysed and then the building's response through its current construction pathologies is examined. Thus, it is intended to conclude about the relevance of the project's analytic methods for the architectural conception of the veterinary hospital, questioning if the notion of tropical architecture was, or was not, used here as a commonplace. Withal, it is foreseen that the evaluation of the environmental control systems, namely what is concerned to the façade and roof's treatment, will allow establishing clear conclusions about its real efficiency and pertinence nowadays. Lastly, this critical analysis of the work and its passive environmental control systems proposes a definition of architectural intervention criteria starting from the original project solutions.

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<sup>2</sup>The '55-day war' occurred in Huambo following the elections of 1992. Confrontations between the parties MPLA and UNITA began on January 9, 1993 and lasted 55 days. During this period the city was barely destroyed. See: "The battle for Huambo" (1993) *The Economist*, 326, 7801, pp. 43–45.



**3rd year veterinary course at IIVA**  
[SOUSA, M.T. (ed.) (2014) Estudos Gerais Universitários de Angola. 50 anos- História e Memórias, Lisboa: Edições Colibri.]



## A Veterinary Faculty in Angola's Central Plateau

The veterinary faculty in Huambo is one of the tardiest university buildings developed during the colonial period of Angola. The establishment of college studies in the country in 1962 triggered the construction of a few educational facilities in the following years, but the veterinary school was the largest university complex planned by the colonial government outside the capital city.

In 1962, higher education was established both in Angola and Mozambique<sup>3</sup> as a result of the *Estado Novo*'s new political strategy that followed the outbreak of the Angolan War of Independence.<sup>4</sup> In the academic year of 1963-1964, six higher education courses were launched in Angola, namely medicine, engineering, pedagogical sciences, agronomy, forestry and veterinary medicine (Santos, 1970, p. 289).

Although the local government had prospects regarding a broader education system with a professional-oriented character, the solution found by the Portuguese government was more conservative and in line with the traditional university model established in Portugal. Furthermore, during its first years the Angolan organization was subsidiary of the Portuguese universities since academic degrees were exclusively awarded in the metropole. Only in 1968 the 'General University Studies of Angola' was considered autonomous and was given the title 'University of Luanda'<sup>5</sup>.

In 1963, the faculty of veterinary medicine opened in Luanda with 15 students enrolled in the first year, but a couple of years later the institution would be transferred to Huambo (former Nova Lisboa). The country's central region had better natural conditions for an efficient teaching of veterinary and, additionally, the local animal research institute (IIVA) could provide the necessary infrastructure and teaching staff for implementing the new faculty. The same strategy of decentralization of university studies was used in the case of the faculties of agronomy and forestry, which also moved from the capital city to Huambo the following year. In an analogous way, the faculties were based at the facilities of the agronomy research institute (IIAA) and their specialists were in charge of teaching. These transfers were driven not just by the need of regionalizing access to education, but particularly to grant sustainability to the new educational projects and take advantage of the few resources available in

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<sup>3</sup> Decreto-Lei nº 44530 de 21 de Agosto de 1962: Free translation: "Are created in the Provinces of Angola and Mozambique, the General University Studies, integrated in the Portuguese University. (...) in fact, the University is just one, intimately connected to the definition and perpetuation of a national unity's idea (...) teaching in the overseas provinces must be done in narrow association with the existing Universities."

<sup>4</sup> See chapter 1.

<sup>5</sup> Decreto-Lei nº 48790 de 23 de Dezembro de 1968: Free translation: "Ministries of Overseas and National Education: determine that the General University Studies of Angola and Mozambique would from now on hold the designation of, respectively, University of Luanda and University of Lourenço Marques."

**Project site**  
[Huambo, Angola]



the country.

The Central Laboratory of Veterinary Pathology had been established in Huambo in 1927. Besides being the oldest scientific research organization in the country, in the 1960s the laboratory had 1200 hectares of land and 10 buildings to perform animal treatments and research. At that time, it was one of the most important veterinary research centers in Africa, and employed more than a dozen veterinarians (Mendes, 2009, p. 227).

Although the laboratory construction started in 1927, works were interrupted several times and the main building was only fully completed in 1953. The colonial planning office (GUC) developed a master plan for the entire premises, presumably in late 1940s, authored by Luís Borges and João António de Aguiar (1906-1974).<sup>6</sup> The plan established an orthogonal grid with the same northeast-southwest orientation as the existing building. It created a large central boulevard along which the department buildings were symmetrically placed. The new urban composition started from the existing E shaped two-storey building and added monumentality to the set, in a consistent scheme with the building's traditionalist style. The laboratory's main entrance was facing northeast but the campus developed on the back and contained different department buildings, such as bromatology, equine immunization, swine immunization, experimental parasitology, bacteriology, rabies, bovines and autopsies.

In 1965, a ministerial act transformed the laboratory into a research institute "so it could respond to the multiplicity of veterinary medical problems and react to the urgent scientific occupation of Angola."<sup>7</sup> However, the most relevant assignment of the new Angola's Institute of Veterinary Research (IIVA) was providing support for the teaching of veterinary medicine at the newly established university. Therefore, the existing facilities were adapted to accommodate the 36 students that were transferred in the academic year of 1965-1966.<sup>8</sup> However, the number of students would rise in the following years and the university would be destined a portion of land in the area to create their new campus (Mendes, 2006, p.156).

In 1966, the director of the veterinary faculty, Prof. Ivo Soares, was appointed dean of the university.<sup>9</sup> He played a key role in developing the project of

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<sup>6</sup> Documents found at the Angolan National Archive show that the completion of the main building took place in 1953. However, the colonial planning office GUC (1944-51) developed the master plan prior to their name change that occurred in 1951 (Arquivo Nacional de Angola, Fundo Obras Públicas, 18.3.23; 18.3.38; 18.3.75).

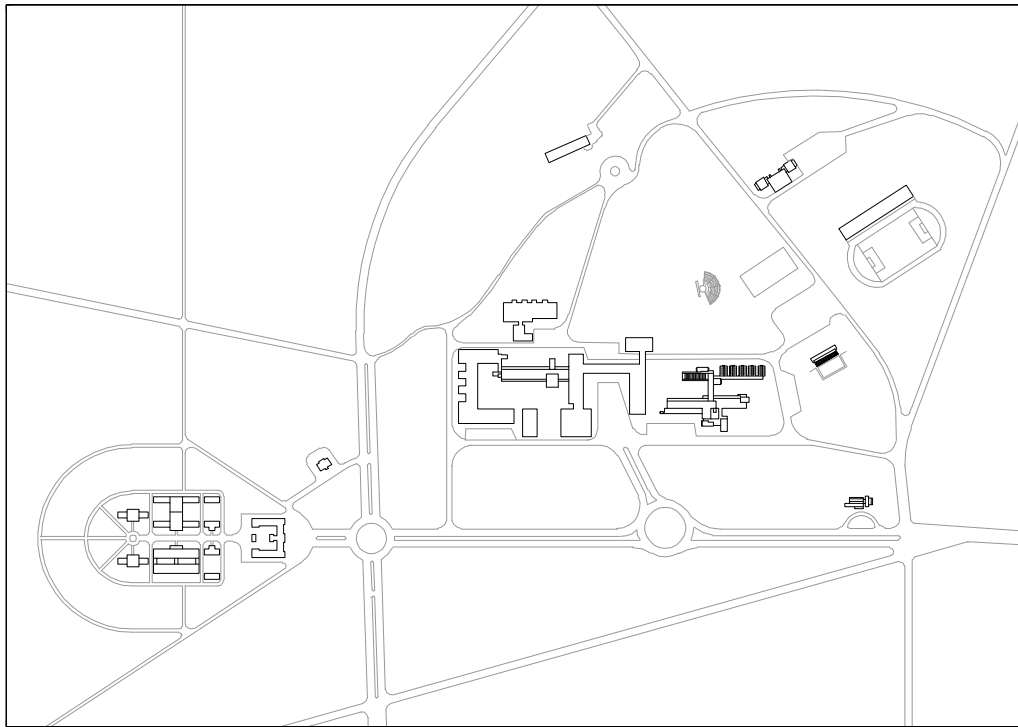
<sup>7</sup> Free translation: DL Ministerial nº 1, B.O.A. nº46, I série de 17 de Novembro de 1965.

<sup>8</sup> According to the data presented at: SOUSA, M.T. (ed.) *Estudos Gerais Universitários de Angola. 50 anos- História e Memórias*, Lisboa: Edições Colibri, p. 119.

<sup>9</sup> (1966) "O Dr. Ivo Soares é o novo Reitor dos Estudos Gerais Universitários de Angola", *Jornal O Planalto*, 8 de Março de 1966, p.3-4 in SOUSA, 2014, p. 336.

**Project site**

[Huambo, Angola]



**Masterplan project**

[Vasco Vieira da Costa archive.]

veterinary medicine in the country, namely by influencing the construction of the new university campus in Huambo. Right after his nomination, Ivo Soares commissioned the master plan for the new college facilities to Vasco Vieira da Costa.<sup>10</sup> The new dean was enthusiastic of this endeavor and very knowledgeable on the programmatic requirements for the new campus. Therefore, in the subsequent years he directly provided inputs during the development of the architectural design<sup>11</sup> and in 1968 organized a field trip to Pretoria with the architect and a group of veterinarians from the IIVA.<sup>12</sup>

The group went on a study trip to the Onderstepoort Veterinary Research Institute and the Faculty of Veterinary Medicine in Pretoria, South Africa. The Onderstepoort campus was the model to the renewed Angolan organization because it was the top reference in veterinary science in Africa. Additionally, it was the place where the IIVA's veterinarians completed internships and got specialisations (Mendes, 2009, p. 267). The relationship between the two institutions predates the establishment of college studies in Angola, as evidenced by the visit of the Onderstepoort director to Huambo reported in the local press in 1958.<sup>13</sup>

The Onderstepoort site was part of the University of Pretoria and was exclusively devoted to the teaching of veterinary sciences. The Faculty was founded in 1920 but had similarly developed from a Veterinary Institute formerly established in 1908.<sup>14</sup> It was the second oldest faculty of veterinary sciences founded in Africa, but in the 1960s its reputation was unparalleled. At that time, the Onderstepoort campus had an immense natural reserve, with 65 ha destined to the teaching facilities and 55 000 square meters of total building area.<sup>15</sup>

The new Angolan faculty aimed at excelling in the same scientific field and ultimately equating to the South African organization. Therefore, an area of 72

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<sup>10</sup> Ivo Soares is sworn in dean of General University Studies of Angola in 31 March 1966. Remains in office until 1974. SILVA CUNHA, J. M. (1966) *Na posse do reitor dos Estudos Gerais de Angola*, Lisboa: Agencia Geral do Ultramar.

<sup>11</sup> José Quintão mentioned Ivo Soares participation during the design process in an interview on June 18, 2013.

<sup>12</sup> According to João Serôdio de Almeida, in an interview on July 18, 2013. João Serôdio de Almeida graduated from the Nova Lisboa's Faculty of Veterinary Medicine in 1972.

<sup>13</sup> Dr. Raymond A. Alexander visited Huambo in 1958 invited by the Government. During his stay in Nova Lisboa he gave an interview to the local newspaper, in which he praised the city's stimulating climate and the laboratory's exceptional technical and scientific facilities. *A Província de Angola*, 2 August 1958.

<sup>14</sup> A Swiss-born veterinarian, Arnold Theiler, founded the Onderstepoort Veterinary Institute (1908) and was also the first Dean of the Faculty of Veterinary Science of the Transvaal University College (1920).

