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The Architecture of Inexact Respiration

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Inexact by Nature

Editors' Note

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The unawareness of the limited natural resources and an unrestricted faith in technology fostered the idea of a universal architecture, which dominated the first half of the twentieth century. The position in which we find ourselves today is not new, however, and can be illustrated by a century-old change of attitude in Le Corbusier's work. At the end of the 1920s, Le Corbusier proposed "one single house for all countries, all climates: a house with *exact respiration*."[1] By "exact respiration," he meant a hermetic interior at eighteen degrees Celsius throughout the year, involving a double wall or double-glazed façade—"mur neutralisant"—mechanical air conditioning being blown between the inner and outer panes. Le Corbusier first envisioned this system for the League of the Nations (1927) and the Centrosoyus Palace (1928–34). The failure of proper temperature control in built works such as the Centrosoyus and the Cité de Refuge (1928–33) and the works for Algiers, Barcelona and Rio de Janeiro, with their practical exigencies of thermal requirements and aesthetic potentials, led to an interest in elementary techniques of environmental control. The most obvious example is perhaps the "sunbreaker" (*brise-soleil*), an architectural element of climate control that started to cover the flat geometry of his architecture and gradually acquired formal autonomy, as illustrated in the Mill Owners' Association building in Ahmedabad (1951–54).

1 "A cette heure d'interpénétration générale, de techniques scientifiques internationales, je propose: une seule maison pour tous pays, tous climats : la maison à *respiration exacte*." Le Corbusier, *Précisions sur un état présent de l'architecture et de l'urbanisme* (Paris: G. Crès, 1930), 64.

The contemporary context of global environmental change and biodiversity loss reframes this debate, challenging architecture in two interrelated aspects: the reduction of carbon emissions at the level of both embodied and operational carbon. In addressing the issue of embodied carbon, existing buildings must be understood as reservoirs of energy resources, allowing possibilities for adaptation, reuse, repair, or recycling (as instigated by the EU's Circular Economy Action Plan). In addition, the specific context should consider a logic of circular economy in the selection of materials and adapted building techniques, in which the life cycle of resources ideally transforms into an endless loop.

The issue of operational carbon, on the other hand, or the energy performance of buildings, directly associated with the idea of comfort, can and should be addressed through design, the architect's primary and favoured tool. The desired resilience and harmless energy behaviour of what is to be built require an understanding of the specificities of each context, that is, an understanding of the ability of materials, buildings, and urban arrangements as a whole to store or dissipate energy as needed. This implies research into typological solutions, suitable geometries for a specific geography and climate, the efficiency and versatility of section and plan of these geometries and the implications in natural heating and ventilation, the properties and local availability of materials, and structural and infrastructural strategies.

This is, in essence, a global problem requiring different local solutions and is particularly challenging in intermediate temperate climates such as the Mediterranean, as despite the absence of extreme temperatures — which facilitates the absence of mechanical solutions — these may vary considerably both between seasons and during the day. The Mediterranean climate is indeed characterized by hot, dry summers and cool, wet winters, and it is worth remembering that this type of climate is not restricted to the area of the Mediterranean basin. It is characteristic of a series of geographies between 30 and 45 degrees north and south, such as in western South and North America, Chile and California, the far south of the African continent and in Oceania. Its seasonal and daily thermal variability escapes unidirectional prescriptions which are possible in extreme climates and requires either capturing heat (cold climates) or dissipating it (hot climates). Perhaps for this reason, architectural research on the thermal performance of buildings has avoided these intermediate geographies between the easier-to-define north and south, with the overwhelming majority of studies conducted in thermally extreme climates.

Nevertheless, Mediterranean climate geographies are extremely rich in architectural heritage. Different economic, social, cultural, material, constructive, formal, and typological realities coexist in these geographies, providing us with a wide reservoir of traditional knowledge and architectural solutions for an alternative to the universal architecture of "exact respiration."

It is a richness which is directly related to the benign nature of the climate, having fostered the development of urban and architectural solutions in which the boundaries between interior and exterior have been diluted, expanded and gained depth, with resonances in the ways of living and using space. Taking advantage of different thermal typologies and their archetypes, often with hybrid configurations to address the dynamics of atmospheric alternation, such as porches, pergolas and arcades, courtyards, greenhouses and caves, spatial mechanisms were developed and became deeply rooted in immemorial cultural habits.

While the shift towards an architecture of "inexact respiration" means to abandon the standards of comfort provided by mechanical control and assume a more tolerant culture towards the relationship between architecture and the environment, where architecture itself provides, or contributes significantly to, the solution, this shift does not mean a return to the vernacular. It means the development of a new (or renewed) architecture which is capable of expressing the zeitgeist and the central problems of sustainability and the energy crisis that characterize it. If architecture is cyclically mobilized towards its legitimation as a language — as witnessed in the Enlightenment, in the modern movement and in postmodernism — how is this urge towards a sustainable architecture defining new architectural languages? How is architectural practice exploring the legacy of the past in defining critical architectural solutions? What typological and material experiences point to an in-depth revision of carbon-based architectural and building solutions? What is the relationship of these solutions with use and ways of living? Given that the most sustainable position is to maintain existing buildings, what can we learn from the practice of reuse and adaptation?

This debate can no longer be postponed or outsourced to other geographies, because these problems of energy and ecology are, first and foremost, a matter of design. By placing them at the heart of the discipline, we also reaffirm the role of the architect — not as a bystander, but as an active agent, capable of intervening with knowledge, discernment, and responsibility in what is built. It is urgent for us, as architects, to become fully aware of the consequences of our actions on built landscapes, so that we may begin to imagine ways of turning entropy into syntropy, and externalities into internalities — as nature does.

This issue of *Joelho* is a contribution to this necessary shift. It brings together seven contributions from different geographies and scales — six of them rooted in or referring to Mediterranean climates — which question contemporary environmental paradigms in architecture, revisit past practices, and propose alternatives for the future.

The issue opens with a critical overview of the present situation in which Viriato Soromenho-Marques presents a philosophical reading of the Anthropocene as a dystopia born from the full realisation of modern

utopia: the alliance between technoscience, market economy, and state sovereignty. For this critical moment, he calls for a new *De Re Aedificatoria*, one capable of reconciling thought and construction, nature and culture.

Eduardo Prieto's contribution offers a critical genealogy of architecture's environmental paradigms — hygienist, technocratic, bioclimatic, thermodynamic, and sustainable — revealing their continuities and contradictions over the last century and advocating for a hybrid and conscious approach. A return to the discipline's foundations, where climate is not an external factor, but constitutive of the architectural project itself.

An ecological reinterpretation of the concept of typology is proposed by Javier García-Germán, in which body, climate, and territory are combined through performative, sensitive, and architectural forms deeply embedded in everyday life. García-Germán examines how certain climatic types — historical and contemporary — create habitable and pleasurable microclimates, grounded in social practices and specific material strategies.

Beyond typology, architectural elements provide further arguments for the elaboration of renewed design strategies. This is explored in the two following articles. Fernando Diniz Moreira revisits the evolution of breathing façades in modern Brazilian architecture, particularly in the work of the *Escola Carioca*, as devices attuned to climate, culture and use. Moreira explores how architects employed elements such as *brise-soleils*, *cobogós* walls and verandas not only as thermal regulation strategies but also as symbolic and spatial features that convey institutional expression and cultural continuity. That an evaluation of architectural elements implies a look towards tradition becomes clear in the essay by Catarina Ribeiro, Nuno M. M. Ramos, Inês Flores-Colen, and Nuno Valentim. Here, the authors discuss the genealogical relations between the Mediterranean balcony and contemporary collective housing, understood as an archetype of well-being. Their article explores how this liminal space has embodied shifting paradigms of comfort, health, and energy efficiency — and how it is now being revalued as a space of climatic mediation, cultural expression, and everyday experience.

Shifting towards speculative satire, Mark Jarzombek and Vikramaditya Prakash reconstruct Banham's famous *Environment-Bubble* in Capri. In a fictional documentary, the text humorously exposes the technical, social, and ideological limits of technological utopias and highlights the radical strangeness of architecture when disconnected from its ecological context.

Lastly, Jaume Mayol presents the pedagogical experience of the TED'A atelier in Mendrisio, offering a deep reflection on the role of architecture in the context of climate emergency. The studio explores the relationship between form and climate, tradition and innovation, matter and ecosystem, across three distinct Mallorcan landscapes (a terraced landscape, a flat landscape, and salt flats next to the sea), with particular attention

to water, vegetation, material reuse, and local craftsmanship. It proposes learning from the past to face the present and design a less impactful future.

Following these seven contributions, a new and final section of this issue of *Joelho* delves into the argument that issues of energy and ecology are, first and foremost, a matter of design. Edited by Guilherme Machado Vaz, this section brings together four projects by Bosch+Capdeferro, HArquitectes, IBAVI, and baubüro in situ, which tackle this main theme, whether through the reinterpretation of vernacular typologies and traditional construction systems, whether through the creative exploration of the possibilities of reusing materials and elements.

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Is There a New *De Re Aedificatoria* in Our Dystopian Epoch of the Anthropocene?

Keywords
— Anthropocene, Earth system sciences, Technoscience, Utopia, Dystopia

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The utopian essence of modernity was centred on a triumvirate — built on the congruence between the sovereign state, the techno-science establishment, and the globalized market economy. This triangle of power has commodified nature and created a fragmented, pragmatic, and operative world culture, which has led us to the crossroads we are collectively facing. The Anthropocene, from a philosophical point of view, is thus the time of the emergence of a dystopia that was born, not from any piecemeal feature of modern history, but from the uncritical and disproportionate fulfilment of modern utopian agendas.

We know that Thomas More's seminal text, which initiated the utopian inner trend of modernity, has older roots. Not only those of Platonism and Neoplatonism, but also other sources much closer to him, such the literary blossoms of the Renaissance movement, where the author of *Utopia* (1516) is affiliated as his most important English exponent. In the urban design of the Utopia's fifty-four cities that the Portuguese Raphael Hythlodaeus — More's main character — found in that imaginary country, there are clear traces of the foundational book of modern and contemporary architecture, born of the genius of Leon Battista Alberti (1404–1472). Although completed in 1452, the ten books of his *De Re Aedificatoria* only became influential after being the first theoretical work on architecture to be printed (1485).[1] The theme of building and transforming spaces, whether man-made or natural, is a key element to modernity, which still prevails in our 21st-century world view. Thomas More himself had no hesitation in considering that the lack of appropriation of arable land, through technologically supported agricultural work, was "cause" enough for the inhabitants of Utopia to wage "a just war" (*iustitissimam belli causam*) of conquest against neighbouring technically indigent indigenous peoples. There could be no clearer and more justifying preface to the coming global tragedy of European colonization and imperialism, of which we are now experiencing the twilight colours.[2]

We live in an epoch whose conceptual core is paradoxically philosophical, even though this discipline is now residual and seems to be absent from collective life. We live in a philosophical age, because what we call the global environmental and climate crisis not only has a dangerous existential and ontological dimension, but it is also the result of the consistent Hegelian "fulfilment" (*Verwirklichung*) of the project of European modernity, which began with the Portuguese caravels and matured in the self-consciousness of German idealism, including Marx's powerful eleventh thesis on Feuerbach: "Philosophers have only *interpreted* the world in different ways, but the point is to *transform* it."[3] The paradoxical dimension of our time, which becomes even more poignant if we reflect on the great and accelerated metamorphosis that the planet has undergone in the last sixty to seventy years, lies at the root of this tragedy that involves the whole of humanity. This time, unlike in classical Athenian tragedy, this dark fate that we can already glimpse, but which we are apparently powerless to change, is not the fault of a supernatural external cause. It is not the whim of the Olympian gods that should be blamed for the growing entropy in the equilibrium state of global life-support ecosystems. The threat implies the possibility of profound damage to the biophysical conditions that could allow human history to continue in a regime of civilizational complexity and refinement. This unprecedented situation is not the result of blind indifference to our fate on the part of colossal and overwhelming physical forces. There is no one to blame but us.

1 Leon Battista Alberti, *Da Arte Edificatoria* [1585], translation by A. M. do E. Santo, review by M. J. T. Kruger, Lisboa, Fundação Calouste Gulbenkian, 2011.

2 Thomas Morus, *Utopia* [1516], bilingual critical edition, translation and commentary notes by Aires A. Nascimento and introductory study by José V. de Pina Martins. Lisboa, Calouste Gulbenkian Foundation, 4th edition, 2016, 516–517.

3 "Die Philosophen haben die Welt nur verschieden *interpretirt*, es kömmt drauf an sie zu *verändern*," *Marx/Engels Gesamtausgabe* (MEGA), Berlin, Akademie Verlag, 1998, Vierte Abteilung, Band 3, S. 21.

1 The Meaning of the Anthropocene as the Landscape and "Epoch" of Today's World

The history of modern science unambiguously shows the collective and institutional nature of the scientific enterprise. It requires material and human resources, organized with a long-term perspective. The scientific enterprise must be linked to the education system, supported by public strategies and budgets, in coordination with market players, legitimized by the support of public opinion and civil society organizations. The process of moving from a piecemeal, dysfunctional view of environmental issues — which tends to hide their seriousness and complexity — to a holistic, integrated view, capable of offering representations and models with a solid quantitative basis and rigorous adherence to concrete reality, has been rather slow and painful. It was necessary to bring together disciplines and, above all, people from different academic cultures. It was essential to reshape scientific projects, including difficult interdisciplinary strategies and complex funding models. This path, which deepens the theoretical legacy of systemic thinking and the effort to model complexity that we have already encountered in *The Limits to Growth* report (1972), began to be undertaken, with deliberation and awareness on the part of those involved, during the 1980s (the end of the Cold War freed up the means and will for this highly refined epistemic expansion). The result was what is known today, often without realizing how new this achievement it is, as "Earth system science." In its maturing process, not only have the natural sciences been brought together, but the social and human sciences have also been engaged.[4]

By overcoming the specialized and fragmented view of "nature" that has prevailed for centuries in modern Western scientific culture, the coordinated study of the Earth system makes it possible to give visibility to complex "emerging" phenomena and processes, objects of knowledge that only become visible through the combination of fields that were previously seen as specialized and tendentially autonomous areas. This is the case with a key indicator for studying climate change, global average surface temperature, as Will Steffen, one of the most important scientists in research into the Anthropocene, explains:

> Basically, the "Earth System" refers to the interacting physical, chemical and biological processes that operate across, and link, the atmosphere, cryosphere (ice), land, ocean and lithosphere. These processes create "emergent properties" – that is, properties and features of the Earth System as a whole which arise from the interaction amongst these spheres. Global average surface temperature is a good example – it is a property of the Earth System as a whole.[5]

4 W. Steffen, K. Richardson, J. Rockström, et al. (2020) "The emergence and evolution of Earth System Science," *Nature Reviews Earth & Environ*ment 1, 54–63. https://doi.org/10.1038/s43017-019-0005-6.

5 W. Steffen, & Jamie Morgan (2021), "From the Paris Agreement to the Anthropocene and Planetary Boundaries Framework: an interview with Will Steffen," *Globalizations*, 18:7, 1298–1310, DOI: 10.1080/14747731.2021.1940070.

In this transformative movement, Will Steffen (1947–2023) play a double innovative role. Firstly, as executive coordinator of the IGBP (International Geosphere-Biosphere Programme) — which ran from 1987 to 2015 — he helped to consolidate the Earth system science endeavour. Secondly, he was a strong advocate of the Anthropocene, as a new epoch in which the history of humanity is intertwined with the history of the Earth. It was in this spirit that Steffen coordinated the first work in which the Earth system and the Anthropocene are interrelated in a coherent and systemic way.[6]

The concept of the Anthropocene was introduced in 2000 by two researchers involved in the scientific revolution of the Earth system.[7] It is a proposal that rigorously translates the way in which recent and dynamic historical temporality, which is measured in decades and centuries, has been able to insert itself into the long-term time of geology, which is measured in millions and tens or hundreds of millions of years. The initial proposal in 2000 suggested 1750, the year of the advent of the steam engine in the English Industrial Revolution, as the date on which the Holocene geological epoch (which began roughly 11,700 years ago, at the end of the Würm glaciation) would give way to the Anthropocene epoch. This was defined by humankind's ability to leave deep, wide, and transformative footprints on the planetary software for many millions of years to come, such as the chemical structure of the atmosphere, the ozone layer, the major cycles of water, nitrogen, carbon, phosphorus, the balance of biodiversity, the average global surface temperature, etc. Subsequently, studies evolved to produce a model of the Earth system and its "planetary boundaries." The model has been updated, containing from the beginning the study of nine interdependent fields — each with a boundary, parameters, quantitative data referenced to a pre-industrial level — and their respective interaction processes. The Earth system modelled in this way comprised the following fields and their respective limits: 1. climate change; 2. biosphere integrity; 3. biogeochemical flows (phosphorus & nitrogen); 4. stratospheric ozone depletion; 5. ocean acidification; 6. freshwater change; 7. land system change; 8. atmospheric aerosol loading; 9. novel entities.[8]

The research is still open, but what we do know already is enough to understand that we are drifting away from the Holocene conditions, favourable to the human dwelling of the Earth within the realm of a complex culture and society. Not only have we already crossed the red lines of most of the nine "planetary boundaries" that allow us to measure the planet's state of health, but we are also compelled to rethink what should be the most appropriate chronology for the start of the Anthropocene. If we count from 1860, when the Industrial Revolution was no longer confined to Great Britain, we see that by 2019, 75 percent of all greenhouse gas emissions have been made in just the last 49 years, since 1970. It was only since the second half of the twentieth century that the overwhelming majority of the 45,000 dams over 15 m high were built, capable of storing 6,500 km³ of fresh water,

6 Will Steffen et al. (2004), *Global Change and the Earth System: A Planet Under Pressure,* Berlin, Springer, IGBP Series.

7 Paul J. Crutzen & E. F. Stoermer (2000). "The 'Anthropocene'," *Global Change Newsletter* 41: 17–18.

8 Richardson, K. et al. (2023), "Earth beyond six of nine planetary boundaries," *Science Advances* 9. https://www.science.org/doi/pdf/10.1126/sciadv.adh2458

which corresponds to 15 percent of the hydrological flow of the world's rivers. The extinction of biodiversity has accelerated, particularly since 1970, to levels that are almost 1000 times higher than pre-anthropogenic levels (many biologists consider that our species will be responsible for the sixth mass extinction since the beginning of life on the planet). The cryosphere is clearly becoming unbalanced, comparable only to periods that occurred several million years ago, in the Pliocene period, when *Homo sapiens* was still far from emerging. The biogeochemical cycles of nitrogen and phosphate have also been exponentially affected by human activity.

The Anthropocene epoch must be viewed, at least initially, with purely descriptive neutrality. It is neither a hymn nor an indictment of humanism or anti-humanism. It simply describes a factual situation: today, humanity is not only the dominant biological species, but also the earthly physical force with the capacity to radically and permanently alter the Earth system. That should not stop us from expressing our deep concern about the course this domination is taking the planet on, with disastrous consequences that are already causing millions of people to suffer every year. The destruction of the carrying capacity of ecosystems which have been devastated and impoverished by intensive agricultural practices, deforestation, extractive activities, or the extreme events resulting from climate change are causing natural tragedies of anthropogenic origin. They are driving hundreds of millions of people into a state of chronic insecurity and poverty, and tens of millions into the helpless condition of environmental refugees. All this erodes social bonds, creates conflicts within and between communities, contributes to the failure of state authority and the rise of public anarchy and disorder. Once again, while states continue to cultivate a culture of military might, completely disconnected from the sheer material reality of the Anthropocene planet, which has erupted at a dizzying pace in recent decades, the community of the Earth system scientists is looking to the future and warning of increasingly likely scenarios, completely out of control, that are being created by the toxic combination of the selfishness, ignorance, arrogance, and irresponsibility of the ruling political and economic elites.[9]

2 What Makes the Ontological Threat of the Anthropocene Invisible?

If we follow the initial vision of the Anthropocene proposal, we know that the emergence of the global environmental crisis overlaps with the beginning of the English Industrial Revolution (1750). It is, however, undeniable that the process of environmental degradation, including the historically unprecedented accumulation of greenhouse gases in the atmosphere, intensified exponentially in the second half of the twentieth century, after the Second World War, in the period that should be referred to as the Great Acceleration phase of the Anthropocene. However, the roots of the main

9 Luke Kemp et al., (2022), "Climate Endgame: Exploring catastrophic climate change scenarios," PNAS 2022 Vol. 119 No. 34 e2108146119 https://doi.org/10.1073/pnas.2108146119

driving forces behind the growing impacts of human material culture on the natural environment, as well as the stubborn ignorance or devaluation of these impacts, are much older. Let us try, in a very condensed way, to identify what I call the masking factors, responsible both for concealing the growing symptoms of the global environmental crisis and for the lack of understanding of the shared and common nature of its long-term negative consequences.[10]

10 W. Steffen, P. J. Crutzen, J. R. McNeill (2007) "The Anthropocene: Are humans now overwhelming the great forces of nature?" AMBIO 36: 614–621.

2.1 The Utopian Soul of the Modern Technoscientific Revolution

The various revolutions of the period of modernity began in the fifteenth century in Europe with the expansion of knowledge and the Western occupation of almost the entire planetary geography. In parallel with this came the emergence of a new understanding of nature and the role of science, and a real metamorphosis in the way humanity began to see itself and to rethink and reframe its relationship with the natural world. Not only has there been a quantitative change in the essence and uses of science, but also a real qualitative change. Science came to be understood as being increasingly linked to technology. Scientific endeavour began to be conceived with the aim of taking theoretical knowledge of natural processes as a lever for the effective transformation of that same natural world through technologies that would limitlessly extend human mastery over nature. Science (*episteme*) seen as the intellectual contemplation of reality, which had pleased the ancient Greeks, shifted, with the moderns, to become a driving force in the process of transforming and mastering the physical world. To serve this purpose, the key ingredient was the intimate unity between science and technology (technoscience). For the ancients, the search for a future that conforms to what is ideal, given by reason, should be the joint work of philosophy, ethics, education and politics. This idealized future (as Plato explains in *The Republic*) is essentially seen as a change in the relationship that human beings have with themselves and with each other collectively in the political realm. Unlike the ancients, the moderns believe that the great leap towards a better future should involve changing human societies' relationship with nature through technology, seen as the embodiment of human knowledge and inventiveness. The new vision of science was driven by the broader goal of increasing human power over natural forces and processes, implementing practical and useful applications that could be developed through the invention and use of innovative technologies.

In modernity, technology ceases to be a mere secondary, instrumental outcome of scientific primacy and becomes the very vehicle and goal of a designed and desirable future, through our increased ability to alter and mobilize nature to satisfy our needs and even our whims. It is no coincidence, as we saw at the beginning of this essay, that the

concept of utopia was invented in this period (in Thomas More's *Utopia*, 1516), and that the most influential utopias that followed it, such as those of Tommaso Campanella and Francis Bacon, have the increasingly predominant presence of technoscience as the driving force anticipating a desirable future.[11] We have reached the contemporary period with a full technological orientation of the scientific infrastructure and system, as well as its planning and operating procedures, in an atmosphere of uncritical optimism, averse to any prudence. The discourse of unlimited scientific progress marginalized dissenting voices and considered the growing number of negative environmental and social impacts as acceptable collateral damage.[12] The utopian impulse of technoscience is increasingly evolving into the opposite world of a dystopian nightmare.

2.2 The Complete Victory of the Market Society

A second concealing factor of general and fundamental importance is the absorption of technoscience into the economic sphere. Technoscience has become a productive force in a market of variable and cyclical geometry, but always tending towards the maximum possible extension. Technoscience has entered the competitive war for the conquest of market niches. The self-interest of companies with a capacity for technological innovation met with little opposition to the rapid implementation of patents in this field. With little or no regulation of environmental impact assessment, companies were able to circumvent the fragile vigilance of public policy, generally concentrated in the sphere of public health. Governments themselves have often become accomplices of these companies in the unrestricted and unconditional race to conquer markets, also as a way of asserting political and national supremacy. The replacement of society by the market, as a fundamental historical actor, paved the way for a profound shift from the model of a society with a market at its service, to the opposite model of a market that transformed society and nature into its two main satellites.[13] The lessons of pure industrial capitalism and the tumultuous subsequent events that led to the first liberal globalization and its demise during the violent thirty years of world wars, revolution and depression (1914–1945) were quickly forgotten after three decades of welfare policies and lightly regulated capitalism. In the 1970s, the wheel of history turned, setting the world on the vertiginous path of a second neoliberal globalization, which entailed the intensification of all the environmental and technological risks that are now part of our daily lives.

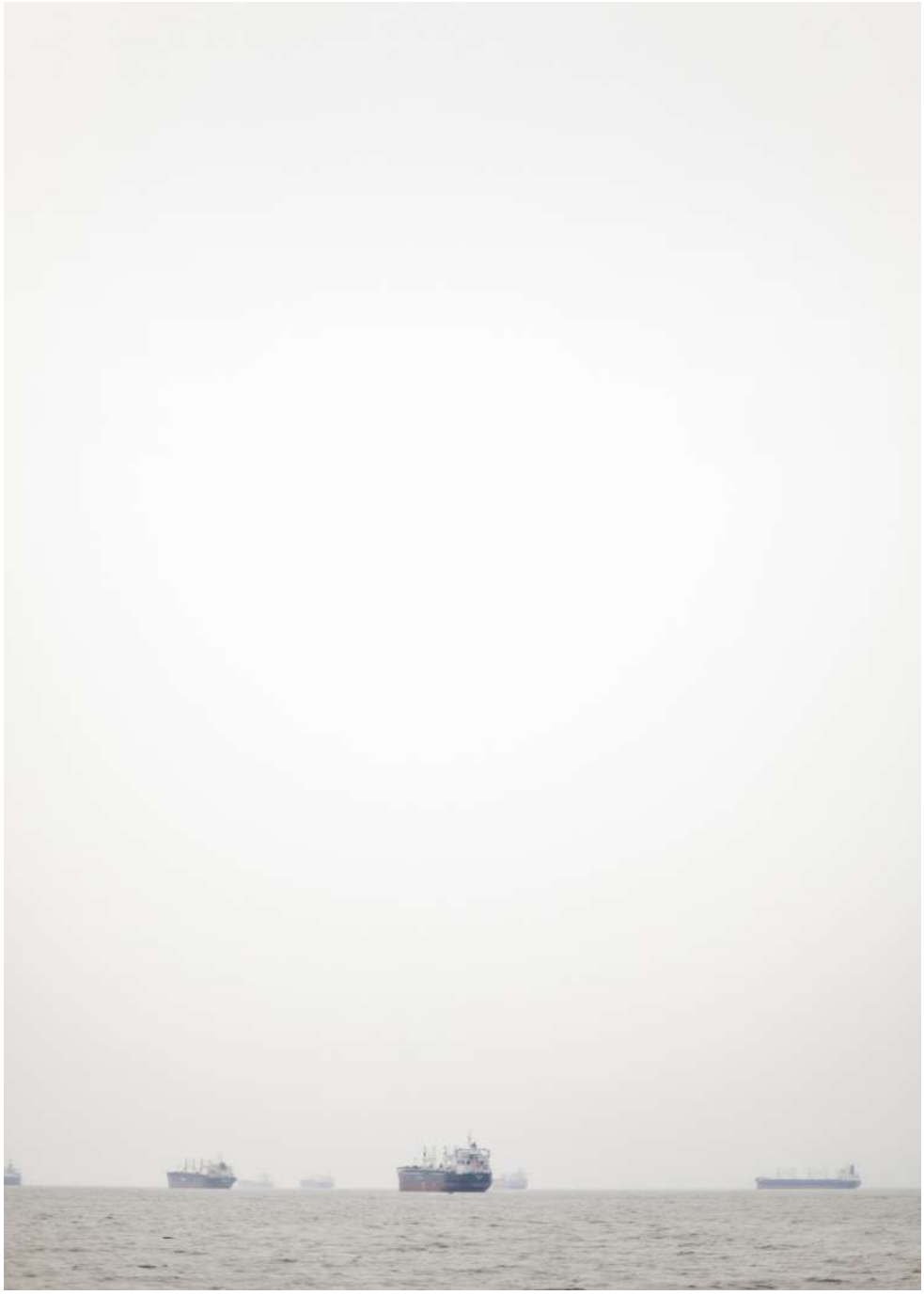
No-one expressed more elegantly than Aldo Leopold (1887–1948) what was at stake in the surrender of science to the relentless hubris of the market. For Leopold, scientific knowledge had two faces: in its ability to shed light on the unknown and to broaden the horizons of our understanding of natural processes, science was a "searchlight"; but to the extent that knowledge transformed by technology becomes a destructive instrument

11 T. Campanella, (2014) *La città del sole* [1602]. Trans. A. Seroni. Feltrinelli: Milano; F. Bacon, (1989) *New Atlantis* [1624]. In: J. Weinberger (ed) *New Atlantis and the great instauration*. Harlan Davidson Inc., Arlington Heights, IL, 61–159

12 European Environment Agency (2013) *Late lessons from early warnings: Science, precaution, innovation*. EEA report no 1/2013. European Environment Agency, Luxembourg, Europe.

13 K. Polanyi (2001), *The great transformation. The political and economic origins of our time* [1944]. Beacon Press, Boston, MA.

fig.1 International shipping, Vancouver.
Photo: Maria Bicker, 2018.



of power, science is also a "sword." Between the demands of the market and the imperatives of national security, even in peacetime, the sciences and scientists were driven to maximize efficiency, even at the cost of the wise light that could illuminate the potentially approaching dangers. The role of knowledge as a sentinel against risks and threats was therefore marginalized by an academy also caught up in the feverish desire for exponential growth.[14]

2.3 The Triumvirate of Modern Utopia and Its Fragmented Worldview

The third concealing factor strikes directly at the heart of international relations, conceived according to the model inherited from the treaties of Westphalia, which rebuilt the European international system at the end of the Thirty Years' War (1618–1648). Its intrinsic and rigidly mechanical understanding of sovereignty has kept international law, geopolitics and diplomacy under the biased spell of realpolitik, unable to filter out the rapid and dangerous anthropogenic transformation of the planetary software.

There is a strong congruence between these three driving forces of contemporary civilization, born in the same period of European history. These three elements of an authentic triumvirate, unrivalled in the contemporary world, share a very similar internal structure in fundamental aspects. They are united by the quest for increasing effectiveness in transforming the world. Science has been driven by its growing marriage with technology and its marvels. The market economy was fuelled by the fundamental imperative of growing investment and the limitless multiplication of capital. The modern state was driven by the tenacious attempt to affirm the validity of its major myths of sovereignty and autonomy. This triple convergence is densified into a triple fragmentation. Science is divided into disciplinary areas, epistemologically differentiated and even distant, united by an operational agenda dictated by the outside world, be it national security (such as the Manhattan Project that allowed the US to win the race to produce the atomic bomb) or private business objectives. Economics, as a theory and practical activity, is centred solely on its internal models and instrumental objectives, aimed at the unlimited growth of production, consumption and profits. What lies beyond this are externalities that can be set aside in the operation of both economic thought and its practice. The ideal type of company in a "free society" is portrayed by Milton Friedman in his classic 1970 essay, which bluntly states that there should be no such thing as "corporate social responsibility." That task should be assigned to government policies and not to private companies, whose job it is to maximize profits for their "shareholders."[15] Finally, the state looks at the planet through the lens of the territorial projection of power, completely oblivious to the complex ecological functioning of the Earth system, concerned only with what lies within the sphere of its sovereignty, and largely indifferent to everything and everyone beyond its borders.

14 A. Leopold, (1977) "The land ethic." In: Leopold A (ed) *A Sand County Almanac* [1949]. Oxford University Press, Oxford, UK, 201–226.

15 M. Friedman, (1970, September 13) "The social responsibility of business is to increase its profits," *The New York Times Magazine*.

3 How Utopia Became Dystopia

Dystopia, as a literary genre and philosophical topic, has essentially been portrayed as a negative utopia. This implies considering specific aspects, already present or emerging, in the society in which the literary work arises, picturing a frightening future in which the seeds of risk, already visible, become painfully omnipresent. This is what Aldous Huxley did with his *Brave New World* in 1932. Benefiting from his friendship with futuristic British scientists, he anticipated a society dominated by the empire wof biotechnologies transformed into post-human technologies. George Orwell did the same in 1948 with his novel *1984*, in which he imagined an asphyxiating totalitarian society. For this, Orwell drew on his direct knowledge of fascist and Stalinist totalitarianism.