<sup>15</sup> BERTSCHINGER, H. J (1991) *The Onderstepoort Faculty of Veterinary Science: past, present and future*, Nuwe reeks no. 276, Pretoria: University of Pretoria, p11.





**West view**  
[Margarida Quintã, 2014.]



**Teachers' block**  
[Margarida Quintã, 2014.]



ha was provided to the development of the new university campus within the 1200 ha of natural reserve that originally belonged to the IIVA. The first drafts of the Angolan campus dated from 1968 show a complex with around 30 000 square meters, even though the faculty had only 93 students at that time.

Concerning architectural developments, South Africa was the major cultural hub in Sub-Saharan Africa. Brazilian modern movement influenced South African Post-war architecture, as suggested by Pevsner on his 1953 article on Johannesburg modern architecture.<sup>16</sup> However, South African scholars have argued later that Pretoria fits better Pevsner's description of a "little Brazil".<sup>17</sup> The University of Pretoria developed significantly during the 1960s with Brian Sandrock (1925-1990) as main architect. In 1968, he had just finished the Administration Building, a massive reinforced concrete structure that became notorious by its bold shapes and brutalist elements. In its turn, the faculty of veterinary science combined several buildings in brick and raw concrete, which seem to have inspired not only the organizational scheme but also the functional and formal solutions later developed in Angola.

Vieira da Costa's visit to Pretoria in 1968 was seemingly influential to his subsequent project in Huambo, insofar as there has been a significant formal change from earlier works, especially with regard to the use of materials. Brick surfaces and raw concrete emerged in Huambo for the first time but its use became current in other Vieira da Costa's contemporary designs such as the Hydraulic Pavilion at LEA, Luanda (1969) or the *Mocidade Portuguesa* Students Residence, Luanda (1970).

The veterinary academic hospital is one of the architect's last designs so, at that time, he was already a reputed architect in Angola. He had developed a large number of public and private buildings during the last two decades, predominantly in Luanda. His projects in the capital city tackled different typologies but always presented identical constructive systems, showed great economy of means and a systematic approach towards climate responsive design.

By reading Vieira da Costa's texts and project descriptions becomes clear that achieving comfortable interior environment without artificial cooling was his first obsession in any commission. Attaining what he considered the desirable interior qualities was a process that used analytical design methods and prior scientific knowledge on the site's weather parameters, solar chart and wind rose.

In Luanda, his buildings are synthetic structures, in which the mass is almost

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<sup>16</sup> See PEVSNER, N. (1953) "Johannesburg: the development of a contemporary vernacular in the Transvaal", *The Architectural Review*, June 1953, p. 361-382.

<sup>17</sup> See, for instance: GERNEKE, Gus. (1998) "From Brazil to Pretoria: The Second Wave of the Modern Movement", in FISHER, R.C.; LE ROUX, S.W.; MARÉ, E. (eds.) (1998) *Architecture of the Transvaal*, Pretoria: University of South Africa, p. 196-226.

completely reduced to the floor slabs because outer walls are thin and as few as possible. Simultaneously, openings are numerous and wide to promote continuity between inside and outside spaces. Natural ventilation systems are crucial to his Luanda's designs in order to deal with the constant temperatures and high humidity. Additionally, shading devices varied according to the building's orientation and were recurrently dimensioned with great precision (Quintã, 2007).

Contrarily to Luanda's hot-humid climate, Huambo presented a subtropical highland climate, with heavy rains throughout the year and high daily thermal amplitude. Therefore, the Veterinary Academic Hospital shows rather different architectural solutions from the previous buildings he designed. In this case, the same consistent approach to climate responsive design delivered a massive and compact building instead of a lightweight structure.

However, in addition to a different climate and to the South African influence, the late period of Vieira da Costa's career was also marked by other factors and collaborations. In late 1960s, several young architects worked at his studio or at the LEA, namely Manuel Correia Fernandes (1969-71), José Quintão (1970-74), António Madureira (1972-74), António Falcão, Paula Alves Pereira, Teresa Saint-Maurice, Michel Toussaint and Troufa Real.<sup>18</sup> In 1970, Vieira da Costa established a partnership with José Quintão, who was a young architect who graduated from ESBAP in 1970 and who had been working in his office for only one year. Quintão was born in Mozambique (1940), studied architecture in Portugal (1960-65) and moved to Angola in 1969. Their partnership would be short and was broken when Quintão moved back to Porto in 1974. However, during their brief collaboration they co-authored several designs, such as the Guedal Nova Lisboa (1972-74), the CAAOP building (1971-73) and the Veterinary Academic Hospital (1971-72).<sup>19</sup>

Further to the indisputable influence from Le Corbusier's work, which was always relevant in Vieira da Costa's architectural production and self-declared by the architect, here the influence of British and American authors seem to be significant as well. In fact, his library in Luanda shows an indisputable turn from a post-war French culture to a predominant Anglo-Saxon influence in late 1960s. For instance, during the 1960s and 1970s, Vieira da Costa collected the American magazine *Architectural Forum* and the British magazine *AJ - The Architect's Journal*, instead of the French and Italian publications that he subscribed earlier.

An analogous change occurred with the architect's travel destinations. Vieira da Costa lived in Angola from a very young age and only left the country for

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<sup>18</sup> Interview with José Quintão and António Madureira, May 15, 2018.

<sup>19</sup> Although Vieira da Costa is the single author of all the remaining buildings of the faculty of veterinary medicine, both architects authored the architectural design of the hospital, which was developed in two stages from 1971 to 1972.

studying architecture. He spent a large period in Europe from 1940 to 1949, living in Porto and Paris. Nevertheless, after moving back to Luanda in 1950 only occasional travels outside the country are reported. Journeys to Brazil, South Africa, Portugal and France took place over the years.<sup>20</sup> However, from 1954 onwards Vieira da Costa travelled regularly to the US since his wife was an American and their family lived in New York. He visited every four years and the city became his most frequent destination outside the country.

Vieira da Costa designed a significant set of buildings in Angola, but the veterinary academic hospital is the latest, most ambitious, and yet most overlooked building of the architect's career. Perhaps this is due to its peripheral location in the country or to the fact that the building remained unfinished till today. However, the building brings new light on the last tendencies of Vieira da Costa's oeuvre, which was interrupted by the civil war in 1975. He then dedicated himself exclusively to teaching at Angola's Engineering Laboratory and to the establishment of Angola's Faculty of Architecture.<sup>21</sup>

Building a university complex in central Angola during the liberation war, which was undergoing for more than 8 years, was apparently a bizarre strategy of Portuguese colonial rule. Moreover, the plans that have been located during the course of this research show much larger developments that should be implemented in the following decades. Although the faculty and facilities were developing slowly, the goal was to create a veterinary school that could become a benchmark institution in Africa.

This process was largely influenced by local agents, who seemingly believed in the continuation of the existing power structures despite the inevitable, and much anticipated political change. Vasco Vieira da Costa was close to Angola's colonial government, and particularly to the young University of Luanda. He had the opportunity of developing a teaching complex with an extraordinary program, which he himself developed. Although the ambitious plan has been left incomplete, the veterinary academic hospital has been built and is an enormous reinforced concrete structure that takes advantage of the mild climate and plateau landscape of Huambo.

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<sup>20</sup> According to his son, the architect traveled to Brazil in 1955 and in 1972; visited South Africa in 1968, namely Pretoria's University, and in 1969 went to Cabo to participate at the Expo. Later, in 1970, he stayed in Europe for a couple of months to visit Portugal and France. Interview with Mário Carr Vieira da Costa, December 1, 2014.

<sup>21</sup> The Faculty of Architecture was established in Angola in 1979, three years prior to his death.

## **Design Phases of the University Campus**

Project and construction of the veterinary faculty campus were managed by phases, as it was usual for educational buildings with public character. The architecture project started in 1969 and in that same year the first building of the complex was also completed. The occupation of the built volumes was made gradually, as they were being finished, but when construction was interrupted in 1975, the campus was still far from being completed.

The material sourced in this thesis' scope allowed for a chronological reading of the project's process and of the several volumes' construction. The description presented follows a time sequence, with text being divided into sections that characterize each of the designed buildings. Nevertheless, the veterinary hospital building, which today is the main built element of this complex, is analyzed in detail on the following section.

Thus, in this section, the campus is presented, which had its start in 1969 and kept being adjusted until 1974, and then the Outpatients' clinic project, whose process dates from 1969 and whose construction occurred the same year, and the Sports field, designed and built in 1970.

Also briefly presented here are some of the un-built projects that completed the complex, such as the riding hall, from 1972, the shooting range, from 1973 and the animal production institute, from 1974.

### **Master plan (1969-1974)**

Vasco Vieira da Costa developed the first master plan for the university campus in 1969. At that time, he also completed the construction documents phase of the outpatients' clinic but the rest of the buildings were merely represented as functional organograms. The 72 ha land allocated to the university was positioned 3km south from Huambo's city center and adjacent to the main road connecting Huambo to Cuima. The IIVA premises were at the southern end of the university site so its urban arrangement was the starting point to Vieira da Costa's master plan. The architect extended the existing monumental axis to the northern end of the plot and created a new and exclusive entrance to the university campus. However, the new buildings did not conform to symmetrical composition schemes but were instead separated from this axis. While the buildings destined to the teaching facilities were placed in a central hill, a few smaller constructions and sports fields were scattered along the plot's natural slope.

Vieira da Costa placed the university buildings 300 meters away from the main road. In between, a dense wood was planted so the facilities would be completely disconnected from the outside and, consequently, immersed in the nature reserve. The only building establishing a relationship with the limits

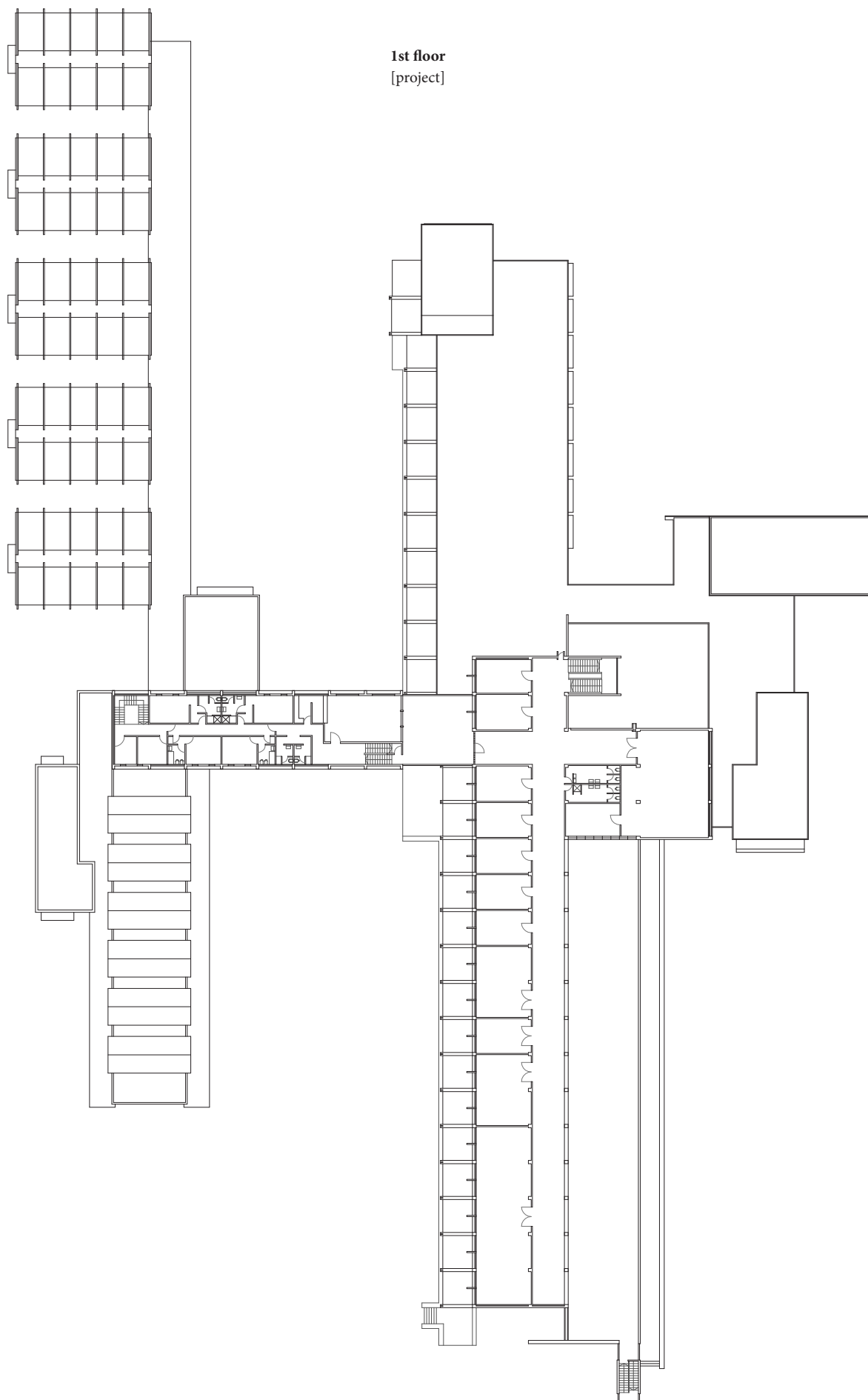
of the plot was the outpatients' clinic because the program required an easy access to the public. Consequently, the building was placed close to the gate and served simultaneously to control the access to the premises. Since all the other buildings were located inside the plot, the architect was free to choose the best building orientation, which, in his words, incorporated concerns with the sun path and the terrain's natural slope.<sup>22</sup> Nonetheless, most buildings followed a parallel orientation to the main axis of the IIVAs premises. This geometric alignment agrees with the pre-established order and brings a formal coherence and rationality to the whole plan. As a result, the new university buildings predominantly had a southwest-northeast orientation, while other structures obeyed to different composition schemes. For instance, the sports fields were east-west oriented because of the sun path, and the shooting range and the amphitheater were adjusted to the natural slope.

The last master plan is dated from 1974, which confirms this was an ambitious on-going project. The plan shows the completed structures: the outpatients' clinic (1969), the sports field (1970) and the veterinary academic hospital (1971-1974); the buildings with construction documents phase finalized: the riding hall (1972), the shooting range (1973) and the animal production institute (1974); and still a few buildings 'in draft'. All the site plans, which are dated from 1969, 1971 and 1974, show a few variations in the arrangement of volumes but the general strategy was the same from the beginning. The differences noted result mainly from the fact that the architectural design had not been fully developed in any of these stages. In 1969, only the outpatients' clinic had a rigorous blueprint while the other buildings were merely represented as polygons allocating areas to program requirements. In 1971 and 1974, as the architectural design and construction works were developing, the site plan was becoming progressively more detailed. Yet, around 50% of the foreseen building area had not yet been fully designed in 1974.

The fact that in 1974 not only construction works were under development but also new buildings were being designed indisputably shows that the veterinary project was still very much incomplete when the works ceased in 1975. It also demonstrates how remarkably ambitious the project was, and how clearly the institution aimed at rivalling with the South African faculty of veterinary medicine. The university complex in Huambo was an impressive endeavour in the African context and it was being planned for progressing significantly during the following decades. Although the Portuguese state was supporting the developments, the local agents, such as the university rector, had the major role in pushing these great aspirations. Vieira da Costa was an accurate interpreter of the university's ambitions and proposed an architectural solution to the site that was consistent with the current Angolan context.

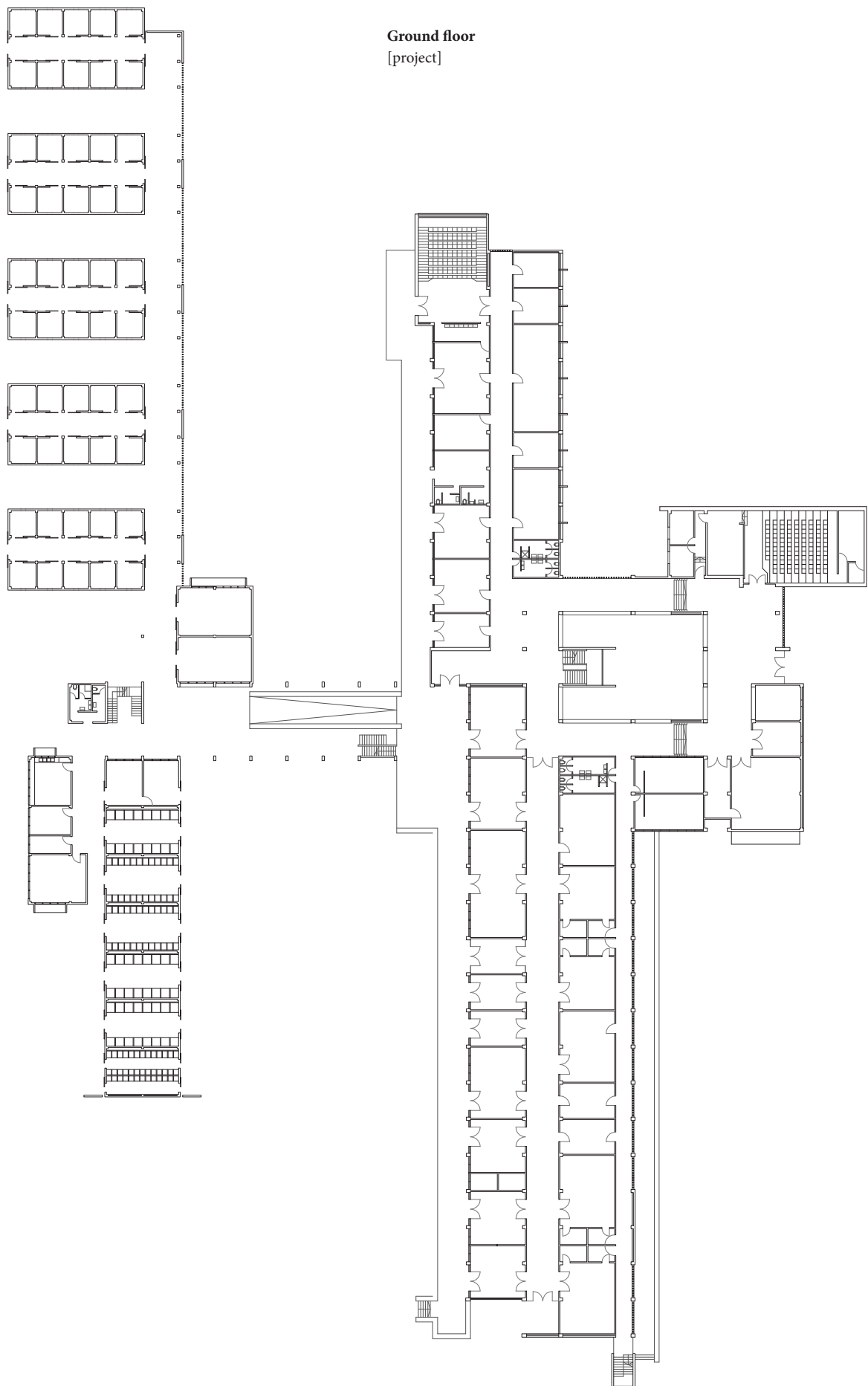
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<sup>22</sup> He often mentioned these concerns, namely in the project description of the sports field (1970) and the riding hall (1972).



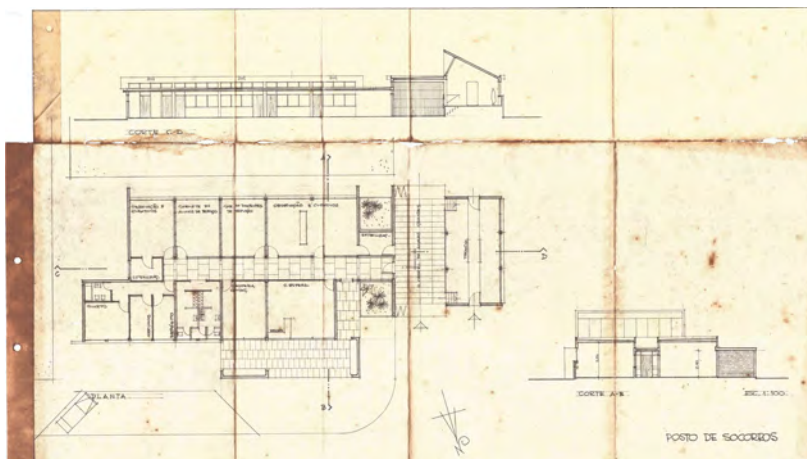
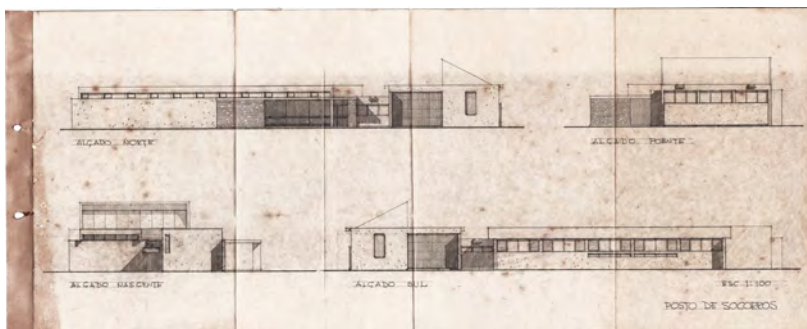


Ground floor  
[project]





**Outpatients' Clinic**  
[Margarida Quintã, 2014.]



**Outpatients' Clinic**  
[Vasco Vieira da Costa archive.]

Developing a valid and present-day architectural language was a concern expressed by the architect in the official project description. He showed his opposition to a traditionalist architectural style by rejecting the use of “false monumentality” in order to achieve the “architectural dignity” required by the university (Vieira da Costa, 1971, p.1). This statement shows an inherent criticism to the conservative structures developed by the colonial urbanization office at the IIVA’s premises. Although Vieira da Costa’s master plan integrated the urban scheme that was previously established, it broke with the traditionalist symmetrical plan and proposed a more harmonious relationship with the site. Instead of reproducing a monumental urban order, the architect created an organized system that connected the new buildings with the natural landscape. Vieira da Costa’s plan also shows an opposite attitude to the formal arrangements of university buildings erected contemporarily in Portugal, namely the monumental complex of the University of Coimbra (1942-1969, by Cottinelli Telmo and Cristino da Silva).

In the architect’s view, the university’s grandeur should be, nevertheless, represented by a coherent and uniform architecture. The formal solutions he addressed ought to give material expression to the institution’s ambitions of excellence and innovation. Furthermore, the architectural design should be suitable to the local reality and evocative of a novel culture. Similarly, Ivo Soares declared in 1972 that the Angolan university should no longer “follow the travelled paths” but instead “accommodate to local realities and respond to the contemporary evolution of knowledge and technology”.<sup>23</sup> Vieira da Costa was giving shape to the rector’s goals with an architecture that was both up-to-date and adapted to local climate and landscape.