The dystopia into which the Anthropocene epoch society has plunged is different. In our case, the root of today's expanding dystopia, which we all already feel in the anguish of the daily dysphoria between values and realities, is not the hypertrophy of particularly repugnant features. Our dystopia was not born out of any negative utopia, but out of the disproportionate transformation of the world by the totally positive programme of the modern utopian ideology, based on its driving triangle: technoscience, capitalist economics, and the sovereign state. This triangle, as we have seen, combines strength with concealment. Its core values are unassailable in isolation: who can blame the desire for emancipation and an increase in knowledge, or the health and comfort of human life? How can we criticize the human desire not to be a mere plaything of a destiny whose causes are hidden in superstition and ignorance? Our dystopia is born out of the synergy between these desired goals and their disproportionate enforcement, incapable of evaluating their limits and conditions of possibility. Erasmus of Rotterdam, in his *In Praise of Folly* (1511), identified the stamp of a universal and unrestricted foolishness at the heart of all human endeavours. We also have to be able, before daring to change the world we have already changed, to realize that this foolishness, in other guises, will always dwell at the heart of the best human ideas and intentions, if we are unable to fight relentless the drive towards the abyss contained in human arrogance disguised as enthusiasm and optimism for the future. As a matter of fact, the new *De Re Aedificatoria* which, like Ariana's thread, can help us out of the deadly labyrinth of the Minotaur, is still waiting for the author who can reveal it to the world.

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The Environmental Paradigms of Architecture

A Critical Approach

Keywords
— Environment, Architecture, Hygienism, Bioclimatism, Sustainability.

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Far from constituting a specialization, and far from being reduced to the principles of simple 'sustainability', the environmental approach to architecture has a long history that can be traced back to Vitruvius and has passed through various treatises until reaching modernity. Architecture manipulates form, matter and energy to shape environments with a certain cultural imprint — it is both matter and environment as well as form and symbol — and this definition not only enlarges the heart of the discipline, but also enriches it with its own values but also with its own contradictions. These values and contradictions must be taken into account when understanding the complexity of the architecture of the last hundred years, determined by the succession, conjunction and mixture of a series of environmental paradigms that are still largely in force: the hygienic, technocratic, bioclimatic, thermodynamic and sustainable paradigms.

That the climate determines architecture and that architecture builds a climate is something that has always been known. The wise men of antiquity knew this, such as the poet Hesiod, who warned that, since "it will not always be summer," we must "find cabins." Vitruvius knew this, when he associated the origin of architecture with the crystallization of social ties and made these depend on the affinity of those who, approaching the fire, discovered comfort. Alberti knew it, when he established a parallel between the parts of architecture and protection against the cold, the sun and the rain. Scamozzi knew it, asking that architects be "also meteorologists." Philibert de l'Orme knew this, declaring that "it would be better for the architect to make a mistake regarding ornaments than to know the beautiful rules of nature, for the benefit of health." Semper knew it, as he associated the quintessence of architecture with the classic quaternary of water, earth, air and fire. Le Corbusier knew this, he whose notorious failures in artificial air conditioning — the exact breathing that he could not breathe — led him to bioclimatism. And, of course, the vernacular builders always knew this, skilled in erecting architectures that were as precarious as they were effective, validating that other truthful cliché that says that architecture is, in essence, refuge.

These precedents — and those that are easy to find as soon as one looks at the history of architecture with different eyes — show that the climate problem is not something new. However, when facing environmental challenges, architects today continue to profess faith in amnesia, the love for starting from scratch, for that naive faith in the tabula rasa that is sustained by the conviction that times we live in are fundamentally original. "To new times, new solutions; to a new Zeitgeist, a new architecture!", they seem to proclaim, as if they were still living in the 1920s.

That we cannot continue acting as modern "heroes" was taught to us in the past by Tafuri and Rossi. And that our times, although turbulent, are not so original, can be shown to us today by the examination of the architecture with which we still compare ourselves, that of the last hundred years. This was an architecture that, far from sticking to simplistic schemes, was very complex, and that, with regard to its relationship with climate, environment or ecology, was handled in a plural way, as shown by the brief taxonomy that we are going to rehearse here: the taxonomy of the paradigms that architects have used to understand their relationship with the environment.

The first paradigm would be the 'hygienist' of the early twentieth century, heir to the old Hippocratic tradition that prevailed in the West for two millennia, and who trusted in the healing powers of architecture, as beneficial channels of that air and that sun that it was intended to "take everyone." The hygienist is the paradigm of that Walter Gropius dressed in a bathing suit who lay on the terrace of his villa in Dessau, or that of Le Corbusier who placed children's games on the roof of his vertical city

of Marseille, or that of those architects of the *siedlungen* who, with splendid stubbornness, oriented the rows of houses towards the sun.

The second paradigm, which we can call "technocratic," was just as "modern" as the previous one, but relied less on "natural" air and sun than on their artificial equivalents: heating and air conditioning. The hypothesis here was that the powerful machinery of the twentieth century was, for the first time in history, going to break the forced dependence that architecture had had on the climate, so that the forms could return to themselves, become "pure." In their metamorphosis they could give rise to a language that, as Le Corbusier wrote in *Précisions*, would be the same both in the poles and in the tropics: the universal language of the Modern Movement.[1] The traces left by this improbable endeavour are many: they range from the wild visions of futurism to the also wild utopias of Archigram that Reyner Banham liked so much, and after them they include the more serious modes of high-tech of that Foster who, as a young man, had no qualms about wasting energy.

Hygienism and technophilia were the two predominant paradigms in the Modern Movement, but it did not fail to contain other trends that, although they were repressed for a time, ended up emerging during times of renewal. Renovating was, in truth, the bioclimatic paradigm, which was built by both those who had renounced machinism and those who had allowed themselves to be fascinated by vernacular architecture by virtue of its wise and economical way of relating to the environment. This new sensitivity for context, for orientation, and for materials was expressed in the fruitful readings of popular architecture by Sybil Moholy Nagy, Bernard Rudofsky, or Hassan Fathy, and in the deterministic but undoubtedly creative ways with which Victor Olgyay — through his never sufficiently considered *Design with Climate* — interpreted in a modern key the lessons of biologists, meteorologists and builders "without pedigree."[2]

The ecological paradigm of the 1970s was the greatest corollary of bioclimatic sensitivity, which had to mutate to face the first energy crises. He did so by first taking advantage of the potential of new technologies, to later enrich himself with the contributions of the biological sciences, and continue to be soaked, at all times, in the naive but no less influential ideology of hippyism in its many versions, from neo-agrarianism to the new age.

Although the return of cheap energy deflated the ecological bubble for almost two decades, the new crises that the millennium brought with it inflated it again, albeit with different technological and ideological airs. The paradigm derived from this process had a double condition. It was, on the one hand, thermodynamic, to the extent that it aimed to become more scientific, investigating the heat transfer processes that occur in human bodies and in body-buildings, and recognizing — problematically — the renovating, aesthetic side that thermodynamics could have. On the other hand, it was also a sustainable paradigm, since it echoed the dogmas that, in all instances, sought to respond to the challenges of climate change.

1 Le Corbusier, *Précisions Sur Un État Présent de l'architecture et de l'urbanisme* (Paris: G. Crès, 1930).

2 Victor Olgyay, Design with Climate. Bioclimatic Approach to Architectural Regionalism. New York: Princeton Architectural Press, 2015.

Complementary in principle, this double condition has only separated over time: if those who support sustainability have prioritized the quantitative sides of the problem to the point of promoting a kind of new functionalism — environmental functionalism — the champions of "thermodynamics" have attempted a difficult conciliation between the technical and the aesthetic. They have even aspired to a new type of beauty, "thermodynamic beauty."

Marked by ecological, health and geopolitical crises of uncertain outcome, our times are — it is true — facing new challenges. But this does not mean that, fundamentally, the ways in which we approach the problem of the environment continue to adhere to one of the aforementioned paradigms: hygienist, machinist, bioclimatic, ecological, thermodynamic or sustainable. In fact, rather than following a single scheme, our approach is now fruitfully hybrid, or eclectic: it takes from one paradigm or another what is of interest for it. From the hygienist, the obsession with ventilation — it is not in vain that we have lived in times of masks — from the machinist, the persistent technological confidence; from the bioclimatic, the learning of "architecture without architects" and the regionalism derived from it; from the ecological, the assumption of the complex and interdependent dimension of the processes that make up buildings and cities, and of the perceptive mechanisms that alter our behaviour through the environment; from thermodynamics, the knowledge of the heat exchange processes that regulate daily life and the conviction that it is possible to play aesthetically with them; and from the sustainable paradigm, the desire for quantification and the regulatory impulse, with all its techno-bureaucratic illusions and its economic opportunities.

As it was in the heroic times of "modernity," architecture continues to be the best laboratory to test these paradigms or call them into question. Not only because the supposedly modest scope of the buildings determines people's lives in many ways; but also because these people, through architecture, are forced into first-hand confrontation with their environment, opening or closing windows, extending or retracting awnings and blinds, turning the heating off or on, until they internalize the mechanisms again — today fundamentally forgotten — of common sense.

A place where climates and microclimates, techniques and ideologies come together, architecture — and especially architecture in minor tone — can become a true field of technical, compositional and pedagogical experimentation on our environmental practices. Some practices we already know have less to do with technical, sociological and political discourses foreign to architecture, or with the technocratic regulations and economic impositions of "sustainability," than with the essential, "internal" problems of the discipline. The same ones, to a large extent, that a Vitruvius, an Alberti, a Scamozzi or a Semper already had to deal with. Climate is not something different from architecture; climate and architecture are simply two ways of saying the same thing: "architecture."

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Territory, Climate, Body and Architecture

—

Toward an Ecological Typology

Keywords
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DOI
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This essay explores the capacity of vernacular types to engage not only the climatic and ecological dimensions of a place, but also its social and cultural commonalities. Starting with the need for an experiential approach to architecture, an initial passage explores the multisensory dimension of the human body. This leads to the everyday life experience of the inhabitants of a given place. Every place reveals common behaviours that are shared among its inhabitants, and ecological types offer disciplinary tools for attuning these questions to architecture. This essay tentatively aspires to redefine the concept of typology, overlaying the formal and material questions considered by previous definitions with performative, behavioural, and phenomenological ones.

In recent decades, the design disciplines have begun to address the pressing demands for an environmentally sensitive approach to the built environment. However, beyond the quantitative and performance-oriented approaches that have prevailed recently, any attempt to connect climate-change concerns and architecture must also focus on working on its cultural dimension, which means understanding the importance of the territorial, climatic, social, and cultural dimensions of a specific place in relation to forms of dwelling.

This implies not only addressing the interactions that exist between local climate, the spatial and material particularities of architecture, or the material ecology that a building mobilizes. It also means studying the anthropology of inhabitation to unveil the connections that exist between local climate, the spatial and material particularities of architecture, and the lifestyles of its users. Through engagement with the climate and sociocultural particularities of a place, students explore the capacity of architecture to mediate between local climates and everyday inhabitation patterns.

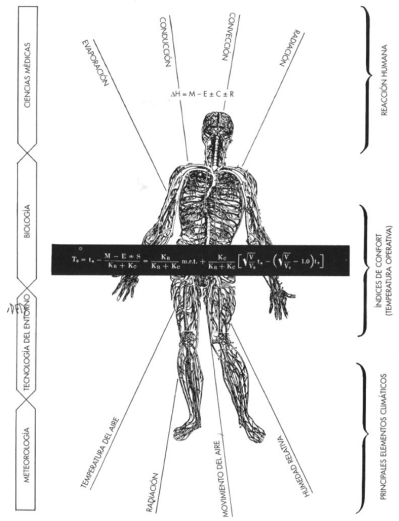
Contrary to the parametric approaches that have dominated thermodynamic architecture over the last decade, it is necessary to find architectural tools for connecting territorial and climatic questions to ordinary life and architecture. A climatic and ecological approach to typology offers an encompassing tool for bridging the gulf that exists between a local climate and a specific inhabitant's patterns of everyday life. Climatic types — both historical and contemporary — show very explicitly how architecture can interact between outdoor climate and the way people live and socialize, potentially connecting the spatial and material features of architecture with the specific physiological and psychological behaviours of its users, connecting the thermodynamic processes caused by architecture and the quotidian behaviour of its inhabitants.

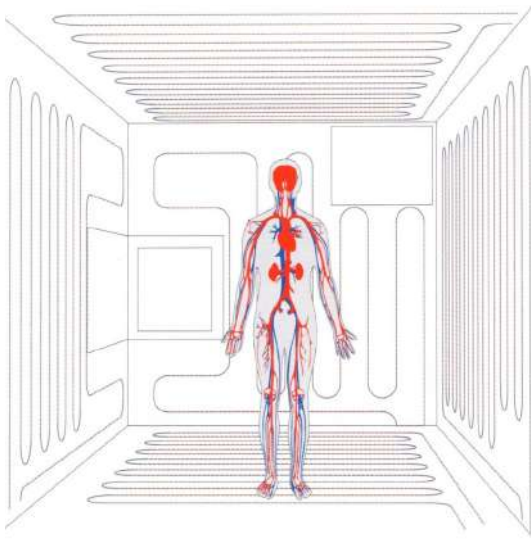
This essay explores the capacity for climatic types to engage not only the climatic and ecological dimensions of a place, but also its social and cultural commonalities. Starting with the need for an experiential approach to architecture, an initial passage explores the multisensory dimension of the human body. This leads to the everyday life experience of the inhabitants of a given place. Every place reveals common behaviours that are shared among its inhabitants, and ecological types offer disciplinary tools for attuning these questions to architecture. This essay tentatively aspires to redefine the concept of typology, overlaying the formal and material questions considered by previous definitions with performative, behavioural, and phenomenological ones.

Body, Comfort, Pleasure: From Physiology to Phenomenology

Over the past ten years, a renewed interest in the human being has emerged, positioning man in the centre of architectural discussions.[1] Even though architecture is a field of knowledge with the ultimate goal of providing

1 See for example Beatriz Colomina and Mark Wigley, *Are We Human? Notes on an Archaeology of Design* (Zürich: Lars Müller, 2016), or Kiel Moe, *Thermally Active Surfaces in Architecture* (New York: Princeton Architectural Press, 2010). For more on the current interest in neurophenomenology, see the books referenced in footnote 5.





2 Over the past few decades, several voices have researched the influence of public health and medicine in the history of the Modern Movement. See Beatriz Colomina, *X-Ray Architecture* (Zürich: Lars Müller, 2019).

3 Richard Neutra, *Survival Through Design* (New York: Oxford University Press, 1954).

4 Lisa Heschong, *Thermal Delight in Architecture* (Cambridge, MA: The MIT Press, 1979).

fig.1 *Design With Climate*, Aladar Olgyay (1969).

fig.2 *Radiant Surfaces In Architecture*, Kiel Moe (2010).

human shelter, over the past several decades, it has paradoxically focused on disciplinary discussions.

The human body was initially incorporated into the discipline of architecture through the field of public health and, decades later, through the paradigm of comfort. It is well documented that the Modern Movement fostered interest in hygiene and health and how the desire for a healthy environment deeply influenced its architectural outcome.[2] From Willis Carrier's "air-conditioned man" (1910s) and the Olgyay brothers' "bioclimatic man" (1969) to Kiel Moe's "radiant man" (2010), architecture has focused on the physiological dimension of the human body, overlooking other, equally important, perspectives.

Beginning in the 1960s, this emphasis was complemented by an interest in psychology. The "medical" body gave way to the "psychological" body, introducing the concept of the "expanded field of perception." Richard Neutra's body of work focused on psychology, representing a clear example of architecture that mediated between the environment and the user's perceptual experience.[3]

These ideas were further developed in the 1970s through books like Lisa Heschong's *Thermal Delight in Architecture*,[4] which searched for an alternative to the homogeneous environments modern architecture was delivering. In contrast to the isotropic spaces and air-conditioned atmospheres that pervaded the modern built environment, Heschong championed the multisensory aesthetic experiences offered by traditional architecture. Drawing on examples ranging from the Finnish sauna to

fig.3 LSD *Art,* Front Cover *Life Magazine* (1966).

the Islamic garden, Heschong argued that the human nervous system is programmed for changing environments rather than homogeneous ones, considering that thermal fluctuations — like those existing between North African summer temperatures and the conditions within the enclosed Islamic patio — have invigorating effects on the human body.

This multisensory approach was related to the interest in phenomenology that arose in 1970s architecture culture. Christian Norberg-Schulz's interpretation of phenomenology focused on reintroducing an original, imagined authenticity to balance the rational abstraction modern architecture had revealed. Maurice Merleau-Ponty's phenomenology was interpreted by a group of architects who introduced wholeness, rootedness, and place into architecture through embodied multisensory experience. The work of architects such as Juhani Pallasmaa, Steven Holl, and Peter Zumthor exemplifies how these questions were introduced in the built environment.