### **Outpatients’ clinic (1969)**

The outpatients’ clinic was the first building erected in the new university campus. The architectural design was finished in 1969 and construction works began immediately. At first, the building was also used for the faculty secretarial services, while classes were still taking place in provisional facilities at the IIVA.

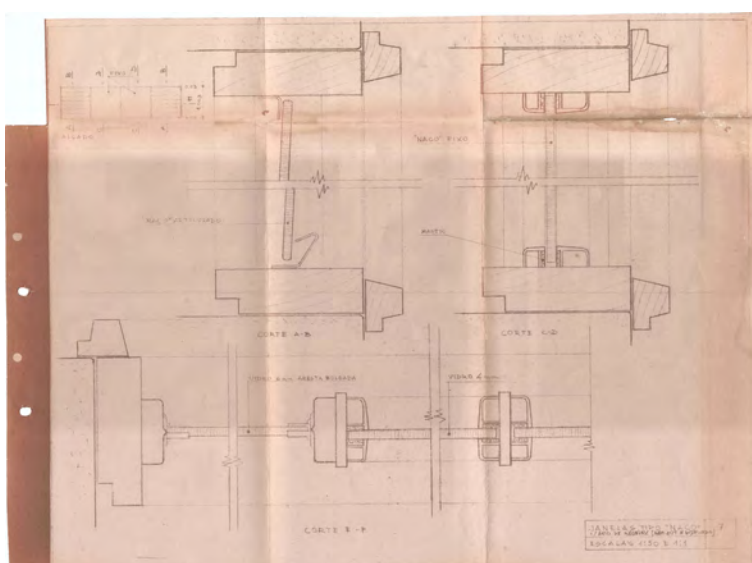
The outpatients’ clinic only provided preventive veterinary medical care. It had no laboratory capabilities and was merely equipped for minor surgical procedures. The most complicated diagnoses required collecting samples that would later be tested at the IIVA’s laboratory. While the veterinary academic hospital was under development, surgeries were also performed at the IIVA. The clinic could not respond to emergency situations, but more extensive treatment options would later be offered at the hospital, which had all the

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<sup>23</sup> SOARES, I. (1972) *Investigação e Ensino Superior*, Luanda: Universidade de Luanda, p.2.



**Outpatients' Clinic**  
[Margarida Quintã, 2014.]



**Window frame detail**  
[Vasco Vieira da Costa archive.]

necessary equipment and enough room to keep injured animals overnight.

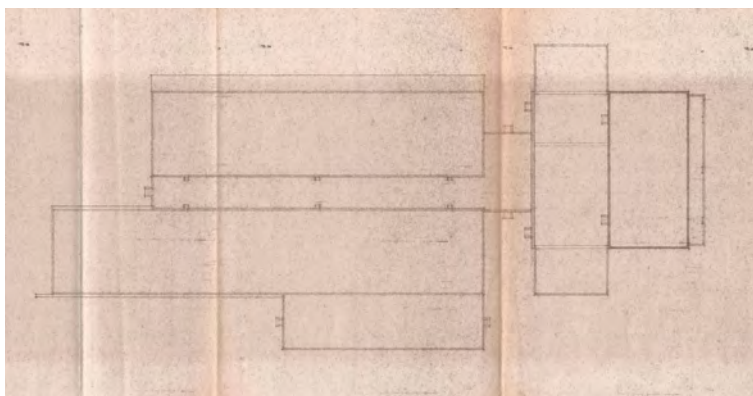
Therefore, the clinic was a simple building with 450 m<sup>2</sup> and a compact program. The building follows the southwest-northeast axis, which is the predominant orientation of the complex. The building entrance is located in the southeast façade, which has a large porch adjacent to the reception area. A central corridor distributes the different treatment rooms and is accessible from both the waiting room and the outside. There is a chamber for a resident veterinarian at one end of the hallway and a large observation room at the other. This room is located in the extreme north of the building and is destined to treat large animals. Therefore, it stands out from the set due to its larger height and to the sizeable gateways that allow access to horses and bovine animals. Placing two gates in opposite facades generated a circulation area for large animals and an observation plinth for veterinarians, which is 80 cm above ground.

The building, although of small scale and with a simple plan, demonstrates a work of volumetric articulation, which is not frequent in previous work by Vieira da Costa. The building has several roofs at different heights that correspond to interior spaces with distinct functions – the porch and central corridor are 2.40 meters high, treatment rooms are 3.20 and the observation room has a ceiling 5 meters above the floor. The different levels of roofing have a similar water drainage process, being carried out through large dimension gargoyles (54x40cm). The water from the higher roofs is drained for the next roof and only then to the ground. This way a more franc drainage of all roofing is guaranteed, but the discharge points to the soil are controlled. Most of the rainwater is conducted to two small landscaped patios that separate the observations room from the rest of the complex.

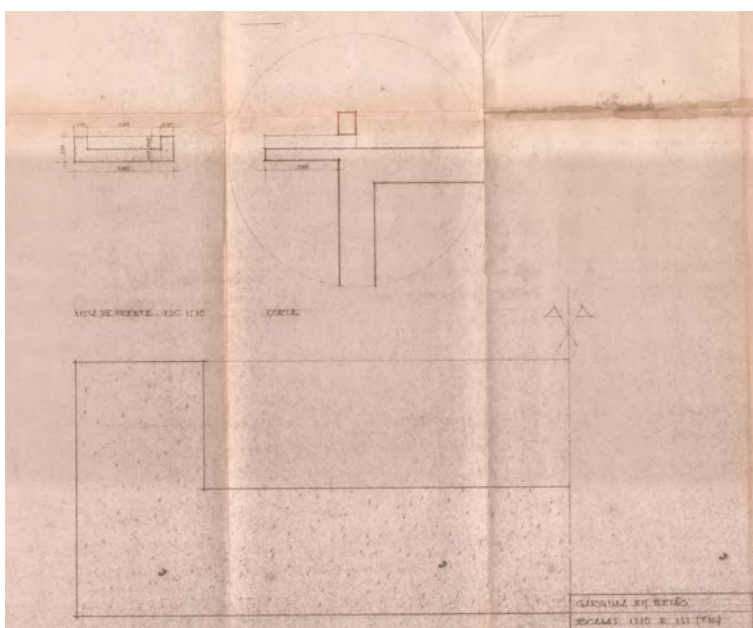
Being the high rainfall a determinant climatic factor in Huambo, it is natural that Vieira da Costa had considered it in his architectural composition. In fact, the drainage of a single flat roof would have placed some difficulties to its flow.

Subdividing the roof into sections and creating an articulated system to conduct the rainwaters according to different heights, is a clever and simple system that allows for controlling soil erosion. The drainage becomes visible; it is a composition element, also emphasized by the large raw concrete gargoyles. In this case, the concern with rainwater drainage seems to have been more relevant for the building's formal composition than shading, as it was usual in Vieira da Costa's work. Luanda's buildings are usually open structures shaded by fixed *brise-soleils* or by movable shading systems, which acquire a very expressive formal relevance and determinant of the building's language. Here the building has large blind plans and relatively small openings, in such way that the apertures' shading does not have a significant expression in the whole. However, fixed thin concrete blades prevent the entrance of direct sunlight in office windows, between 14 and 16 pm. The incoming of low sunlight in





**Outpatients' Clinic**  
[Margarida Quintã, 2014.]



**Gargoyle detail**  
[Vasco Vieira da Costa archive.]



late afternoons (between 16 and 18 pm) would be controlled through interior moveable blinds.

Despite being a tempered climate, the architect was concerned in creating a cross ventilation system for the medical offices. High windows were placed on the opposed façade that, taking advantage of the height difference between the rooms and the corridor, ventilate the space directly to the exterior. The window frames applied are from Naco, in this case, with fixed surfaces and glass blades with adjustable opening.

The building has a simple reinforced concrete structure and 4 meters structural spans, corresponding to the medical offices' width. The observation room, a space with great dimension to receive large animals, is made of two 4.5 meters width structural modules.

Inside the spaces were applied a reduced number of materials, according to the building specifications report and what was able to ascertain on the site visit. Floors were mainly in hydraulic mosaic and tiles coated the walls. Only on the entry area was applied a noble pavement, granite, and the walls were plastered.

On the outside, materials acquired a more markedly raw character. The architect used apparent concrete on linear elements and applied brick cladding on more extensive surfaces. Also applied two kinds of plaster with different textures, a thin grain on roofing slabs and a tyrolean, with high roughness, on exterior walls on the main façade and on the observations room's volume. That way, although the range of the applied materials was narrow, as usual, different types of finishes ensure a variety of surfaces, which was uncommon to his work until then.

Here, the juxtaposition of compact volumes and its materiality grant the work a brutalist expression. Whilst this is a clear tendency of this period of the architect's work, the veterinary medical complex is the only built example where raw concrete and brick are used. In this small building, prior to the veterinary hospital, materials are used in a different way than usual; the concrete is not protected by plaster and brick surfaces are used in the exteriors for the first time.

The building is designed with blunt shapes, with breaking of surfaces and the addition of volumes. The resource of architectural elements such as fixed shading slates or gargoyles suits the climatic mediation function but simultaneously acquires aesthetic value, by their systematic presence and concerted presence with the raw/rough shapes of the building.

The clinic served as laboratory to test some formal solutions that were then repeated in the hospital, namely what concerns the volumetric articulation tendency and the use of materials. The building's solar orientation was the same as the rest of the complex, so that the solutions tested for the openings,



**Sport's Field**  
[Margarida Quintã, 2014.]

window frames and shading were also reused with no great changes. However, these formal solutions gain an amazing dimension when applied on the veterinary hospital. The same precepts were perfected and amplified to a larger scale, and gave origin to a complex and radical building in Angola's context.

### **Sports field (1970)**

The educational complex also included leisure and sports equipment,<sup>24</sup> being that the only one built, in 1970, was an exterior sports field with a side bench to fit about 500 spectators. Locker rooms were placed under the bench, taking advantage of the terrain's slight slope and allowing the service areas' access to not be seen from the playing field. The bench is divided in two equal volumes that correspond equally to two locker rooms, creating an access corridor between both bodies, which allow the connection between service and playing areas.

There is a 70cm difference between the flooring height of the service volume and the field, so that the elementary concrete structure that simultaneously builds the bench can also serve as roofing for the locker rooms. In the connection of the flat locker rooms' roof with the tilted plan, a continuous window is formed for the entering of indirect light. Seen from the section, the slight height gap between the two plans allowed for creating of a void that also serves as the space's natural ventilation device, guaranteeing in an elegant manner the building's salubrity.

Solar orientation was also one of the architect's concerns, expressed in its descriptive memory. The sports field is oriented after the north-south direction, considered ideal for outdoors sports fields. Vieira da Costa further explained that the benches were placed in a way that spectators would have their backs facing west (Vieira da Costa, 1970, p.1), from which is presumed that most games occurred during the afternoon period. This orientation was also chosen for other non-built equipment, such as the soccer field, athletics track and riding hall.