A renewed interest in phenomenology has emerged in the work of a group of architects, historians, and theoreticians who are using cognitive science, neurophenomenology, and embodied cognition "to shore up architectural phenomenology ethical project with scientifically rigorous accounts of embodiment." [5,6]

5 A number of architectural historians and theoreticians have resorted to neuroscience to reinvigorate the phenomenological project. See for example, Sarah Robinson and Juhani Pallasmaa, *Mind in Architecture: Neuroscience, Embodiment, and the Future of Design* (Cambridge, MA: The MIT Press, 2015); Sarah Williams Goldhagen, *Welcome to Your World: How the Built Environment Shapes Our Lives* (New York: HarperCollins, 2017); Harry F. Mallgrave, *Architecture and Embodiment: The Implications of the New Sciences and Humanities for Design* (New York: Routledge, 2013); or Alberto Pérez-Gómez, *Attunement: Architectural Meaning After the Crisis of Modern Science* (Cambridge, MA: The MIT Press, 2016).

6 This renewed interest in phenomenology can, for instance, be found in the issue of *Log* devoted to this topic. See Bryan E. Norwood, "Disorienting Phenomenology," *Log* 42, Winter-Spring 2018.

Unlike Freud's understanding of the sharp separation of body and mind, neurobiologists like Jean-Didier Vincent have probed the idea that environment, soma, and senses are interconnected and form a continuous realm, unveiling the fact that human psychological emotions are connected to the body's physiological processes.[7] Present interest in phenomenology is being reinvigorated through a rigorous scientific approach, which enables more precise knowledge of the effect that specific design decisions have on the perceptive environment. This means designers will be able to create architectural environments with a complete understanding of the reactions caused by specific stimuli on the human body.

The phenomenological project was based on the presupposition of another universal subjectivity — through embodiment — which would come to replace modernity's objectivity. However, rather than provide a universal theory of architecture, a revival of phenomenology must use renewed tools as a way of unveiling the particularities of different embodiments.

Making it clear that neurophenomenology will provide the practical knowledge needed to attune the human body to architecture — providing healthier, more varied, heterogeneous, and stimulating atmospheres — the real challenge is to understand how this physiological-perceptual paradigm can permeate architecture in everyday life. This question introduces the second part of this essay, which explores how ordinary everyday life atmospheres can help with understanding how the built form affects how occupants perceive, think, and behave.

Atmospheres of Ordinary, Everyday Life

Ordinary life has been a continuous source of inspiration for architects. From Robert Venturi or Rem Koolhaas to Atelier Bow-Wow, the study of ordinary architecture and urbanism has enriched and transformed architecture culture. Architects typically turned to existing urban phenomena for redefining their own discipline. Learning from Las Vegas studied the strip mall to formulate the decorated shed principle. Delirious New York explored the architectural conditions of the Manhattan skyscraper to reinvigorate architecture through programme hybridization.[8,9] Made in Tokyo documented anonymous contemporary architecture in the city of Tokyo as an alternative to the sophisticated star-architecture culture.[10] Unlike these books, which focused exclusively on the built environment, a new generation of publications analyse the connections between users, everyday life, and the built environment. Revealing an anthropological perspective, ordinary, everyday life is mapped to show how architectural and urban elements interact with non-architectural elements such as the human body, plants and animals, or atmospheric phenomena to define particular behaviours.

For instance, recent books by Atelier Bow-Wow explore what they define as the "ecology of livelihood."[11] Through meticulous, detailed sectional perspectives, Momoyo Kaijima and Yoshiharu Tsukamoto

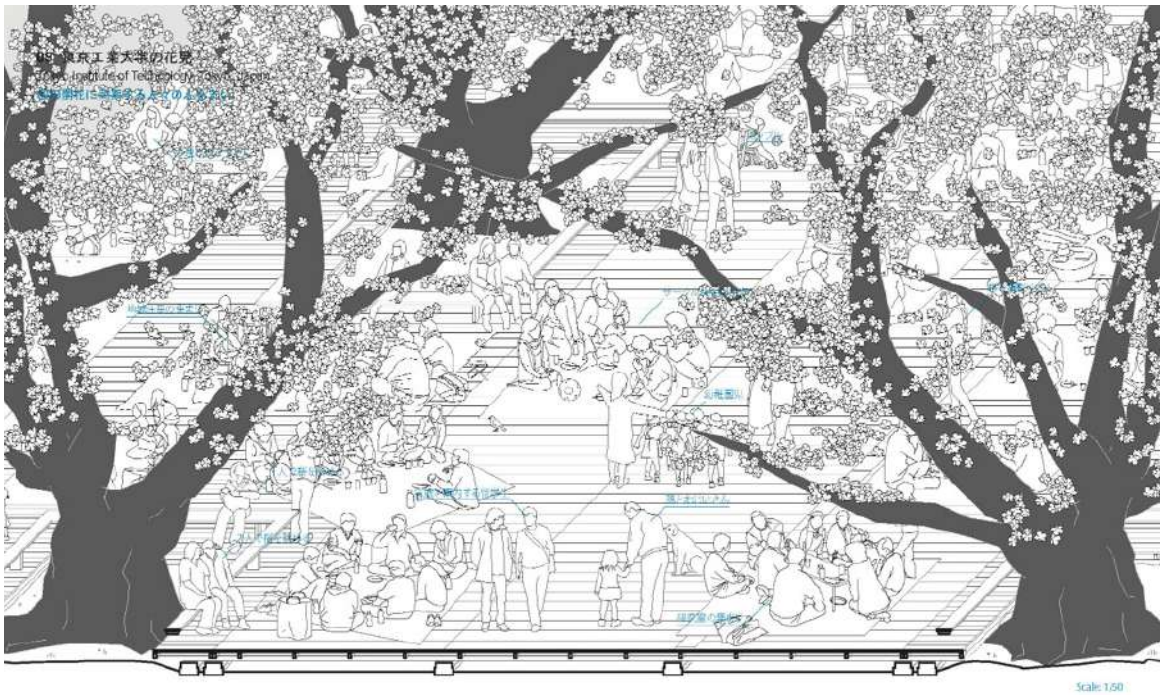
7 See Jean-Didier Vincent, *The Biology of Emotions*, trans. John Hughes (Oxford, UK: Basil Blackwell, 1990).

8 Robert Venturi, Denise Scott Brown, and Steven Izenour, *Learning From Las Vegas*, rev. ed. (Cambridge, MA: The Massachusetts Institute of Technology, 1977).

9 Rem Koolhaas, Delirious New York: A Retroactive Manifesto for Manhattan (Oxford, UK: Oxford University Press, 1978).

10 Junzo Kuroda and Momoyo Kaijima, *Made in Tokyo* (Tokyo: Kaijima Institute, 2001).

11 See books such as Atelier Bow-Wow, *Commonalities, Production Of Behaviors* (Tokyo: Lixil, 2014), Yoshiharu Tsukamoto, *WindowScape: Window Behaviourology* (Singapore: Page One, 2012), or *Windowscape 3* (Japan: Film Art, 2016).



12 Drawing by a student at the Tsukamoto Workshop at the Tokyo Institute of Technology (2013–14), from Atelier Bow-Wow, *Commonalities of Architecture* (Delft, Netherlands: TU Delft, 2016), 52–53.

13 Atelier Bow-Wow and K. Michael Hays, *Architectural Ethnography: Atelier Bow-Wow.* (Berlin: Sternberg Press, 2017).

represent how users inhabit buildings. Overlaying the space of construction with the space of human interaction, the space of representation with the space of occupation, they show the interrelationships between diverse elements. For example, the drawing "Cherry Blossom Viewing" depicts an annual Japanese event showing the precise interaction between the arrangement of cherry trees, cast shadows, the beauty of blossoming flowers, a picnic, and social encounters, which together make this specific situation memorable.[12] Tsukamoto explains that they listen to and observe user behaviours to understand what is happening in each place, claiming "[e]very place reveals unique behaviors that are shared among the people who are part of that place. These behaviors are not something we can design. They are already there. We can only encourage or intensify them by intervening in existing conditions that define the behavioral capacity of that space."[13]

Photography is of great use in the search for ecological connections between inhabitants, the built environment, and climate. Modern and contemporary photographers — from Henri Cartier-Bresson, Frank Kappa, or Francesc Català-Roca to Joel Meyerowitz — have documented everyday life during the last century, showing the connections that exist between climate, architecture, atmosphere, and human behaviour. Through their work, natural and built environments can be analysed to further understand

fig.4 (previous page)
Commonalities, Cherry Blossom Viweing at Tokyo Tech, Atelier Bow-Wow (2013–14).

fig.5–6 *El Mojón,* Francesc Català-Roca (1967).

the relationships between places and people. Pictures introduce everyday life, unveiling not only productive activities or social patterns, but also more mundane tasks — though equally relevant for understanding the connections between humans and climate — such as how people dress or interact with the built environment, revealing situations in which inhabitants are enjoying a good life. Interestingly, these everyday life circumstances are sometimes framed by architectural devices — a glass house or a porch — providing a first approximation of the architectural arrangement a particular climatic situation requires. This enables architects to find the architectural elements that can deliver the same climatic effects, articulating a smooth and continuous thread between everyday life situations and the architectural frame that causes them.

However, this documentary evidence needs to be complemented by a parallel initiative that aims to understand the existing interactions between the built environment, the microclimate it causes, and the way it is inhabited. Relating these questions to each particular situation requires acknowledging the thermodynamic connections that tie the human body — both its physiological functions and psychological emotions — to architecture's spatial and material features. This means understanding precisely which thermodynamic phenomena connect human behaviour

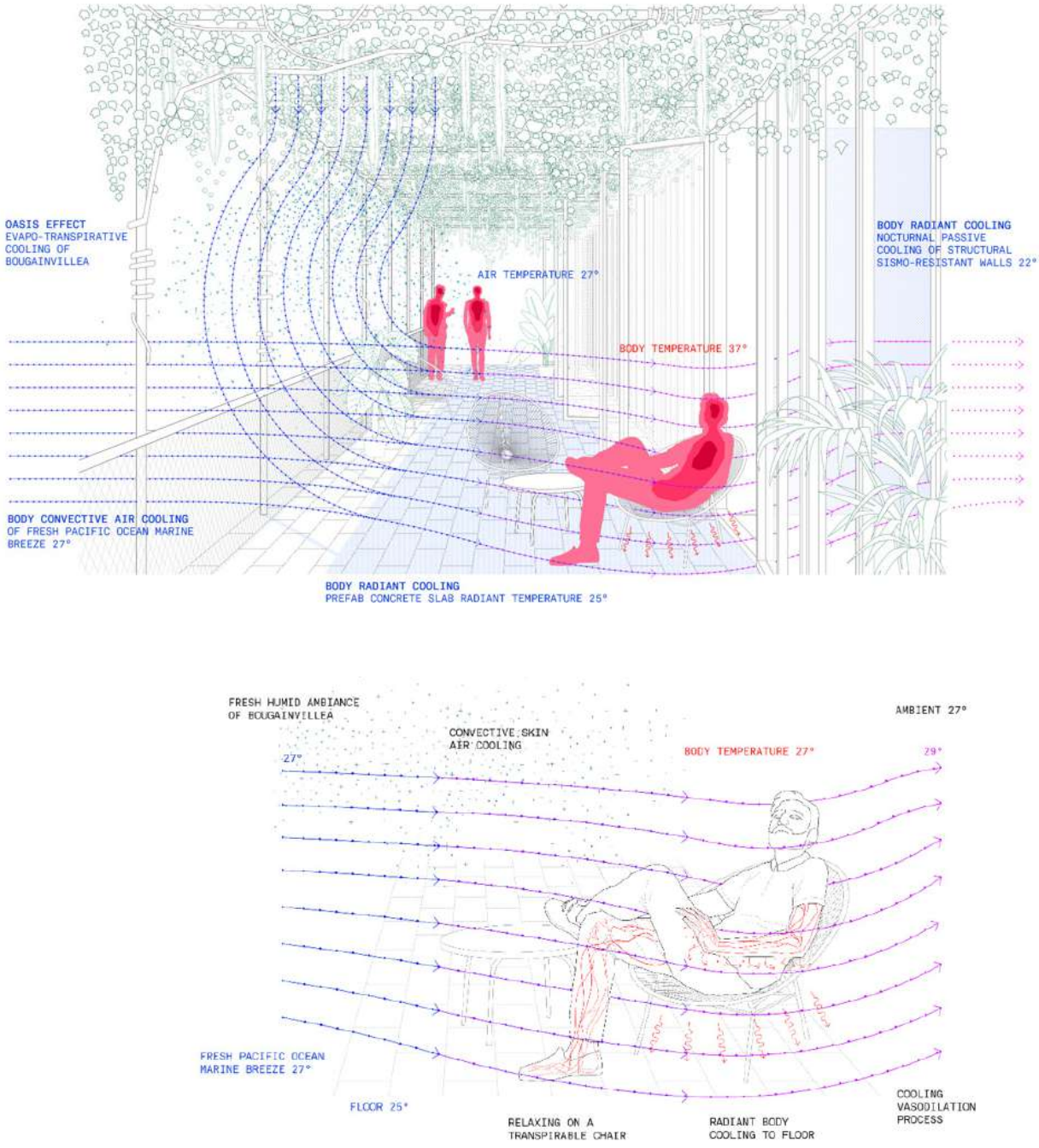


fig.7–8 Physiological Processes of Man Under Bouganville Shadow. Concytec Competition, Lima (Perú). Taas & Javier García-germán (2015).

to its context, as well as understanding the physical interactions — haptic, thermal, acoustic, and so forth — at play in a specific situation and how these affect the human perception to make it intense and pleasurable. The goal is to overlay ethnographic investigations of everyday life with the technical expertise provided by disciplines such as physics, physiology, or neuroscience with architectural tools to develop a wholistic approach that enables the design and build of successful spaces. This is done by searching for architectural elements that evoke such social and physiological behaviours. Both historical and contemporary architecture culture offer examples of spatial, material, passive, and mechanical elements that can provide the comfortable and intense climatic effects found in specific situations.

The attached figure shows a proposal for a public, covered open corridor for an office building drawn for a competition. It depicts the interactions between the material space, its microclimate, its plants, and the behaviour of its users. It is passively ventilated to generate a stimulating space that encourages social interaction. It can be argued that this space works at a social level due to its stimulating and passively generated atmosphere. In turn, this atmosphere works because the psycho-physiological processes have been properly designed.

Climatic Type as Spatial Practice

It is difficult to predict the architectural situations in which specific atmospheres will unfold. However, climatic types offer an invaluable knowledge for understanding how specific architectural solutions mediate between local climates and the everyday life of inhabitants. Present in different latitudes around the world, climatic types offer an extensive catalogue of basic architectural solutions that effectively adapt to the climate. Classic books like Jean Dollfus's *Les Aspects de L'Architecture Populaire dans le monde*[14] or Bernard Rudofsky's *Architecture Without Architects*[15] are valuable references that distil the architectural and climatic strategies at work.

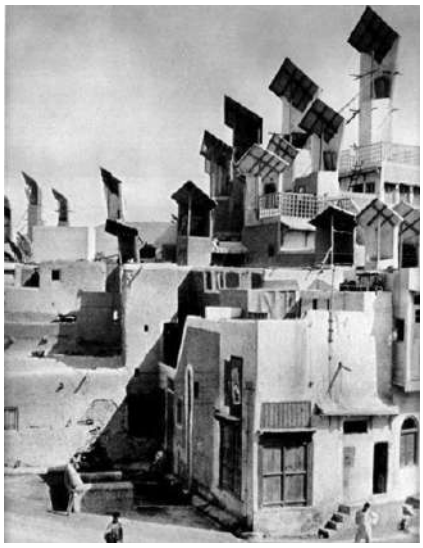
Climatic types offer a precise orchestration of spatial and material considerations for a specific microclimate. Challenging the modern insulated-envelope paradigm, these types interact with climatic conditions, articulating an open-system thermodynamic approach to architecture. Furthermore, climatic typologies display precisely how specific thermodynamic mechanisms, like a patio or attached greenhouse, overlay purely performative questions with other issues that are connected to the way in which architecture is used. For instance, Lacaton & Vassal systematically attach polycarbonate greenhouses to buildings, a great example of the powerful connection between specific thermodynamic devices, the microclimates they generate, and the everyday life that can potentially be experienced by its inhabitants. From post-occupancy photographs, it is also possible to understand the experiential engagement

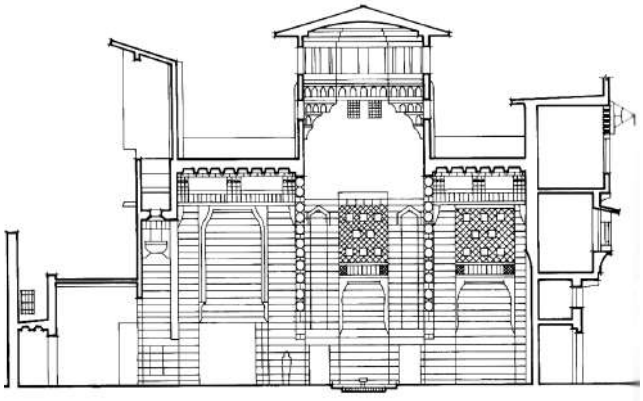
14 Jean Dollfus, *Les Aspects de L'Architecture Populaire dans le monde* (Paris: Editions Albert Morancé, 1954).

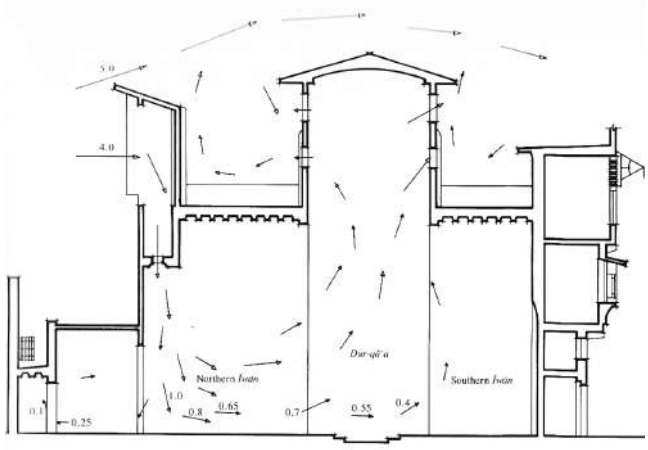
15 Bernard Rudofsky, *Architecture Without Architects: A Short Introduction to Non-Pedigreed Architecture* (New York: Museum of Modern Art, 1965).

fig.9 The Wind Catchers of Hyderabad (1928). *Architecture Without Architects*. Rudofsky.

fig.10 Muhib Ad-Din Ash-Shaf I Al-Muwaqqi. In *Natural Energy and Vernacular Architecture*. Hassan Fathy (1986).







of users within induced microclimates, unveiling the capacity for climatic types to mediate between habitation behaviours and the physiological and psychological processes at work.

Climatic Types Are Also Metabolic Types

Interestingly, climatic types offer more than a precise spatial and material climatic orchestration. They also give compelling lessons regarding its material ecologies, giving very interesting clues about the connections between the material composition of a building and the regional geographies where those materials come from. This question is driving a renewed interest in vernacular and primitivist technologies.

For instance, the study of a wood Swiss Alpine chalet displays a very simple material metabolism. It offers the possibility to understand where materials are sourced from and where they are transformed. Similarly, other buildings with massive structures such as a rammed-earth Moroccan *ksar* located in the in foothills of the High Atlas or a limestone trullo in the Italian region of Puglia display simple material ecologies. In the case of the Murgia trullo, the dry-stone keystone vault can be traced down to the Murgia karst plateau geology, stone being sourced from the limestone quarries around Alberobello. Likewise, in the case of the Ait-Ben-Haddou *ksar*, the earth is sourced around the building site. Interestingly, in these massive monomaterial structures, one material prevails, its simplicity assuring both the trackability and the recyclability of these structures.

Natural ecosystems work according to laws which cycle material flows following a closed process where outputs become raw matter for the next material input. Attuning building processes to natural dynamics requires using organic building materials which form part of geo-ecological spatiotemporal cycles. The pulsing drive for wood, stone or earth as building materials responds to this demand to synchronize building cycles with natural cycles.

The material strategies unfolded by practices such as TED'A arquitectes, Anna Heringer or Francis Kéré make use of building techniques such as load-bearing rammed-earth walls or brick masonry which reinvigorate local and artisanal practices. The building procedures they use are close to the AT movement — appropriate technology movement — unfolding a technological apparatus which is adapted to its economical and social context. However these nostalgia-driven regional positions, even though are very necessary in the contemporary context, cannot be used widely — as, for example, they are not applicable for massive housing developments in the ever-growing cities of the tropical belts; they need to be refuted by optimistic architectural practices which, recharging ancient low-cost techniques with industrial procedures, propose a renovated multicultural material ethics, granting a cosmopolitan perspective to traditional building procedures.

16 Anthony Vidler, "The Third Typology," *Oppositions* 7 (Winter 1977), available at https://monoskop.org/images/5/50/Vidler_Anthony_1977_1998_The_Third_Typology.pdf.

17 Alan Colquhoun, "Typology and Design Method," *Perspecta* 12 (1969), 71–74.

Toward a Fourth Typology?

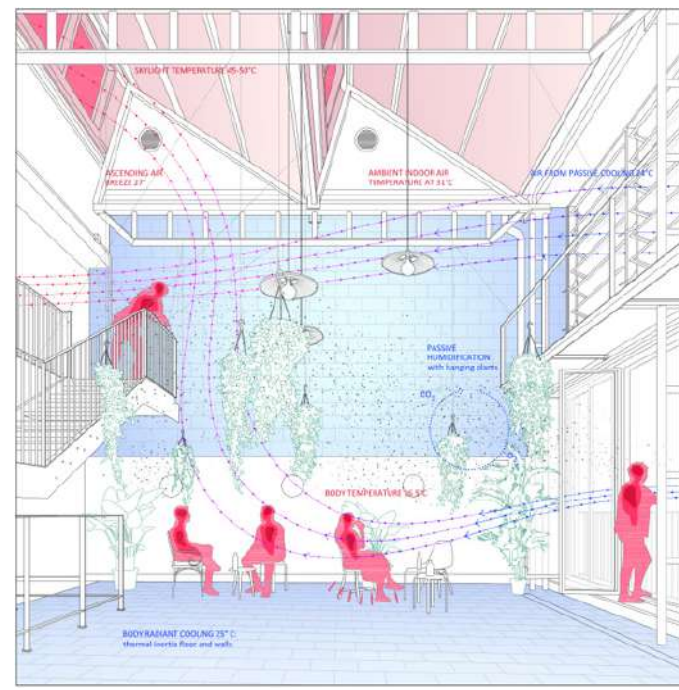
According to Anthony Vidler's 1977 article, "The Third Typology," the idea of typology has had three different conceptualizations.[16] Initially, it was connected to the natural order of the primitive hut. An outcome of the rationalist philosophy of the Enlightenment, the prevalent idea during the eighteenth and nineteenth centuries understood the combination of type-elements as the expression of the underlying form of nature beneath its surface appearance. In the early twentieth century, this understanding gave way to a second idea of typology linked to technological production, best exemplified by Le Corbusier's interest in the industrial "object-types." Developed through a long optimization process, the concept of object-type became the basis for design.

However, in the 1960s these initial definitions were questioned, sparking an interest in the form of the traditional city and bringing forward a third understanding of typology. Transcending former conceptualizations which found validation outside the discipline, the new idea of typology found its focus of interest in the traditional city and its architecture. According to Alan Colquhoun, modernity oscillates between "biotechnical determinism" on one hand and the "free expression" of the architect on the other, but leaves a void that had been previously filled by core disciplinary values.[17] The new idea of typology that developed during those years bridged this gap. Connected to urban form, it was recognized as a disciplinary tool for understanding the morphological evolution of the city through time. Devoid of the ideological content of previous conceptualizations, typology now offered a set of objective architectural tools referring to their formal nature as architectural elements.

Interestingly, there is a symmetry between the idea of typology that appeared in the 1960s and the renewed interest that has emerged over the past several years. Contemporary architecture has also oscillated between two opposing positions: the performative ecodeterminism of sustainable practices and the delirious genius of the star system. Unfortunately, this polarization excludes several essential architectural questions, operating in a cultural and social vacuum that obviated not only core disciplinary values and the historical background of architecture, but also its human and collective side.

Similar to what happened in the 1960s, this vacuum must be counteracted by a return to core disciplinary values and social engagement. From this point of view, a typological discourse can potentially bridge the void between the techno-scientific and the social and cultural opposites required to interact in architecture. Climatic typology — or the study of climatic types — has the potential to fill this vacuum. Climatic types bring forward a new understanding of typology, which merges the thermodynamic, the cultural, and the social. This is done using concepts and tools belonging to the discipline of architecture.

fig.11–12 Taas & Javier García-Germán. Climatic Social Condenser in 159 Unit Social Housing Scheme. Carabanchel, Madrid (2017–2022).



From a performative point of view, climatic types are understood as material constructs that orchestrate space, matter, and programme to generate specific climates.[18] Unlike Dollfus or Rudofsky, who link climatic types to specific geographies and regions, this idea of typology is no longer understood in connection to a given place, but as thermodynamic schemes available for use in a variety of locations and situations — as long as they are compatible with local climates — paying tribute to Durand's idea that architectural history offers a wide variety of solutions that can be recombined in novel ways. This concept circles back to the correlation between type and form that pervaded typological definitions until the iconographic turn dispensed with it.

Moving from the performative to the behavioural, this understanding of typology complements the formal idea prevalent in the 1960s. Integrating atmosphere with peoples' behaviours, it conflates the architectural conceptualization and construction with its occupation, drawing architecture closer to Henri Lefebvre's concept of "spatial practice."[19] This idea of typology combines architecture, anthropology, and psychology to deliver an understanding of architecture that overlays its spatial practice, the representation of space, and representational space.[20] To put it simply, this understanding superimposes lived space, perceived space, and conceived space, designing spatial and material systems to provide an intense and stimulating atmosphere, where everyday life can unfold.

Transcending Le Corbusier's industrial types, Nikolaus Pevsner's functional types, Venturi's iconographical types, or Aldo Rossi's formal types, this understanding of typology also supersedes the notion of "behavioural typology," which has been recently defined. [21,22,23] In behavioural typologies, content prevails over container, human behaviour and activity over space, habitability over structural consistency. Expanding on this idea, climatic types conflate the formal and material structure of the architectural type with the microclimates it elicits and the behaviour of its users, superseding performative determinism to embrace an open ecological interaction between architecture, atmosphere, and the social with human bodies.

Unlike previous visions which understood that "type can no longer define the confrontation of internal ideology and external constraints," this interpretation unveils the fact that architectural tools like typology can be aligned with political endeavours.[24] This new idea of typology delineates an inclusive architecture that complements the quantitative rigour unfolded by thermodynamic practices with a stronger emphasis on everyday life experience. It merges the quantitative, techno-scientific thermodynamic and ecological discourse on sustainability with a disciplinary outlook to provide more intense and stimulating atmospheres for everyday life and a politically charged agenda.

18 Performative refers to the climatic performance specific spatial and material features can elicit in an architectural interior.
19 Hays, 23.
20 Henri Lefebvre, *La Production de l'Espace* (Paris: Editions Anthropos, 1974).
21 Nikolaus Pevsner, *A History of Building Types* (London: Thames & Hudson, 1976).
22 Aldo Rossi, *L'architettura della* città (Padova, Italy: Marsilio Editori, 1966).
23 See Marco Casamonti, "Architectural Typology vs. Behavioural Typology," *area*, Oct. 6, 2014. Available at https://www.area-arch.it/en/architectural-typology-vs-behavioural-typology-2/.
24 Rafael Moneo, "On Typology," *Oppositions* 13 (Summer 1978), 22–45.

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Breathing Surfaces

Brazilian Façades of the 1930s and 1940s

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Modern Brazilian architecture offered a fertile territory for experimenting with the most varied forms of mediation between exterior and interior, such as brises, *shutters, wooden trusses, hollow elements and wide eaves. The application of these elements to the façades of high-rise buildings raised questions about the very nature of the facade in the modern era. In addition to the practical role, defining and offering basic conditions for carrying out the activities for which the buildings are intended, and to the operative role, reducing the internal temperature, the facades also perform a symbolic role, giving a face to the institution or the function that is developed there. This article seeks to develop this argument, through a closer look at two buildings of the Escola Carioca, the headquarters of the Brazilian Press Association (ABI) (1936–1938), by MM Roberto, and Parque Guinle (1948–1954) by Lucio Costa. It shows that these façades not only delimit the uses and made them possible, but also help the building to engage with the surrounding milieu through elements of climatic adaptation while representing the uses which took place there.*

In the various publications on modern Brazilian architecture in international magazines, between the mid-1940s and the early 1960s, buildings designed by architects of the so-called Escola Carioca played a significant role. In general, the publications highlighted their plasticity, elegant forms, and lightness, as well as the success achieved by integrating the arts and the attention paid to elements of climate protection.

This interest in modern Brazilian architecture was due to the fact that it pointed out paths for some concerns of international criticism in the middle of the 20th century, particularly regarding the supposed inability of modern architectural functionalism to deal with cultural and climatic aspects of the different regions, as well as themes such as monumentality. If in the 1920s, modern architecture seemed to be a universal project, the result of reason and technology ready to be implemented in the most distant corners of the world, it soon expanded to regions that were not yet industrial, nor fully urban, and that had very different climatic conditions and cultural traits from those of the few European countries where it was born. Modern architecture had to deal with diversity of both places and cultures. Its supposedly universal aspects had to converse with historical inheritances, traditional materials and building practices and classic continuities.[1] In this process, it assumed individual expressions and developed a series of peculiarities influenced by the conditions of the different places.

This diversity of expressions in modern architecture was also the result of the efforts of architects to adapt their creations to the different climates of the places where they built. The works of Richard Neutra (1892–1970) in California and Puerto Rico, Lucio Costa (1902–1998) in Brazil, Hassan Fathy (1900–1989) in Egypt, Maxwell Fry (1899–1987) & Jane Drew (1911–1996) in Ghana and Nigeria and Josep Lluis Sert (1902–1983) in different countries (United States, Spain and Iraq) showed that modern architecture was able to find more suitable ways of relating to the environment, through devices of climatic adaptation, which almost always found their roots in the building traditions of each region. The spread of air conditioning from the mid-1970s, in addition to the poor maintenance and lack of conservation, shadowed the richness of these experiments, but in the last years, with calls for a more sustainable architecture, there is a renewed interest in these architectural achievements, particularly for their techniques of environmental control.

Modern Brazilian architects were not the first to be concerned with such aspects. Observing the solar orientation and wind regime, preventing excessive heat or cold and making better use of available materials and resources have been present for millennia, particularly in traditional societies. However, with the rise of modern architecture in the early twentieth century, the ways of understanding the relationship between building and the climate have undergone significant transformation, through scientific knowledge and the new materials available.

1 William Curtis, *Modern Architecture since 1900,* 3rd ed., (London: Phaidon, 1996), David Leatherbarrow, *Architecture Oriented Otherwise,* (New York: Princeton Architectural Press, 2009); Roberto Segre, "Corrientes cruzadas: arquitectura moderna en América Latina y el Caribe". *IAT online*, febrero 2011. According to Roberto Segre: "Criticizing the protagonists of the Modern Movement of making an architecture alien to climatic problems and lacking a relationship with the urban or rural context are unfair. It is almost a stereotype, to consider the 'International Style' as a unified and coherent block, when the codes of European rationalism were applied in different ways by architects operating in multiple and contrasting regions of the world." (Segre, 2007 p. 7).

Brazil offered a fertile territory for experimenting with the most varied mediation techniques between exterior and interior. To deal with a climate marked by strong sunlight, which brings heat and light in excess, Brazilian architects were attentive to adapting to the climate, using *brises-soleil*, shutters, wooden trusses, hollow elements and wide eaves and balconies. These experiences were remarked upon by the exhibition *Brazil Builds* (1943), by the many international reports in architectural magazines that followed it and by the main pioneering accounts of Brazilian modern architecture, such as Henrique Mindlin and Yves Bruand.