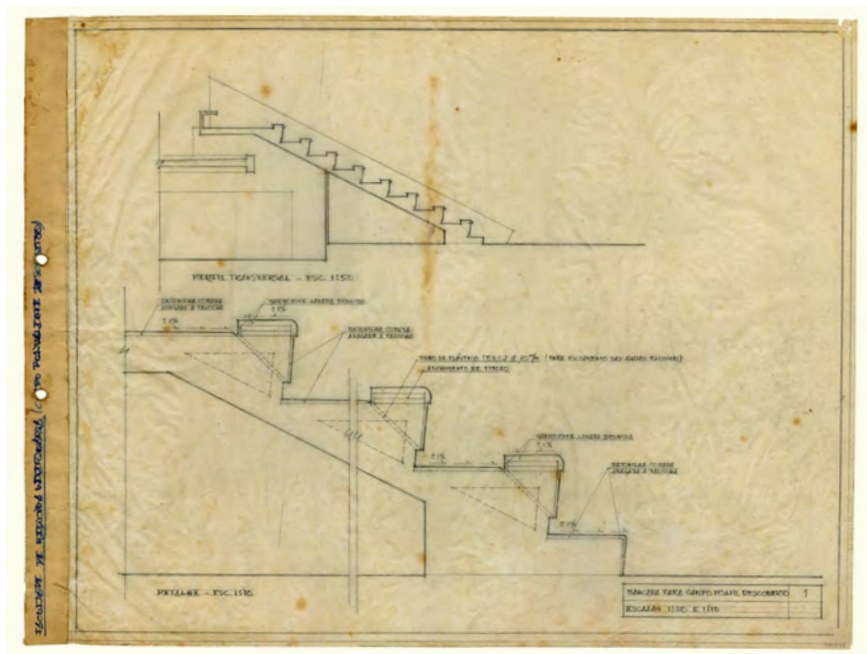
The building is succinct and elemental, yet revealing great design precision and intelligence in articulating spaces. There is also an expressive care in colour and material use, especially with paving, combining concrete with *marmorite*. The staircase is simultaneously façade and roof, and therefore water drainage is assured through a slight slope and drainage pipes hidden in the steps. It is also designed as a façade visible from the field, conjugating two identical monumental stairs, delimited by triangular concrete walls. The floor is red and the seats, although being fixed concrete elements, seem to land

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<sup>24</sup> The sports field is 11 x 22 meters, which is close to a regular tennis court. There is another sports field in the masterplan, which is 45 x 90 meters, probably a soccer field with an athletics track. There was also an open-air amphitheatre in the masterplan.



**Sport's Field**  
[Margarida Quintã, 2014.]



**Sports' field**  
[FAUAN archive.]



**Sport's Field**  
[Margarida Quintã, 2014.]



over the stair, rising about 10cm and highlighting them through colour and finishing.

### **Non-built: riding hall (1972) and shooting range (1973)**

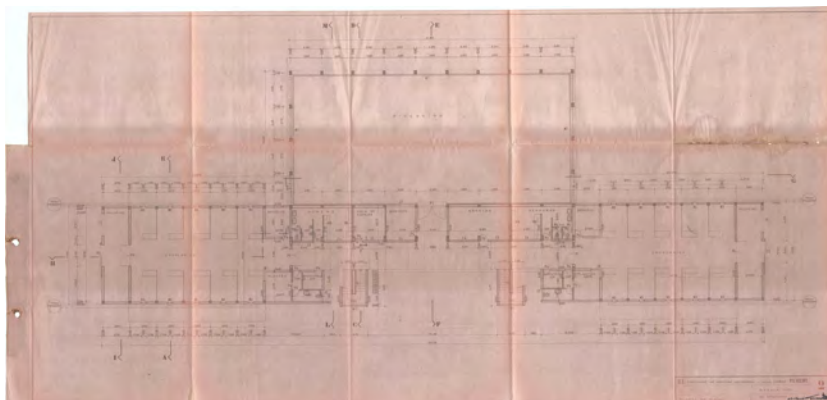
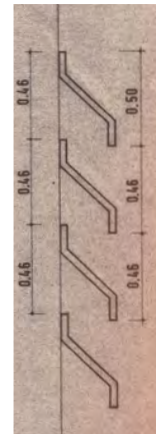
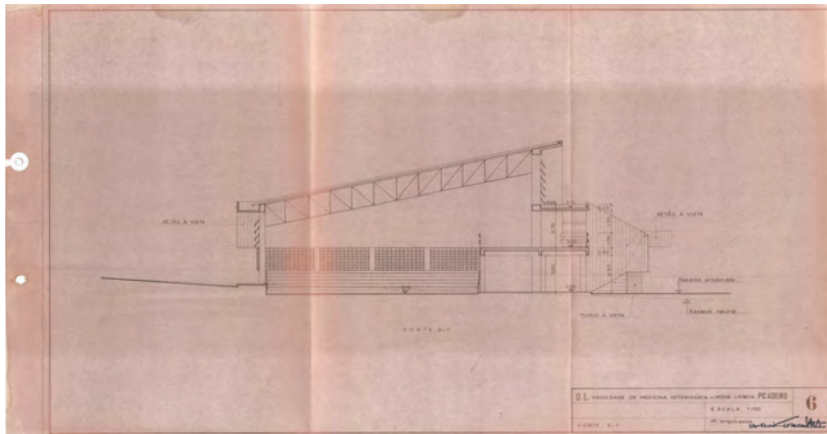
The university complex's project that started in 1969 contemplated a set of buildings that were being detailed over time, just as construction moved forward. However, there are two buildings that correspond to equipment with sports character whose execution project was completed but construction never initiated. That is the case of the riding hall, from 1972, and the shooting range, from 1973.

In the sphere of this research, elements were traced related to these two projects, however only the riding hall process is complete. Of the shooting range, only the descriptive memory and the building's location are known. Vasco Vieira da Costa signs the riding hall's process in co-authorship with José Quintão since it dates from the time both were partners. As for the shooting range, designed the year after, it is a process conducted exclusively by Vieira da Costa.

In both cases, the descriptive memory references the conditioners that influenced the building's orientation. The shooting range was rigorously oriented after the north-south axis, being that, according to the architect, this was an essential requirement of the program. The building's access is done from the north flank and it would be necessary to construct embankments to accommodate the shooting range in this orientation. Still according to the descriptive memory, this pavilion is the furthest construction from the complex for security reasons (Vieira da Costa, 1973, p.1).

The riding hall, by its turn, was implemented with a displacement of 5 degrees from the north-south orientation, as well as the other sports equipment. While the sports fields and the shooting range, being outdoors spaces, were implemented this way due to solar route, in the case of the riding hall this orientation is due to the natural slope of the terrain, which the project tried to follow to prevent unnecessary soil movements. The architects caveat, however, that this is an unfavourable orientation for the building, seen it exposes the façades with greater length to east and west (Vieira da Costa, Quintão, 1972, p.1).

The riding hall's program included an arena, stalls and complementary amenities, such as sanitary installations, locker rooms, director's office and barns. The building has a symmetrical composition in which the volume assigned to the arena, with 600m<sup>2</sup>, occupies a central position, and the stalls, divided in two blocks, were displayed laterally. The riding hall is a volume with large dimensions, with double height ceiling and sloped roof, allowing for the installation of a tribune over the service areas on the ground floor. The stalls are



### Riding Hall

[plan, section and detail ;Vasco  
Vieira da Costa archive.]



volumes with single height ceilings, placed on each side of the main hall.

As in the remaining buildings of the complex, the applied materials would, fundamentally, raw concrete for structural elements, brick cladding and concrete grids. There are only significant differences in the shading elements used, since for this solar orientation the concrete slabs, used in the hospital and clinic, would not be at all sufficient. This building required the installing of other type of shading devices, whether due to the riding hall's volume or the unfavourable orientation of the west-east longer façades. Thus, it was foreseen that the continuous openings facing these orientations were shaded with fibrocement blinds, which would allow to filter sun light and simultaneously favour a constant ventilation of the interior space.

The fibrocement elements that were designed for the riding hall are a solution that Vieira da Costa employed in a recurrent manner in industrial naves, namely at the Fabimor bicycle factory, in Luanda, or the Guedal repair shop, in Huambo. Although the arena was a covered space, it will be widely ventilated from its four façades: to the north and south, the lateral façades were composed of pre-fabricated concrete grids; to the west, the public access openings were composed of wood venetians.

#### **Non-built: Animal Production Institute (1974)**

The animal production institute's project was finished in 1974. In the scope of this research were only tracked the building's descriptive memory, the reinforce concrete's project and its rigorous implantation in the plot. The construction began right after the project's completion; nevertheless, works were stopped in 1975. Nowadays there are just the building's foundations at the site.

The animal production institute was part of a set of buildings whose projects were not yet totally completed. The final group would host the faculty's laboratories, divided into different research departments, namely for animal nutrition, physiology, genetics and breeding of farm animals. The institute's activity would serve the whole country and be oriented towards research and development work. It should have comprised the breeding of all species of farm animals and animal production issues, in order to respond to future needs of production of safe food.

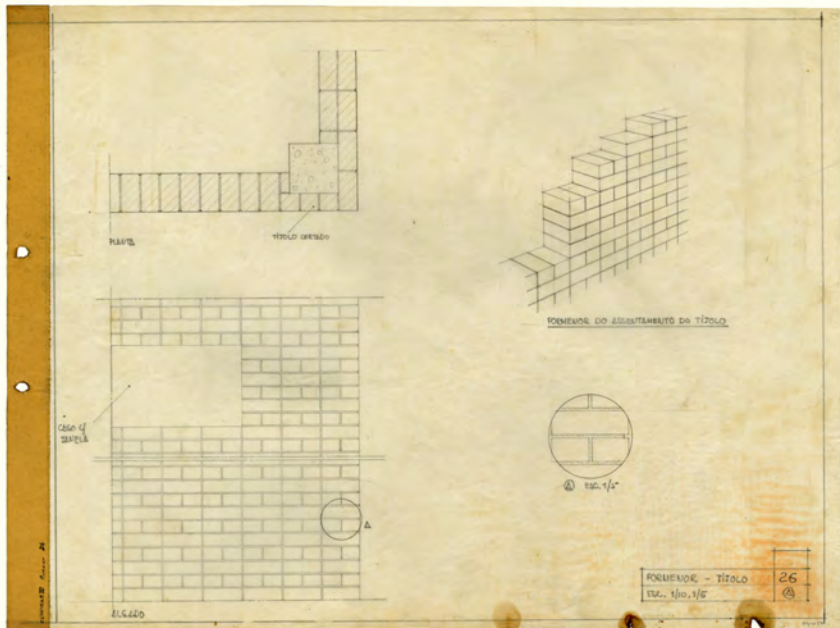
At a formal level, according to the descriptive memory, this building would be perfectly incorporated in the laboratory group:

**“dada a implantação do instituto ser feita num complexo de edifícios, que se preveem, dadas as suas características afins (laboratórios), serem encaixados, formando e limitando um campo a sul do conjunto da totalidade da faculdade, optou-se por uma linearidade e sobriedade tanto de forma**





**Bricks detail**  
[FAUAN archive.]

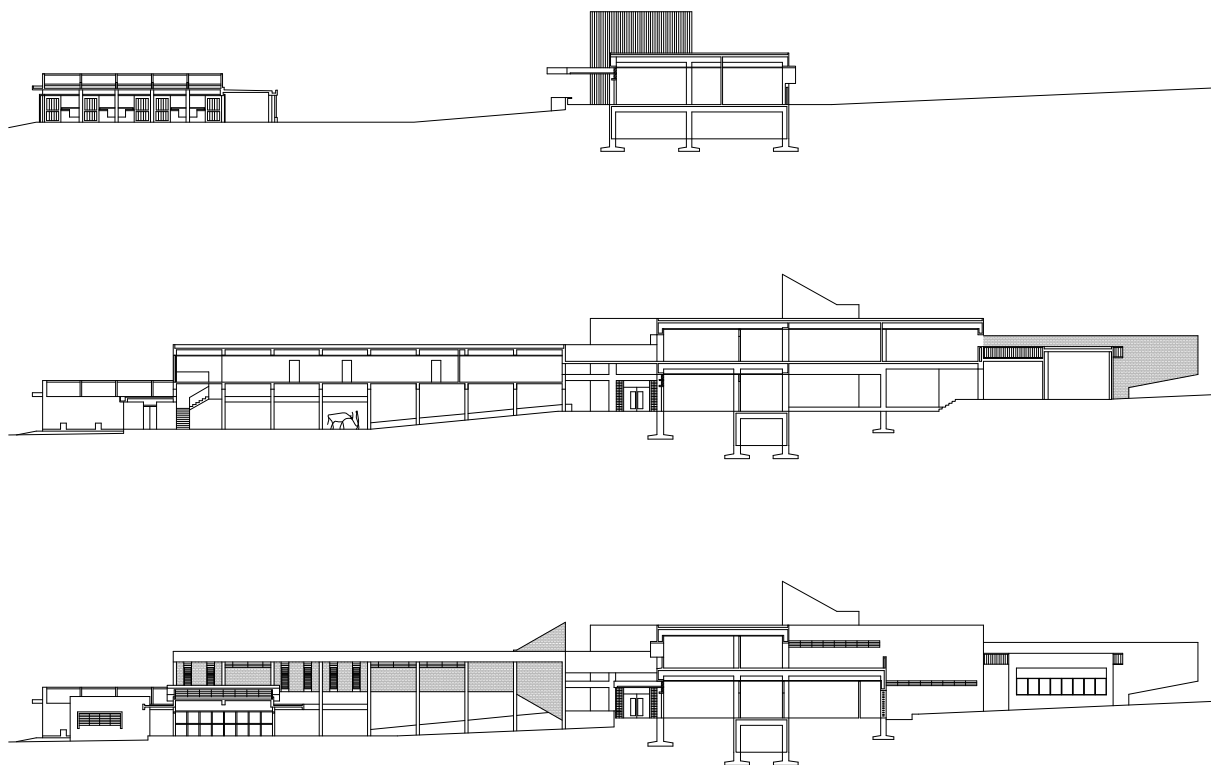






**Sections**  
[project]

**General view**  
[Margarida Quintã, 2014.]



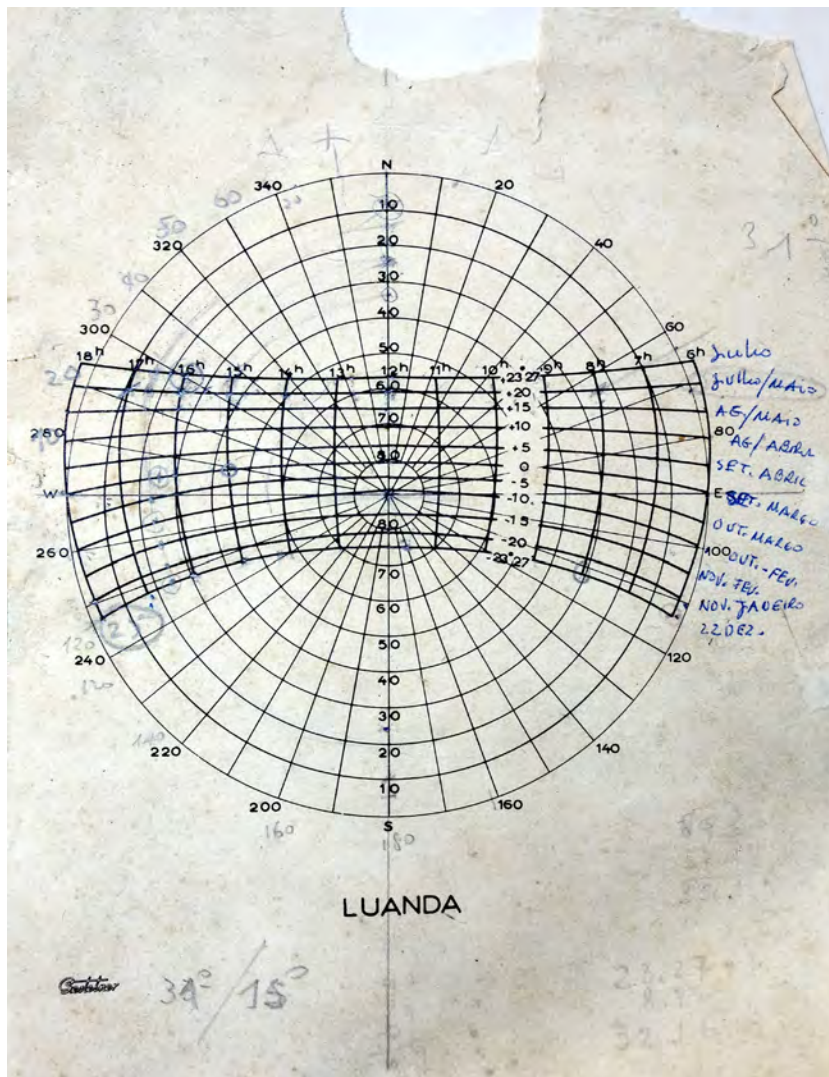
**como de materiais (...) acusando-se no entanto quer estrutural quer formalmente os acidentes resultantes de funções específicas dentro do edifício ora em causa.”<sup>25</sup>**

The institute is a linear building with a rectangular plan, two storeys and about a 120m extension. On the ground level: social areas, laboratories, offices, study rooms and an amphitheatre with 40 seats. On the first level: laboratories, offices, study rooms, museum. Just two protruding volumes that correspond to the didactic museum and the amphitheatre. There is still an exterior staircase on the south end that would make the connection with a building to be constructed posteriorly. The building would be contiguous to another U shaped volume.

There is still a set of large dimension exterior ramps, which would be used by people and animals, giving access to the first floor of the building. The foreseen utilities' network was very simple, only electric network, telephones and bells to connect the several departments. There is no register of an air conditioning network. Plumbing was accessible from the basements ceiling, hidden in false ceilings or apparent in laboratories.

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<sup>25</sup> VIEIRA DA COSTA, V. (1974) “UL Faculdade de Medicina Veterinária, Nova Lisboa, Instituto de produção animal, Memória descritiva”, February 1974, p.1.



Vasco Vieira da Costa  
[published by Diogo Cruz.]

Luanda solar chart  
[Vasco Vieira da Costa archive.]



## Veterinary Academic Hospital: Designing with Huambo's Climate<sup>26</sup>

The project for the veterinary hospital was developed in two phases: the first one in 1971, which corresponds to the volumes destined to classes, and the 1972's process that refers to the hospital admission cages for animals with larger and smaller sizes. When the first half of the building was completed, the students left the IIVA's facilities and classes transferred to being taught in the new building. The construction of hospital admissions building just started in 1974.

Before the animal stables were built, animals not requiring hospitalization were seen on an outpatient basis. The new facilities allowed animals with more severe or complicated conditions to get round-the-clock care in the hospital barns or isolation facilities. The facilities included a small animals clinic, with cages for birds, rabbits, pigs, goats, cats and dogs (left to right) and a large animals clinic, with stables for horses and cattle.

The project for the Huambo Veterinary Academic Hospital was rather ambitious, designing classrooms, laboratories and surgical rooms in a 7,000 square-meter construction. The building has northeast-southwest orientation in an H-shaped plan. The four wings, with different functions and design, form a horizontal set that spreads along 170 meters of brick and exposed concrete. The main entrance is located in the centre, where hospital life revolves around the patio. Several passageways meet and surround a small garden on which a concrete staircase rises from the ground.

The wing on the left side of the patio has two floors with surgery and recovery rooms; the wing on the right has one floor with classrooms along a central corridor.<sup>27</sup> Due to the site's topography, the other two volumes are located 30 meters to the west, on a lower level. A bricked volume suspended on exposed concrete pillars covers the passageway from the patio to the animal shelters.

The wings for animal shelter also have different characters. To the north, large animals, cattle and horses, were housed in five identical blocks linked by an open-air corridor. The volume to the south has seven rooms to house small animals with large-scale skylights on the top. Besides providing natural lighting and ventilation, this system is also an icon of the building's architectural

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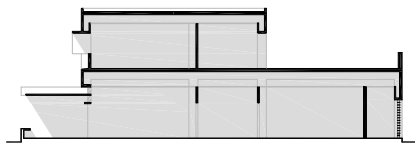
<sup>26</sup> A significant part of this analysis was previously published by the author: QUINTÃ, M. (2013) "A Resisting Modern Monument: Huambo Veterinary Academic Hospital", *Docomomo Journal* 48, *Modern Africa Tropical Architecture*, Barcelona : Docomomo International, p.34-39 ; QUINTÃ, M. (2013) "Veterinary Academic Hospital in Huambo: Old African Brutalism", in TOSTÕES, A. (ed), *Modern Architecture in Africa : Angola and Mozambique*, Lisboa : ICIST Técnico, p.212-221.

<sup>27</sup> These volumes were built in the construction's first phase, while the kennels and stables were only built after 1974, according to Prof. José Quintão.

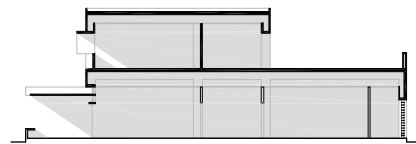


### Sections

[summer solstice, december.]



15.30



16.30

expression.

Due to the long rainy season of the Angolan central plateau, Vieira da Costa conceived several sheltered outside spaces. From October to April, the daily rains are usually heavy, sudden and thundery, so cover is vital for using the outdoors. For this purpose, the architect designed four-meter span-cantilevered inverted beams to cover the exterior passageways along the building. Rainwater drainage is camouflaged within the building and designed to work daily.

The architect considered that suitable natural ventilation and solar protection were normally enough to limit the use of air-conditioning systems. However, under demanding circumstances or typological constraints, he chose artificial methods of environmental control to create the necessary conditions of comfort.<sup>28</sup> In tropical Luanda, Vieira da Costa used the Modern lexicon to design creative and efficient systems of shading, natural ventilation and rainwater drainage. These Modern devices were designed for each building's particular circumstances, such as typology, climate and site (Quintã, 2007).

Vieira da Costa used the same method in the Veterinary Academic Hospital, but with different results. He exposed the building's structure, highlighting the concrete elements through the large brick surfaces. At the same time, infrastructure and environmental control systems were concealed within the building. Huambo's moderate climate endorsed simple environmental solutions and limited the use of air-cooling systems.<sup>29</sup> This way, the architect could easily develop a building in harmony with the landscape, establishing continuous relationship between inner and outer spaces. The large horizontal slabs, the transparency of concrete grids and the use of raw materials contribute to blending the building into natural environment.

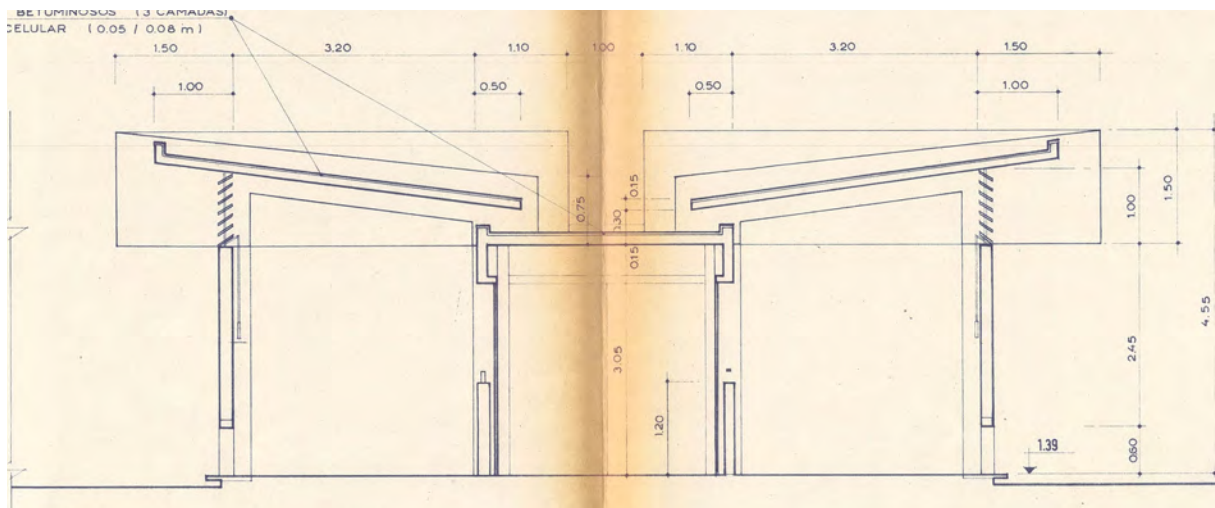
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<sup>28</sup> See for instance, the use of air conditioning devices in Angola's Engineering Laboratory and Students Residence in Luanda.