These challenges were even greater when they had to deal with the facades of high-rise buildings. The large-scale application of *brises-soleil*, particularly at the headquarters of the Brazilian Press Association (ABI) (1936–1938) and at the Ministry of Education and Public Health (MESP) (1936–1943), contributed to putting evidence of Brazilian architecture on the international scene. These two buildings were featured in the many publications dedicated to Brazilian architecture, which always included sketches and drawings of the elements of sun protection.[2]

One of the first articles on modern Brazilian architecture, in 1940, already highlighted ABI's *brise-soleil* as an ingenious solution to solve the problem of the tropics and, interestingly, also stated that the *brise-soleil*

2 Both ABI and MESP were included in the famous 1943 *Brazil Builds* exhibition and were widely reported in the magazines: "Brazilian architecture: living and building below the equator" *New Pencil Points,* (Jan, 1943): 59, 60, 62; "Modern Buildings/Offices", *Architectural Review*, n. 567, v. 95 (Mar, 1944): 69–71, 75–77; "Le Ministère de L'Education et de Santé Publique à Rio de Janeiro" and "Building ABI," *L'Architecture D'Aujourd'hui*. Brésil, n. 13–14 (Sept, 1947): 13–19, 60–61. MESP was presented in detail at: "Office Building for Ministry of Education and Health. Rio de Janeiro, Brazil," *Architectural Forum*, (Feb,1943): 37–44. In turn, ABI's headquarters appears in: "ABI: from new techniques spring new forms," *Architectural Record* n.88, (Dec. 1940): 74–79; "ABI Building," *The Architectural Record* (Jan. 1943), 49.

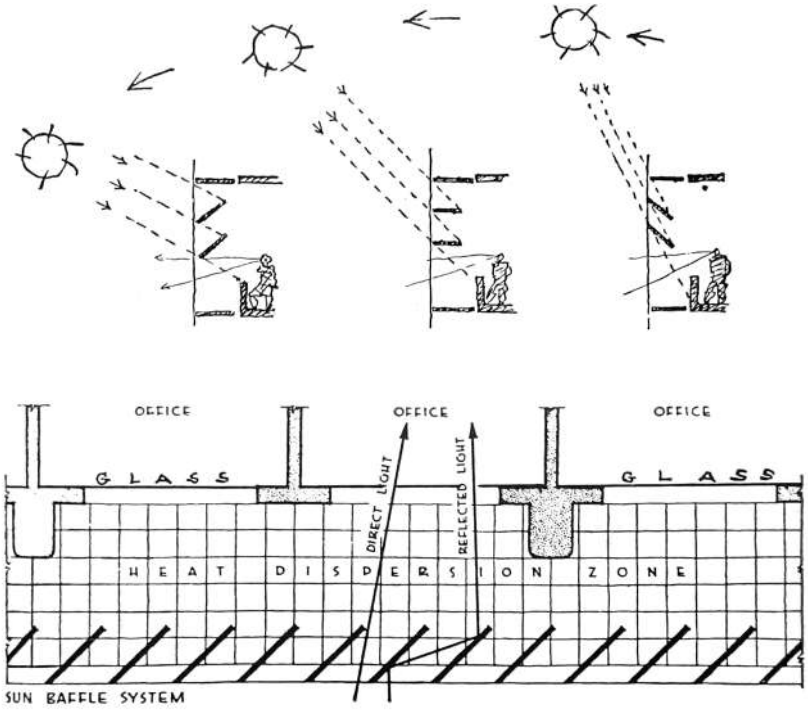


fig.1 Sketches of the operation of the brise-soleil system of the Ministry of Education and Public Health. Source: Kidder Smith, G.E. "The Architects and the Modern Scene," *Architectural Review,* n. 567, (Mar. 1944): 78.

fig.2 Detail of the floor plan of the Brazilian Press Association (ABI). Source: "ABI Building," Architectural Record, (Jan 1943): 49.

membrane gave "its shape and ornament to the exterior."[3] This seemingly unpretentious observation deserves attention because it reminds us that a facade not only defines what is inside and outside but must establish a relationship between the exterior and interior of the building and represent what occurs within it.

We can say that the facades of these Rio de Janeiro buildings perform three roles simultaneously: 1) a practical role, as it delimits the space and offers basic conditions for carrying out the activities for which the buildings are intended; 2) an operative role, as it modulates light and reduces the internal temperature; and 3) a symbolic role, since it provides an appearance to the institution or the function that is carried out there.[4] To achieve these functions, Brazilian architects understood the façade as an expanded and widened transition between the interior and exterior by the use of protective elements, such as *brises*, lattices, hollows ceramic pieces, venetian blinds, verandas and other elements which acted as filters but also provide depth to the membrane of the facade.

In this article, I seek to develop this argument, through a closer look at the facades of two buildings, the headquarters of the Brazilian Press Association (ABI) (1936–1938), by MM Roberto, and Parque Guinle (1948–1954), by Lucio Costa, two milestones of the school.[5],[6] Both are located in the city of Rio de Janeiro, which has a hot and humid tropical climate with high temperatures combined with high relative humidity during most of the year, with more intense rains in the summer and dry periods in the winter. They are examples of the intense process of verticalization since the 1930s, with office buildings in the centre and residential ones spreading along its south zone. They were also chosen to illustrate the maturity reached by Brazilian architects regarding these issues in just a few years. The ABI was the first large scale building with these devices, its inauguration preceding the MESP. The Parque Guinle was probably the most refined version of these experiences, along with examples by the Roberto Brothers, such as the buildings Instituto de Resseguros do Brasil (1942) and Seguradoras (1949–1952).

All these buildings are representatives of the so-called Carioca School. The many accounts on modern Brazilian architecture published between the mid-1940s and mid-1960s often emphasized that elements of the modern language, such as *brise-soleil*, the *pilotis*, and the free plan, were treated with lightness, plasticity, and elegance. They also noted the search for elements of climate adaptation from colonial architecture and the rich integration of the arts.[7] After an in-depth look at the redefinition of the facade in the modern era, some considerations are made on the way in which the architects from Rio de Janeiro, particularly Lucio Costa, used traditional features to face this challenge, which are followed by closer look at two facades.

3 "ABI: from new techniques," 75.

4 This argument can be partly debited from the analysis that David Leatherbarrow conducts of the church of the Church of San Martin de Porres in Puerto Rico, designed by Henry Klumb, which has its side facades composed entirely of sunshades that allow ventilation and views of the garden (Leatherbarrow, *Architecture Oriented Otherwise*, 2009, p. 23) and in the argument made in the first chapter of *Surface Architecture*, co-authored with Mohsen Mostafavi (Cambridge: The MIT Press 2002). In this article, the term "role" was adopted instead of the term "function" used by Leatherbarrow, because of the particular connotations of the latter in the context of modern architecture.

5 The Roberto brothers — Marcelo (1908–1964), Milton (1914–1953), and Maurício (1921–1966) — established their office (MM Roberto, later MMM Roberto) in the 1930s and were among the pioneers of modern architecture in Brazil. In addition to the Brazilian Press Association Building (ABI), their most notable works include the Santos Dumont Airport (1944), the IRB Building (Brazilian Reinsurance Institute) (1942), the Seguradoras Building (1952) and Marques do Herval (1956). Their work helped establish Brazilian modernist architecture on the international stage, particularly through their innovative solutions for climate control and their interpretation of modernist principles in a tropical context. For an overview of their works and career see: Luiz Felipe Souza, *Irmãos Roberto Arquitetos*, (Rio de Janeiro: RioBooks, 2014); Claudio Calovi Pereira, *Os Irmãos Roberto na arquitetura do Rio de Janeiro, 1936-1954*, master's dissertation (Porto Alegre: PROPAR/UFRGS, 1993); Yves Bruand, *Arquitetura Contemporânea no Brasil* (São Paulo: Perspectiva, 1981): 93–102; Fabiana Izaga, "Os edifícios de escritórios dos irmãos MMM Roberto no Centro do Rio de Janeiro: ou toda arquitetura leva a um urbanismo," *Revista Docomomo Brasil*, n. 5, (fev. 2022): 21–23; Daniel Barber, *Modern Architecture and Climate: Design before Air Conditioning*. (New York: Princeton Architectural Press, 2023): 77–97.

6 Born in 1902 in Toulon, Costa graduated as an architect from the National School of Beaux-Arts in 1922, a school that was dominated by neocolonial architecture at that time. In the mid-1920s, Costa became actively involved in efforts to document traditional architecture, travelling to historic cities in Southeast Brazil. His initial projects in the latter part of the 1920s clearly reflect neocolonial architecture, but he emphasized qualities such as simplicity and ▸

austerity while avoiding excessive decoration. In 1930, Costa shifted his focus toward modern architecture, likely influenced by Gregori Warchavchik, a Ukrainian immigrant known for designing Brazil's first modern houses, who became his partner in their architectural office in Rio de Janeiro. Their early 1930s projects, such as the Gamboa Worker's House and the Schwarcz House, showcased the abstract vocabulary of functionalist architecture. During this decade, Costa also contributed to two landmark projects in Brazilian architecture: the Ministry of Education and Health Building (1937–1943) and the Brazilian Pavilion at the New York World's Fair (1939). Costa played a crucial role in solidifying Brazil's built heritage preservation system working at the National Institute of Heritage (SPHAN). He won the design competition for Brasília in 1957. For an overview of his work, see: Lucio Costa, *Registro de uma vivência*. (São Paulo: Empresa das Artes, 1995); Ana Luíza Nobre, João Masao Kamita, Otávio Leonídio, Roberto Conduru, eds. *Lucio Costa: Um modo de ser moderno,* (São Paulo: Cosac & Naify, 2004); Otávio Leonídio, *Carradas de Razões: Lucio Costa e a arquitetura moderna brasileira*. (Rio de Janeiro/São Paulo: PUC-Rio/Loyola, 2007).

7 The exhibition "Brazil Builds," which took place in the Museum of Modern Art in New York in 1943, displayed this new architecture to the world. This exhibition addressed both the interests of the Vargas regime, in its search for an artistic representation and for instruments of propaganda, and the interests of the American government in its diplomatic effort towards Latin America during the World War II. The term Carioca School came to designate the works of these architects based in Rio de Janeiro, but whose influence reached many parts of Brazil from the mid-1940s.

8 Colin Rowe, "Chicago Frame." In *The Mathematics of the ideal villa and other essays*. (Cambridge: The MIT Press, 1976): 98–99.

9 These studies sought to develop methods and tools so that architects could better understand the climatic aspects and, thus, design more appropriately, such as the Form and Climate Research Group of the Columbia University School of Architecture (BARBER, 2016) and Architecture Princeton University Laboratory, led by Victor Olgyay, author of *Design with Climate: an Approach to Architectural Regionalism* (1963), a key reference in the field.

More Porous, Thin, and Transparent Facades

These buildings from Rio de Janeiro bring us to an older problem of the architectural discipline in the modern era, which was the very idea of the dissolution of the facade. The modern continuous space made the walls more porous, thin, and transparent — reduced to almost nothing — but never reduced to anything. Today, this transformation in the way of thinking and defining a facade seems to be simply a logical consequence of modernity, but it was one of the great dilemmas that affected the architectural discipline, as it challenged the architectural conventions in vogue at the turn of the nineteenth to the twentieth century.

This challenge can be seen in the first North American skyscrapers, which transformed the usual relationship between solids and voids, structure and cladding, affecting the very way of thinking about architecture. As Colin Rowe showed, the steel structure made it possible to increase the glass surfaces and decrease the supports, thus freeing the facades from expressing the building loads and the traditional anthropomorphic analogies, which for centuries have been associated with facade design.[8] With the real possibility of constructing these buildings, architects faced several questions. To what extent would new technologies determine the facade? Should this represent aesthetic intentions, or should they be left free, as the expression of a new constructive technology? By adopting this second option, would it be possible to produce an image appropriate to the function carried out in the building? How to arrange elements of sun protection in an coordinated way with this desired image and with its structural and constructive elements? In short, how to arrange a facade that can delimit, mediate well with the surrounding environment and create a remarkable image for the building?

Since Gottfried Semper, these questions have concerned some architects and thinkers. If many of those skyscrapers in late nineteenth-century Chicago had their audacious structures lined with classic ornamental elements, other architects at the turn of the century sought an expression more coherent with the new era, such as Otto Wagner. Along with his disciples Max Fabiani and Jože Plečnik, he had been looking for simplification and a new type of ornamentation, reducing the facade to a single surface, strongly emphasizing its planar condition, as in one of his last works, the Neustiftgasse 40 building.

Brazil would make a fundamental contribution to this debate. The concern with adapting the building to the climate of the place where it would be built was a constant among modern local architects, even before more in-depth and scientifically based studies were developed, such as those produced by post-World War II environmental comfort laboratories.[9] The architects from the Carioca School managed to build the first facades entirely with *brises-soleil*, an incessant pursuit that Le Corbusier had launched since the late 1920s. The French-Swiss architect places himself as the creator of *brise-soleil*, pointing to the year 1928, the year in which he

fig.3 Jože Plečnik, Villa Langer, Vienna, 1901–1902. Photo: Author, 2010

fig.4 Max Fabiani, Artaria Haus Vienna, 1900. Photo: Author, 2010.

fig.5 Otto Wagner, Neustiftgasse 40 Building, Vienna 1909–1910. Source: Heinz Geretsegger, Max Peintner, Otto Wagner, 1841–1918 (New York Rizzoli, 1979): 128.

fig.6 [next page] Le Corbusier and Pierre Jeanneret, *Immeuble Clarté,* Genebra, 1930–1932 Source: Willy Boesiger, Le Corbusier et Pierre Jeanneret, Ouevre Complete de 1929–1934. 6 ed. (Zurich: Les Éditions Girsberger, 1935): 66.

fig.7 [next page] Le Corbusier and Pierre Jeanneret, *Maison Locatif,* Argel, 1933. Source: Boesiger, Le Corbusier et Pierre Jeanneret, 171.

came across a remote project for a residence in Tunisia, Villa Baizeau.[10] Warned by the owner to have large balconies on the periphery of the volume, Le Corbusier imposed large incisions and recesses under the slabs and pillars in an original cubic volume, causing the walls to be quite recessed.[11] Despite the innovation and the central role that this house would have in its elaboration of its ideal of a modern home, there is still no *brise-soleil* element as such.

Until then, in his belief in technology, Le Corbusier sought to solve the problem of climate adaptation through mechanical elements. At the Cité du Refuge (1929–1933), in Paris, and at the Centrosoyuz (1928–1936), in Moscow, he proposed hermetically sealed facades composed of double sheets of glass, the *mur neutralisant*, in which hot or cold air would circulate in the space between the two blades, heating or cooling the environments. However, both failed due to technical and financial difficulties and the interiors became very hot in summer and very cold in winter.[12]

Shortly thereafter, at the Immeuble Clarté (1930–1932), an apartment building in Geneva, Le Corbusier abandoned sophisticated mechanical elements and used low-cost sun protection devices — balconies, retractable awnings and interior blinds — that modulate the incidence of the sun according to the user's wishes, thus generating dynamism on the facade. As part of a larger urban plan for Barcelona in 1931, he designed a block containing apartments with *pilotis* and two floors, with operable louvres in their façade.[13] Only in 1933 did he design the Maison Locatif in Algiers, a tall building with two of its facades entirely composed of hollow elements.[14]

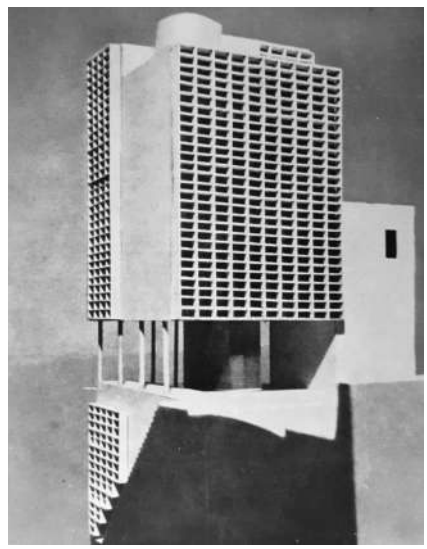
10 A page inserted in a special issue dedicated to Brazil in the *l'Architecture D'Aujourd'hui*, shows works by Le Corbusier indicating the advances in this direction: the Villa Baizeau (1928) (*pilotis*, *parasols*, *auvents*) Allotment Project in Barcelona (1933) (jalousies, loggias), *Maison Locative* (1933) and the *Cité des Affaires* in Algiers (1938–1942) (loggias, *brises-soleil*) and, finally, the Unité de Marseille (1945–1947) (loggias, *brise- soleil*). Le Corbusier. Petit historique du *brise-soleil* extrait de l'ouvre. in *L'Architecture D'Aujourd'hui* No. 13–14, (Sept., 1947): 10.