<sup>29</sup> According to Prof. José Quintão, there were no air conditioning devices except for surgery rooms.



**Animal shelters: stables**  
[Margarida Quintã, 2014.]

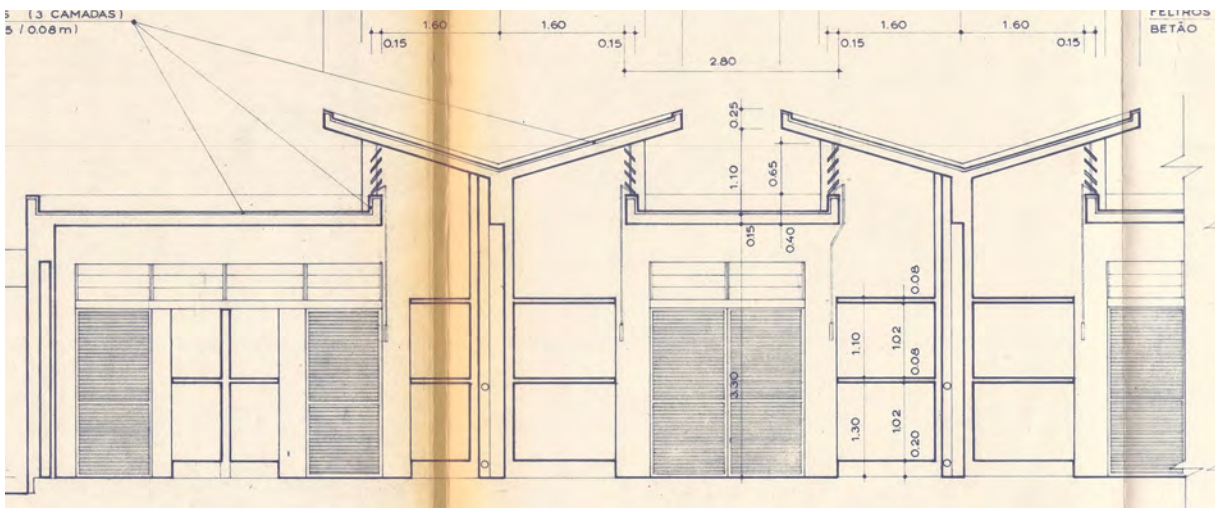


**Animal shelters**  
[Vasco Vieira da Costa archive.]





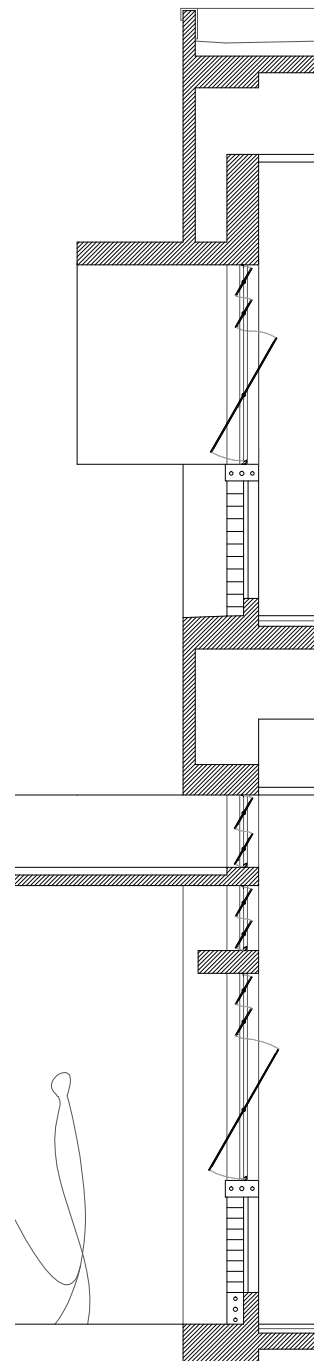
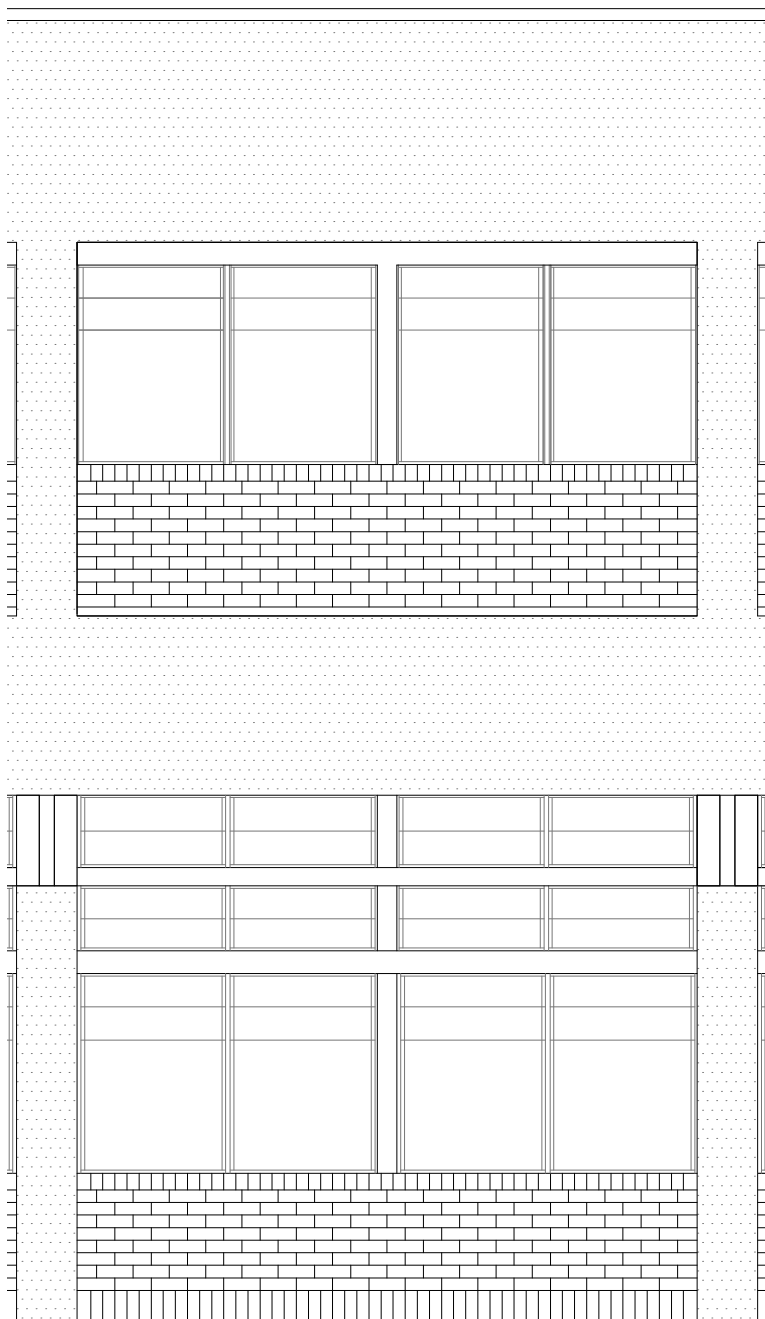
**Animal shelters: small cages**  
[Margarida Quintã, 2014.]



**Animal shelters**  
[Vasco Vieira da Costa archive.]

**Details**

[project]





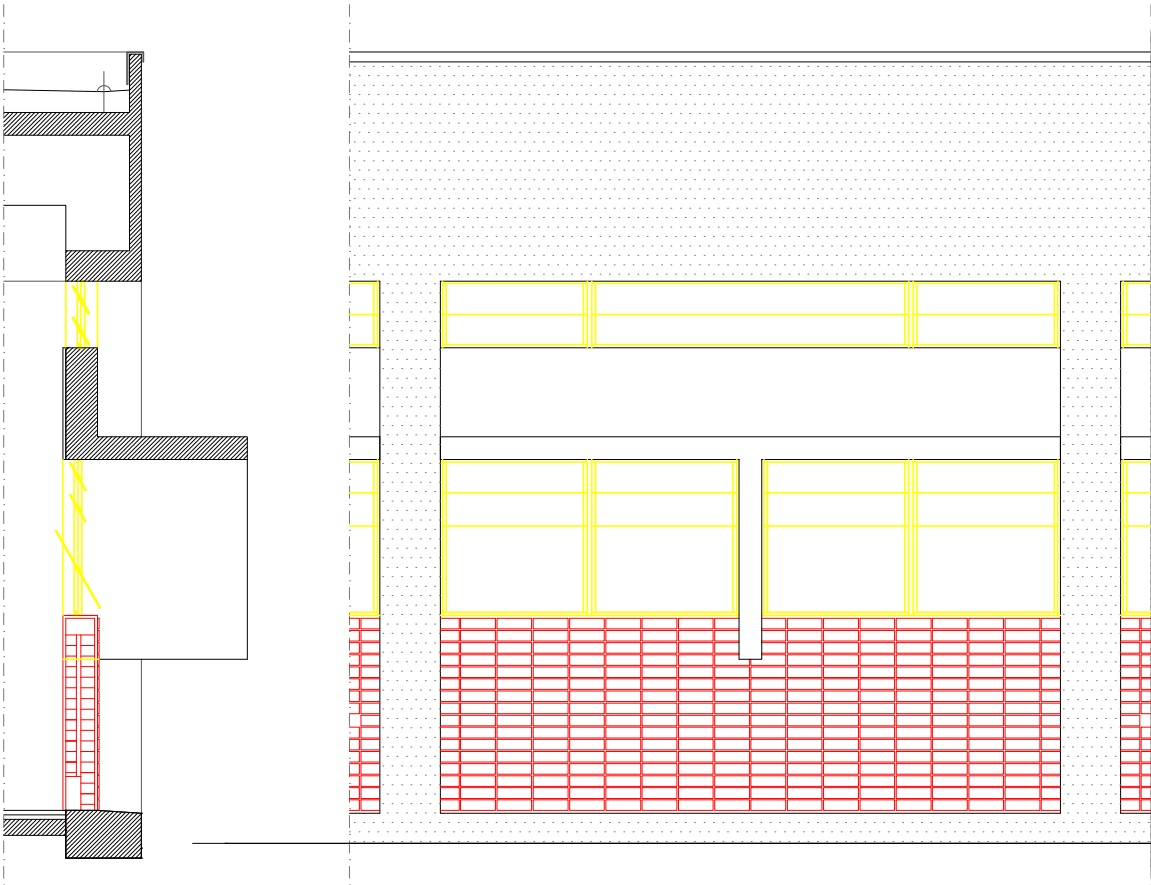


**Northwest façade**  
[Margarida Quintã, 2014.]



**Southeast façade**  
[Margarida Quintã, 2014.]

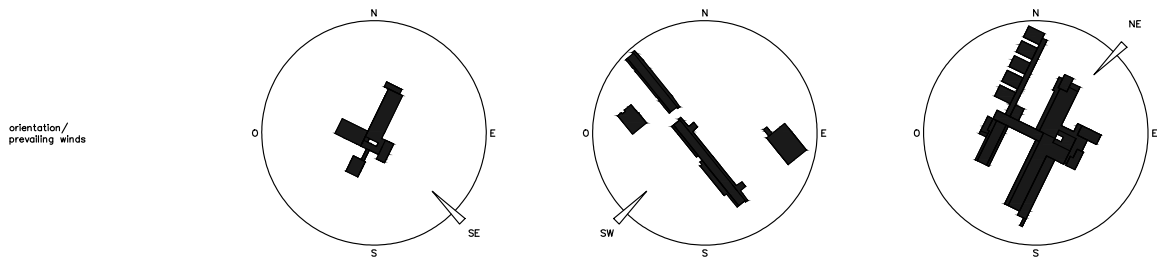
Details  
[as built]



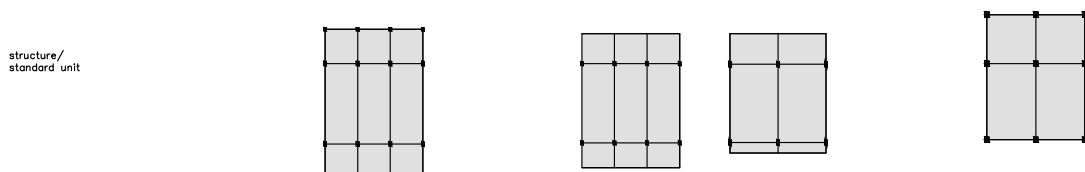
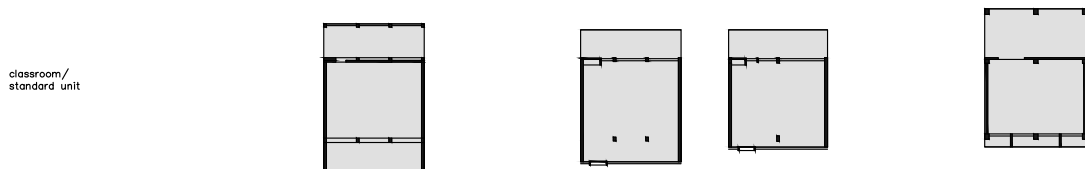


# Comparative chart

	Colégio de Henrique Carvalho	Liceu Almirante Lopes Alves	Faculdade de Medicina Veterinária
school type	preparatory school	high school	college
architects	Antonieta Jacinto; Francisco Silva Dias	Francisco Castro Rodrigues	Vasco Vieira da Costa; José Quintão
design dates	1958 – 1960 (2 years)	1963 – 1969 (6 years)	1969 – 1974 (5 years)
construction dates	1960 – 1961 (1 year)	1963 – 1970 (7 years)	1969 – 1975 (6 years)
plot area	45710 m <sup>2</sup>	8850 m <sup>2</sup>	45710 m <sup>2</sup>
gross floor area (project)	45710 m <sup>2</sup>	8850 m <sup>2</sup>	45710 m <sup>2</sup>
gross floor area (as built)	45710 m <sup>2</sup>	8850 m <sup>2</sup>	45710 m <sup>2</sup>



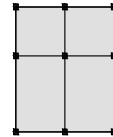
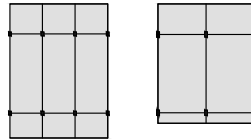
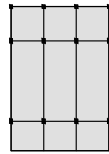
location	Saurímo, Lunda Sul	Lobito, Benguela	Huambo, Huambo
latitude	9.66 S	12.37 S	12.77 S
longitude	20.39 E	13.56 E	15.74 E
altitude	1081 m	1 m	1700 m
climate type	Aw (tropical savanna)	BSn (hot semi-arid)	Cwb (subtropical highland)
annual temperatures (máx/med/min)	29 ° / 22,5 ° / 16,3 °	27.6 / 23.9 ° / 21 °	26.1 ° / 19 ° / 12.6 °
medium temperature (coldest month)	20.4 °	18.9 °	15.7 °
annual precipitation	1355 mm	215 mm	1479 mm
rain season	october – april	–	october – april
relative humidity	55 %	79.3 %	59 %
air humidity (dry season)	low (25–60%)	high (74–84%)	medium (48–70%)



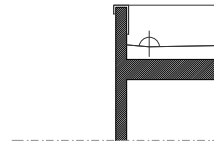
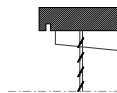
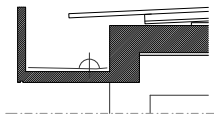




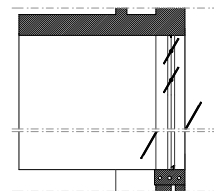
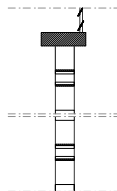
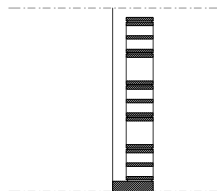
structure/  
standard unit



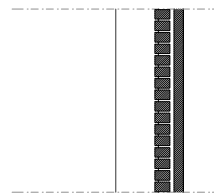
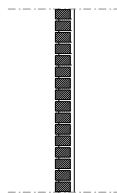
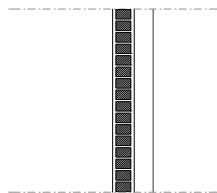
roof



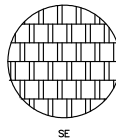
window/  
shading



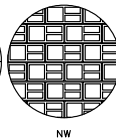
walls



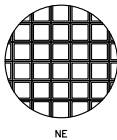
ventilation elements



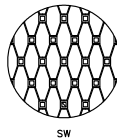
SE



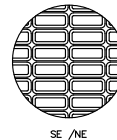
NW



NE

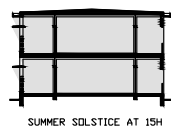


SW

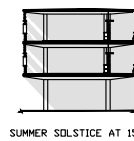


SE /NE

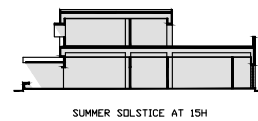
shading scheme



SUMMER SOLSTICE AT 15H

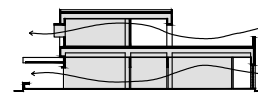
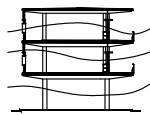
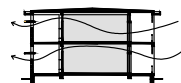


SUMMER SOLSTICE AT 15H



SUMMER SOLSTICE AT 15H

ventilation scheme





current name	Escola do 1º Ciclo do Ensino Secundário de Saurimo	Escola Comandante Valéria	Faculdade de Medicina Veterinária da UJES
current use	high school	high school	ruins (w/military use)
current state	high school	high school	ruins (w/military use)
maintenance works	–	–	–
renovation works	–	2014 – 2016	–
building transformations	1972 / 2010	–	–

orientation/ prevailing winds			
roof			
window/ shading			
walls			
ventilation scheme			



# Conclusion

At the end of this thesis there are important conclusions to be taken. The most evident of such conclusions is perhaps that the development of a network of schools in post-61 Angola constituted a process where the quest for urgent and inexpensive construction was at the outset of a modern architectural language. As we look deeper into the histories of the case studies, it also becomes evident the key role played by the problematics of climate responsiveness in the maturing of this new architecture, as well as in the maturing of a basis of understanding between outsider architects and local authorities in Angola.

The scope of application of climate responsiveness design methods applied in the post-61 Angolan schools, however, has proved far from transparent. Even if architects, institutions, brands and all other sort of agents have laid claim to the possession and mastery of climatic data, and to their integration into architectural design<sup>1</sup>, it becomes clear from this study that the responses to the problems posed by climate constraints were anything but objective: varying from one architect to another, it seems reasonable to suggest that the understanding of the problematics of climate responsiveness was more of a consequence of the authors' backgrounds and frameworks of architectural references<sup>2</sup> than of the outcome of scientifically-established knowledge, or protocols.

The conclusion that the architects of Angola relied above all on their empirical understanding of the problematics of climate responsiveness is indeed supported by the fact that knowledge on the specific climatic parameters of the country's different regions was still maturing by the mid 60s. Yet the empirical nature of such an approach should not shroud the prowess of these architects, nor the accuracy of their solutions. As the analysis of the case studies has so clearly demonstrated, the buildings were indeed correctly adapted to their specific environments: their orientation, sun protection devices, prevailing winds regime, ventilation schemes, all these aspects have been adequately implemented, and thus proved successful. As the analysis has also revealed, even the seemingly similarity of the structural frames was indeed based on rather dissimilar external wall thicknesses, as a response to the dissimilar temperature ranges characteristic of every building location.

The achievements of such empirical approach to the problematics of climate responsiveness point towards the unequivocal development of an ethic of tropical architecture in the Angola of the 1960s. But this ethic notwithstanding, it is manifest that the integrity of these buildings' performance has often been compromised by reasons of different nature: whether project related (such as the Lobito's school lack of sun shading in the classrooms), malfunction-related (such as the Saurimo's school roof drainage system); or simply neglect-related (such as that which resulted from the years of civil war). As a counterpoint to these vulnerabilities, however, the informal investment in the schools' conservation performed by students and local communities has proved quintessential to the buildings' best climatic performance, and is therefore worthy of the highest praise.

As I look back at my research project I contemplate the fact that I have failed to develop preservation strategies for the different case studies, and I relate this relative shortfall to the difficulties posed to the access to all sorts of

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<sup>1</sup> Namely Luanda's DSOPT and the LEA, but also the advertisements by Lupral, or the articles by Campina, Bernardes, Cunha, Rodrigues, etc.

<sup>2</sup> These design tools were not taught at Portuguese architecture schools.

information concerning Angolan architecture. Not only was there very little information available about the case studies at the beginning of my research, as the process of documentation that I underwent revealed extremely demanding, and above all erratic. Having said that, I believe that such process of documentation has had a successful outcome. The buildings in question were for the first time subject to an in-depth study that brought to light new information about the original designs, local materials, construction sites, and building systems. The combination of archival research with on-site building survey enabled the production of new drawings that overlap original project designs with current building states, enabling important interpretations about the changes that took place throughout time. Plus, the comparative analysis of the case studies — as summarized in the section entitled “Comparative Table” — has unveiled the common architectural genealogy that gave rise to what we have come to know as the modern character of the Angolan schools of the 1960s.<sup>3</sup>

It should furthermore be noted that the process of documentation of the case studies did not constitute a merely archaeological endeavour, but was rather driven by a critical reading that aimed at preparing the possibility of future interventions in the buildings. But if it is unquestionable that such interventions will benefit enormously from studies like my own, and from others that our academic community has been successfully developing in recent years, I nevertheless believe that an effort should be made to reconcile the building’s material potential with the social demands of its contemporary users and surrounding communities. I, therefore, stand for a mode of scholarship that will take on the task of bringing together building specialists, users, legislators, developers, and constructors into an all-inclusive discussion about the real patrimonial value of Angolan modern architecture in our day. Such processes are naturally as complex as they are vital, and for my part I hope this study may cast a new light on this relatively recent but pressing subject.

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<sup>3</sup> In fact, the three appendices containing new drawings are an integral part of this thesis, perhaps even the most relevant and original piece, so its parallel reading is necessary to a fair understanding of the whole.



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