11 Harris Sobin, "Veils and Shadows: Le Corbusier in North Africa, 1928–1936", *Proceedings of the Meeting of the French Colonial Historical Society* Vol. 19 (1994): pp. 188–189.

12 Brian Brace Taylor, *Le Corbusier, The City of Refuge, Paris 1929/1933,* (Chicago: The University of Chicago Press, 1987): 111–115; Daniel Barber, "Le Corbusier, the Brise-Soleil, and the Socio-climatic Project," *Thresholds* 40 (2012): pp. 24–25.

13 Barber, *Modern Architecture and Climate,* 1–5.

14 Willy Boesiger, *Le Corbusier et Pierre Jeanneret, Ouevre Complete de 1929–1934.* (Zurich: Les Éditions Girsberger, 1935): 170–173.



This departure from indisputable faith in mechanical technology is associated with a major change in Le Corbusier's work, when abandoning values linked to lightness, mathematics, machine precision, and the classical, his projects, from the 1930s onwards, began to use brick in vaults or exposed on walls and floors, natural stone cladding, ceramic floors and wooden frames, such as Casa Errazuris (Chile, 1930), Maison Mandrot (Le Pradet, 1932) and Petite Maison de Weekend (Celle St Cloud, 1935).

This change in his work coincided with his trips to South America in 1929 and to North Africa, in the beginning and middle of 1931. Experiences with different landscapes, cultures and climates may have accelerated this detachment from the mechanistic ideal, along with the adoption of a topographic and regionalist sensitivity and a renewed interest in territory and nature.[15] If his work until the late 1920s was marked by his obsession with flooding his spaces with light, when dealing with other geographies, he discovers that shadows also produce spaces and *brises* are constantly used as at Maison Currutchet (La Plata, 1949), at Unité and reach their peak in his works in India.

The tradition of dealing with the environment

To deal with the strong sunlight bringing heat and light in excess, architects from Rio de Janeiro prioritized elements that favoured the entry and exit of the winds, such as sunshades, shutters, hollow elements and wood lattices. In addition, they sought to avoid excessive heat in the most used rooms, through better orientation.

We can identify the origins of this concern of Brazilian modern architects in the attentive look that Lucio Costa directed to our colonial architecture in the early 1920s within the scope of the movement known as neocolonial, in which he was involved until the late 1920s when he aligned with modern tendencies. He received diatribes from his former mentor José Marianno Filho (1881–1946), complaining that his reform in teaching at the Escola de Belas Artes would be displacing the vocabulary of neocolonial architecture and, thus, disrespecting the country's traditions.[16] By way of response, Lucio Costa explained that he admired colonial architecture so much that he understood its spirit, its logic, and its suitability to its time and place. In emphasizing the honesty and clarity of colonial constructions, he criticized the decorative emphasis of the neocolonial and stated that the principles of colonial architecture could be incorporated into modern architecture, resulting in an architecture more capable of responding to the challenges of the new era.[17] In "Reasons for the New Architecture," Costa provided a broader justification for his choice of modern architecture, highlighting the major achievements and transformations in terms of walling, façade, and structure.[18] Strongly attracted to the local building traditions, he claimed that the main principles of colonial architecture could be incorporated

15 William Curtis, *Le Corbusier: Ideas and Forms*, (London: Phaidon, 1986):109–116, 162–168. Kenneth Frampton, "Primitive Form and the Linear City" in *Le Corbusier, the Architect of the Century*. Michael Raeburn, Victoria Wilson, ed. (London: Arts Council of Britain, 1987): 29–30; Mary McLeod, "Le Corbusier in Algiers," in *The Oppositions Reader*, Michael Hays, ed. (New York: Princeton Architectural Press, 1998): 487.

16 In 1930, Costa was appointed by the new Vargas regime to the chairmanship of the National School of Beaux-Arts, with the mission of reforming the teaching system of the school. Inviting Warchavchik and other pioneers to teach, Costa introduced modern teaching methods of modern architecture, causing great discomfort among the old establishment. Costa's initial response came in a short article "A Beaux Arts School Alive' (1931), which he later expanded in an article entitled "Reasons for the New Architecture" (1936). Although these writings did not enable him to keep his position, as he left the school in the following year, they remained important statements of Brazilian modern architecture. Lucio Costa, "Uma Escola Viva de Belas Artes" (1931) and "Razões da Nova Arquitetura" (1936) in *Depoimento de uma Geração*. Alberto Xavier, ed. (São Paulo: PINI, 1987): 47–51

17 Costa, "Uma Escola Viva," Costa, "Razões da Nova Arquitetura."

18 Costa, "Razões da Nova Arquitetura," 33–34.

19 Fernando Diniz Moreira, "Lucio Costa: Tradition in the Architecture of Modern Brazil," *National Identities*. 8(3) (2006): 265.
20 Costa, "Uma Escola Viva," 47.
21 Costa, *Registro de uma vivência,* 71.
22 Costa, *Registro de uma vivência,* 27.

into modern architecture, thus enabling it to better respond to the challenge of the new age.[19]

Over the following decades, Costa undertook a series of studies on our colonial architecture, in which he sought to emphasize the continuity between colonial and modern. In these studies, he was not looking for exceptional monuments (like baroque churches), but for anonymous, simple and functional buildings, which demonstrated honesty of construction, old patterns of living and appropriateness to their time and place: "Bahia and Recife, and the old cities of Minas Gerais, made me understand the real architecture... A contemporary architecture, according to our materials and conditions, habits and culture. Nothing more, only this."[20]

In the modest traditional buildings of colonial times, one can observe, according to Costa, the essential qualities of Brazilian architecture, which resulted from the gradual adaptation of Portuguese models to the social conditions and constraints of the environment. It was possible to see these as rude, simple, and "plastic" constructions in the rural areas of both Portugal and Brazil.[21] Evoking Loos' emphasis on straightforwardness, Costa frequently expressed that unpretentiousness was a necessary quality of good architecture: "Arriving there, I felt into the past in its simplicity, purity, a real past. That was new for me. It was a revelation."[22]

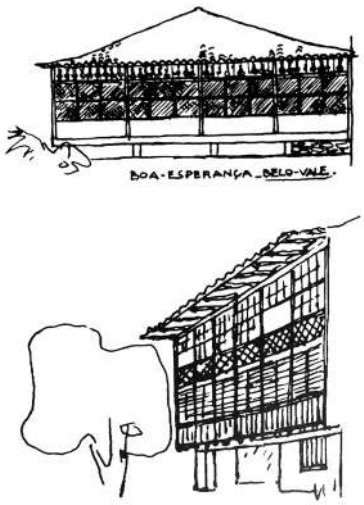


fig.8 Lucio Costa, Sketches of traditional houses, São Luís. Source: *Registro de uma vivência* (São Paulo: Empresa das Artes, 1995): 500.

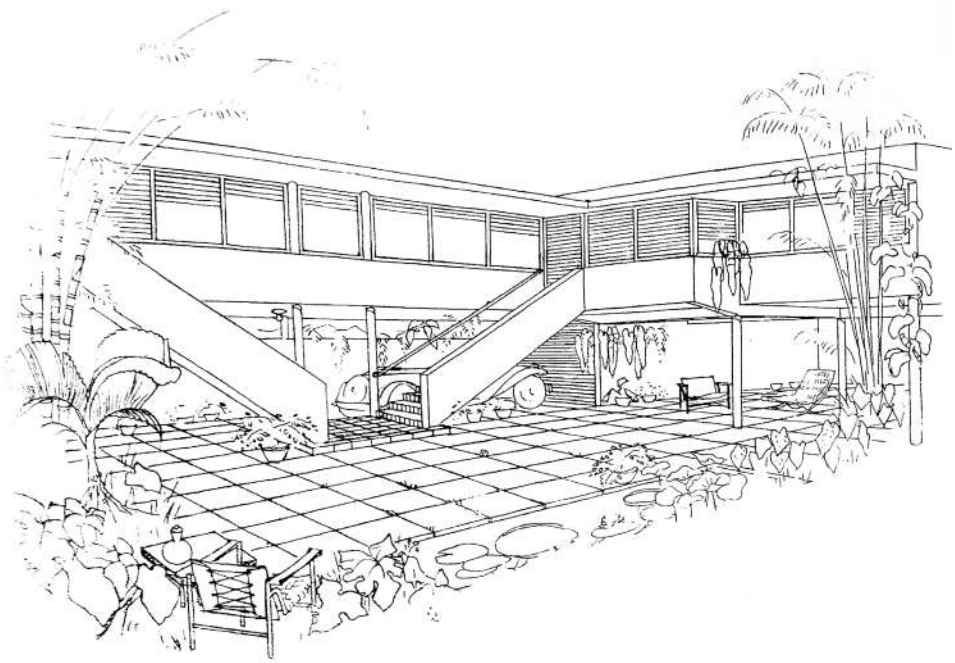


fig.9 Lucio Costa, Ownerless houses, 1932–1936. Source: *Registro de uma vivência,* 89.

His understanding of tradition was not only based on materials and forms, but on sensorial experiences, patterns of dwelling, and ways of dealing with the environment.[23] According to Costa, one needs to restore the architectural essence, which can be found in common buildings, those where people live the prosaic lives, and not in extraordinary examples.[24]

According to him, the colonial house offered centuries of experience from which modern architects should learn.[25] His drawings and sketches of the colonial house described building techniques, plans, windows, and elements of solar protection. Driven by his modern approach, Costa focused on qualities shared between modern and colonial architecture, such as the inner functionality and the lack of ornamentation.

These studies also played a key role in his architecture. After abandoning the neocolonial aesthetics and carrying out some projects with the abstract vocabulary of modern architecture, together with Ukrainian immigrant Gregori Warchavchik (1896–1972), Costa designed the "ownerless houses" between 1932 and 1933, attesting that his understanding of tradition was not based only on materials and forms, but on sensory experiences, in the cultural practices of living. The drawings of the "ownerless houses" contain principles that are the basis of the houses he designed in the following decades. In this return to the origins, it was also necessary to study the elements of the colonial house, particularly the elements of sun protection.

ABI: Institutional, Classical and Urban Values

These same climate-related principles could also be used for more complex projects such as high-rise buildings. The architects of the Rio school made a fundamental contribution in this regard, starting with the headquarters building of the Brazilian Press Association (ABI). Representing the professional body of journalists, probably the most influential group at this moment in Brazilian politics, the building acquired an institutional character. It was the result of a competition promoted by Herbert Moses, president of the institution between 1932 and 1940, who was fully engaged with the realization of the new headquarters, and won by brothers Marcelo and Milton Roberto, from the MM Roberto office.[26] It consists of offices and presents a free plan, independent structure, garden roof and *pilotis*. The pillars were set back from the facade and wooden frames from floor to ceiling were placed between them, creating an external loggia about 1.5 m deep, which acts a space of transition between offices and the exterior.

Located at the corner of Araújo Porto Alegre and México Streets at the centre of Rio, the plan has a L-shaped format since with an internal courtyard. Their two free facades did not enjoy a favourable orientation. Thus, to avoid excessive sunlight, the architects implemented a solar protection system on both facades composed of fixed vertical blades arranged obliquely from floor to ceiling. Initially planned to be made

23 Moreira, "Lucio Costa: Tradition," 266–267.
24 Lucio Costa, "Uma documentação necessária" (1937), In *Arquitetura Civil II: textos escolhidos da Revista do* IPHAN, (São Paulo: MEC/IPHAN/FAUUSP, 1975): 93–97
25 Costa, "Uma documentação necessária," 93.
26 Bruand, *Arquitetura Contemporânea*, 93–94; Pereira, *Os Irmãos Roberto*.

fig.10–11 MM Roberto, ABI headquarters, Rio de Janeiro, 1936–1938. Photo: © Gonzalo Renato Núñez Melgar, 2017.

fig.12–14 MM Roberto, ABI headquarters, Rio de Janeiro, 1936–1938. Photo: Author, 2005.

fig.15 MM Roberto, ABI headquarters, Rio de Janeiro, 1936–1938. Photo: © Gonzalo Renato Núñez Melgar, 2017.

of aluminium, the blades were made in concrete for financial reasons. In 1940, an American magazine emphasized the sunshades as an ingenious solution to solve the problem of sun striking the facades of the tropics.[27]

The ABI's headquarters was the first tall building to contain an entire facade composed of *brise-soleil*, a feat only idealized but not yet achieved by Le Corbusier, as seen previously. The competition was launched in January 1936 and the result came out in June of the same year, even before Le Corbusier's second visit to Brazil, between July and August 1936, when he had a closer contact with Brazilian architects and participated in the design of the MESP headquarters.

The building has a ground floor, a mezzanine floor and another 11 floors, with a tripartite division. The base (ground floor and mezzanine) consisting of stores set back from the facade, except for the lobby which, surprisingly, opens completely to the street giving access to the elevators and the inner courtyard, in one of the greatest urbanity lessons of modern architecture. The entire lobby is fully open to the sidewalk, to the pedestrian movements in the streets and circumstances of the city.

The main body of the building itself comprises nine floors, containing end-to-end lines of sunshades, with the exception of the eighth floor. Finally, the crowning consists of more two floors, not visible from the street level, set back to obey urban requirements, but the composition proves to be more complex, since as the eighth floor of the main body does not contain sunshades, it ends up reinforcing with the ninth floor, the crowning in fact of the building.

A closer look identifies the different textures of the travertine marble used as a cladding for the beams that appear on the facades, while the *brises* are made of concrete pieces. If marble suggest permanence and nobility of an institution, the lines of *brises*, which do not allow us to fix our gaze on a central focus on the facade, refer to a dynamic and modern image that the institution sought to allude to. In turn, the colossal order and the large glass bricks panel at the centre of the Mexico Street facade, reaffirm the symmetry and classic values of the building.

This play between continuity and discontinuity, classic tradition and modernity, is maintained in the urban insertion. The occupation of this area followed the guidelines of the Agache Plan (1930), which determined blocks of quadrangular shape with buildings of the same height occupying the limit of the lot with the street, leaving internal patios. The recessed base and fenestration brought by the *brises* are different from those of the context, but the facade tripartition, the colonnade on the ground floor and the recessed floors at the top provide continuity and reestablish the relationship with the neighbours. ABI does not compete with the context, but, on the contrary, with its relative muteness of horizontal lines it creates a suitable backdrop to enhance the eclectic elements of the National Library across the street, which has a similar volume, as noted by Comas.[28]

27 "ABI: from new techniques," 75.

28 Carlos Eduardo Comas, "Rio, Pernambuco, Rio Grande e Minas: contextualismo e heteromorfismo," in *Arquitetura moderna no Nortes e Nordeste do Brasil: universalidade e diversidade*, ed. Fernando Diniz Moreira (Recife: CECI/UNICAP, 2007): 37.

Although the sunshades perform a crucial role in blocking solar radiation, especially on the west façade, as shown by the measurements and simulations made by Regina Correa and Roni Anzolch, their arrangement was not very efficient since a single type with the same inclination does not perfectly meet the needs for solar protection.[29] In addition, there are disadvantages of making the areas farther from the window less lit and of preventing full vision to the outside. Additionally, there are drawbacks to having areas farther from the window that receive less natural light and limit the view outside. Air conditioning machines installed in the later decades restricted the full use of this space, which is not easily accessible. Although the system of *brises* in the façade was not fully successful in maintaining a comfortable temperature effectively the entire year, this façade should be understood as an experiment, a pioneering effort to employ *brise-soleil*. The Roberto brothers continue this research and, in the following years, offer sophisticated examples of plastic treatment and facade protection, such as the already mentioned Seguradoras and the Marquês do Herval.

Finding a balance between the proposed programme and the strict urban code, without giving up their intentions, was a great challenge for the Roberto Brothers, whose sensitivity and inventiveness helped them to conceive an architecture of high quality, which was continued with other more mature examples regarding the solar protection of facades, as already mentioned.

Parque Guinle: Domesticity and Nature

The opportunity for Lucio Costa to address the relationship between interior and exterior in tall building resolution came when a wealthy family commissioned him to design some apartment buildings in the Laranjeiras neighbourhood, also in Rio de Janeiro, in 1948, Parque Guinle. This initiative consisted of a group of six apartment buildings for the upper middle class to be built on the family's property, of which only three were built: Nova Cintra (1948), Bristol (1950) and Caledônia (1952).

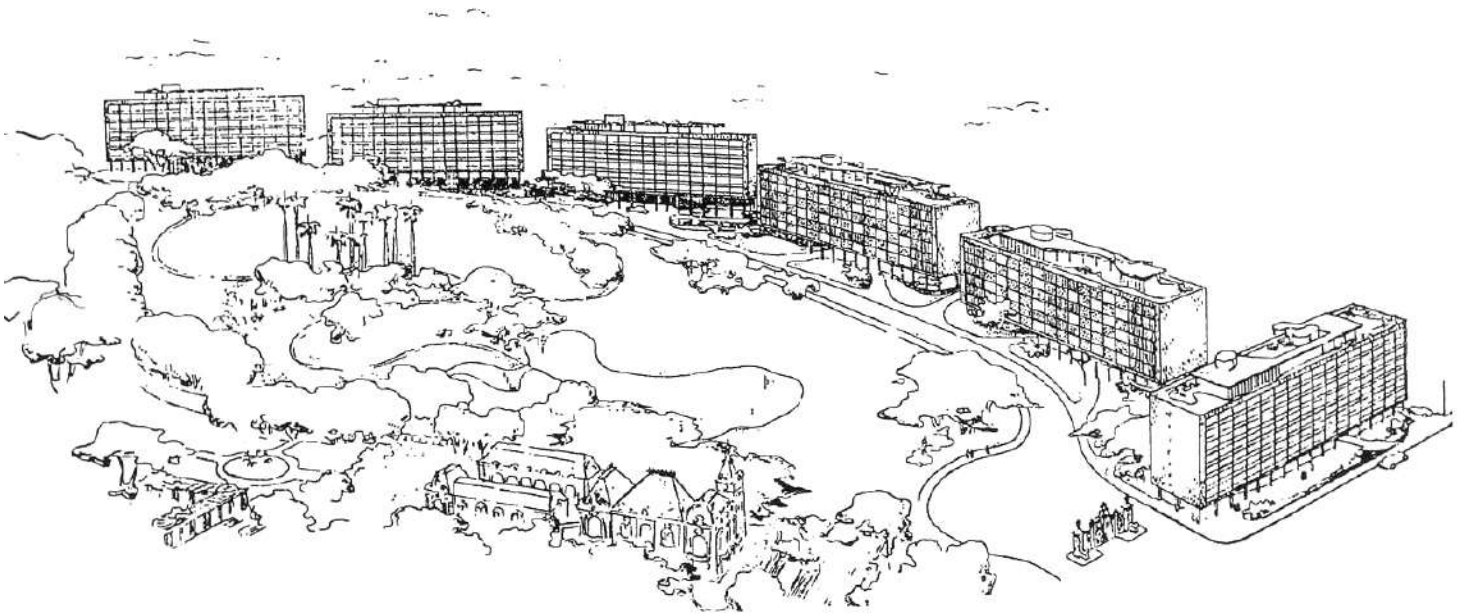
The site was an oval depression, quite difficult to build on. Costa kept this depression as a park, and placed prismatic blocks around it, forming a circle-like arrangement, and kept the family mansion on the highest ground, as the core of the composition.

The apartment buildings are parallelepipeds measuring 65 m long and 15 m wide, following modern principles: independent concrete structural skeleton, flat slab with cantilevered floor, underground garage, double height *pilotis* on the first floor, two cores of elevators, and two exterior stairwells.[30] Each building contains four apartments per floor arranged in parallel strips, but the two apartments at the centre of the floor are actually duplex apartments with two bedrooms each, while the two apartments at the corners are on a single floor, are bigger and with four bedrooms each.

29 Sílvia Morel Corrêa, Roni Anzolch. "ABI e MES: dois casos emblemáticos de fachadas com brise-soleil," *Asociación de Escuelas y Facultades Públicas de Arquitectura de América del Sur*, (Campinas, 2019): 6–8.

30 Carlos Eduardo Comas, "A racionalidade da meia lua. Apartamentos do Parque Guinle no Rio de Janeiro, Brasil, 1948–52," *Arquitextos*, 1, n.10.1 (2001).

fig.16 Lucio Costa, Parque Guinle, scheme, Rio de Janeiro, 1948–1954. Source: Costa, *Registro de uma Vivência,* 206–207.



In making the plans of the Nova Cintra, Lucio Costa also invoked old traditional patterns, particularly the two verandas in each apartment, one more social and the other with a domestic character:

> It was the essence of this traditional scheme that we tried to revive in the apartments in Parque Guinle: a kind of winter garden, adjacent to the living room and a room with no specific destination, connected to the bedrooms and the service; one more formal and the other more at ease, thus corresponding to the homemade veranda.[31]

The first built block, Nova Cintra, was located next to the access to the park, aligned with the existing urban pattern, acting as a transition point with the city. Its south façade facing the city is covered with glass, painted blue until the parapet while the north façade facing the park is covered with a myriad of protecting elements. The other two blocks, Bristol and Caledônia, were located roughly perpendicularly to the Nova Cintra and accommodated on the slope, being joined by a street that follows the curvature of the arrangement.

While the Nova Cintra has a favourable solar orientation, with the main spaces of permanence (living rooms and bedrooms) facing south, the location of the other two blocks was a challenge: to have the main spaces (living rooms and bedrooms) facing the park means they also have to face west, the merciless sunset. Costa sought to alleviate this situation by creating a sun protection system in the west facades facing the park and in the north façade of Nova Cintra. In the Caledônia and Bristol, verandas were added in all the rooms facing the park: they are only 70 cm on the living room and 1.20 m in the bedrooms. To counteract excessive sunlight, Costa created a membrane of sun protection elements, a unique combination of *brises-soleil*, venetian blinds and perforated ceramic elements, known as *cobogós*, which have two different sizes.[32] Most of these elements originated from Moorish architecture, which was revived by the Portuguese when they arrived in the tropics. The vertical *brise-soleil* planes, on the other hand, are made up of fibre cement painted yellow at the Nova Cintra, blue on the Bristol and pink on the Caledônia. The result is a sort of quilt, that covers the entire façade.

The plane of *cobogós* is occasionally perforated in the centre by an opening delimited by a slim concrete frame, creating the image of a prosaic window. If the façade protects the building from the sun and from of a passerby, this window provides direct views to the park. The square window in a *cobogó* panel became a formal motif widely repeated by other Brazilian architects during the 1950s and 1960s.

Completely dressed in different panels of different elements and textures, the interaction of transparent, translucent, permeable and

31 Costa, *Registro de uma Vivência*, 212.

32 The name *cobogó* came from the initials of surnames of the three engineers from the north-eastern state of Pernambuco, who patented this hollow precast element made of cement and sand in 1930: Coimbra, Boeckman and Góes. By the 1930s, advertisements showed that many companies were offering this piece, not only in concrete but also in ceramics, and with different designs, which became quite popular in Brazil since it made construction lighter and faster and allowed ventilation through the buildings.

fig.17–18 Lucio Costa, Parque Guinle (Caledônia), Rio de Janeiro, 1948–1954. Photos: Author, 2006.

fig.19 Lucio Costa, Parque Guinle (Bristol), Rio de Janeiro, 1948–1954. Photo: Author, 2006.

fig.20 Lucio Costa, Parque Guinle (Nova Cintra), Rio de Janeiro, 1948–1954. Photo: Author, 2006.

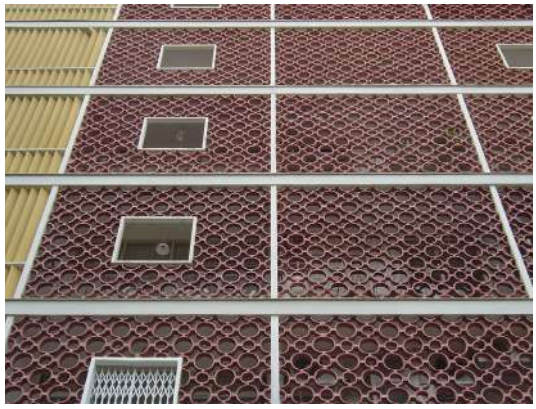


fig. 21 Lucio Costa, Parque Guinle (Bristol),
Rio de Janeiro, 1948–1954. Photos: Author, 2006.

fig. 22 Lucio Costa, Parque Guinle (Nova Bristol),
Rio de Janeiro, 1948–1954. Photos: Author, 2006.

opaque elements provided an air of immateriality to this membrane. Despite this diversity of traditional and new elements, the result is not confusing; on the contrary, it is a unified composition, whose variety defies monotony.

Since the pillars were receded from the façade, there are no clear clues about the distribution of rooms in the apartments, as is common in high-rise residential buildings. Even if there is correspondence between the types of closures and the types of spaces behind them—the *brise-soleils* corresponding to bedrooms and the *cobogós* corresponding to living rooms and offices—these features are not evident from the outside, as noticed by Eskinazi and Penter.[33]

As seen, the modern era made the facade lose its materiality, attenuating the difference between window and facade. Considering the facade as a large window, Costa proposed an innovative way of thinking about the architectural surface. In fact, this facade performs the basic roles of a window: it frames views of the surrounding landscape, illuminates the interior and allows the building to breathe.

This permeable surface, mediating between interior and exterior, works as a loggia, shading the facade, filtering light, and letting breezes flow. As shown by measurements made by Cunha and Bastos, these elements work particularly well.[34] With these devices, Costa created a spatiality in the facade itself, a space that belongs to the exterior and the interior, at the same time. In this way, it provided depth to the façade; however, seen from a distance this effect disappears, and the membrane seems to fade.[35]

This sort of transparency recalls Adrian Forty's discussion of the different interpretations of the term in modern architecture between "literal transparency," as heralded by modern masters as a fruit of technology and "phenomenological transparency," revealing the apparent space between volumes and the interpenetration between them, as presented by Colin Rowe and Robert Slutsky.[36] The Parque Guinle's façade instead of these two interpretations seems to allude to a third position, "transparency of meaning," as explained by the critic Susan Sontag in *Against Interpretation*: "Transparence is the highest, most liberating value in art — and in criticism — today. Transparence means experiencing the luminousness of the thing in itself, of things being what they are."[37] This interpretation is closely related to modern aesthetics while admitting a phenomenological meaning.

The facades are intended to be experienced from the outside, as well as from the inside. The intense light is attenuated, creating a notable effect on the interior. The exterior reveals the interior, allowing one to see people moving in the interior, as in traditional houses, when privacy was prioritized, and ventilation channels allowed. At the time when buildings were beginning to replace houses in Brazilian cities, these buildings represented a kind of experiment, an attempt to adapt the traditional house to a new way of living.

33 Mara Eskinazi, Pedro Penter, "A fachada como interface, de Lucio Costa a Irmãos Roberto: repertório de projeto," *19th Seminario Docomomo Brasil*, (Salvador, 2019): 9–10.

34 Victoria Cunha, Leopoldo Bastos, "Avaliação bioclimática do edifício moderno: o caso do Edifício Nova Cintra, Parque Guinle," *19th Seminario Docomomo Brasil*. (Salvador, 2019): 8–11.

35 Moreira, *Lucio Costa*, 270.

36 Adrian Forty, *Words and Buildings: A Vocabulary of Modern Architecture* (New York: Thames and Hudson, 2000): 286–287.

37 Forty, *Words and Buildings,* 288.

38 Josep Lluís Sert, "Windows and Walls: An Approach to Design" *Architectural Record* 131 (5) (1962): 132–133.

39 On these issues consult: David Leatherbarrow, Mostafavi, Mohsen. *Surface Architecture*. Cambridge: MIT Press, 2002. p. 9.

Concluding Remarks

Despite the fact that there is a clear evolution in the treatment of the climatic devices, the facades of the ABI and the Parque Guinle were successful attempts to avoid what Josep Lluís Sert, some years later, called anonymous facades, referring to the skyscrapers of the 1950s.[38] Sert pointed to the need for a reassessment of the past and for a reinterpretation of traditional measures and figurative elements, in order to reconnect contemporary architectural practice with practical and symbolic human needs. Rejecting the fashion of the glass facade and turning to vernacular shapes and traditional devices, Roberto Brothers and Lucio Costa were anticipating these problems, mediating between modernity and tradition, rationality and convention.[39]

These facades are important chapters in the history of modern architecture, which has brought major changes to the facades, making them more porous, thin, transparent and open, as can be seen. The facades of high-rise buildings in Rio perform three functions simultaneously. First, they delimit and contribute to making the uses envisaged there feasible. One can work or live without external disturbances but perceives the outside when wanted. They help the building to engage with the surrounding environment, whether in the dense centre of Rio or in the park in Laranjeiras. Second, with their climatic protection devices, the facades achieve this mediation with an external environment, regulating the air intakes, allowing the entry of natural light, and attenuating the internal temperature. Finally, they represent the institution well, in the first case, and the living habits, in the second case.

The various elements of climate protection express the way buildings operate in relation to the climate, which can lead us to other ways of understanding the building, not only paying attention to its shape, but also to the way they work in their engagement with the environment, how they breathe and how they participate in their milieu. Demonstrating that technology/modernity and heritage/tradition can be reconciled, these facades successfully mediate between functional and economic requirements and aesthetic impulses, responding to the local culture and climate. The traditional shading elements used are not intended to give it a traditional look, but rather to express an old and continuous relationship with light and climate.

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The Recent History of Balcony Design in Housing Buildings as an Archetype of Well-Being

Keywords
– Balcony design, Housing buildings, Well-being, Environmental concerns, Comfort

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This article covers the evolution of the balcony archetype since the late nineteenth century when this element, identified as cellular and isolated, a private space above the public and collective realm, took on a significant role in housing buildings. Using analysis of the literature and primary sources, the aim of this overview is to understand the main paradigms and concerns that conditioned the design of balconies and to contribute to the redefinition of the Mediterranean balcony. In this study, a division of recent balcony design history is proposed into three key periods: the rise of open balconies in the nineteenth century related to the new health and hygiene standards; the mid-twentieth century reinterpretation of the traditional shading systems for sunlight and ventilation control on balconies; and the popularization of the glazed balconies on the 1970s in response to the energy crisis. This understanding of how the exploration of balcony design was shaped by the search for comfort and well-being at each moment could contribute to more sustainable housing models in Southern Mediterranean countries.

1 Introduction

During the nineteenth century, the balcony became widespread in Europe thanks to its revolutionary functions of introducing air, light and openness into modern households. At that time, in response to the spread of lung diseases that shattered European cities, the balcony became associated with new standards of health and hygiene and adopted as a symbol of modern life.[1] Marked by this genesis, balconies were still considered to increase the perception of liveability in dwellings when the development of compact and high-density cities became a strategy to promote sustainable development during the last century.

The relevance of balconies as an archetype of well-being was also highlighted during the recent Covid-19 pandemic, when balconies once again became associated with the benefits of being in the open air.[2] In a moment that can be enlightened by a parallel with the past, the pandemic crisis emphasised the collective desire to have a private outdoor space in dwellings and stressed the need to rethink balcony design for the welfare of the community.[3]

Nevertheless, the practice of closing or eliminating balconies is global and ancient, and it has deeply modified the image of some urban environments worldwide. Since the era of vernacular architecture, numerous instances have been observed when inhabitants made adaptations to their balconies, whether it be enclosing them with shutters or glazing, or even eliminating them entirely, which mirrored the cultural and environmental paradigms of each respective period.

The contradictions inherent to this archetype of well-being cause increased uncertainty in the design process. And, in a moment when the balcony archetype is under redefinition in the Mediterranean context,[4] it seems relevant to contribute to the current discussion about the most appropriate design balcony. This can be done by reconstructing the evolution of balcony design in housing buildings throughout some paradigmatic moments of history in which environmental concerns shaped the balcony design.

Therefore, this article covers the evolution of balcony design since the late nineteenth century, when balconies took on a significant role in housing buildings and climate concerns were considered to be directly incorporated into the envelope design.[5] The article is focused on the archetype of private balconies in housing collective buildings in urban contexts which, as explained by Rem Koolhaas in the retrospective *Elements of Architecture*, differ from their "cousins" the porches, or the verandas, because they are roofed platforms along the outside of a house on the ground floor level; from the terraces and loggias since they are un-cantilevered, on the ground or on a roof; and from the gallery (a street in the sky), because it is an elevated walkway that runs alongside the flank of a building, connecting apartments. In contrast, the balcony was identified as cellular

1 Paul Overy, *Light, air and openness: modern architecture between the Awars* (Thames and Hudson Ltd, 2008).

2 Bernardo Zacka, "An Ode to the Humble Balcony," *The New York Times* (2020), https://www.nytimes.com/2020/05/09/opinion/covid-balconies-architecture.html.

3 Efthalia Thaleia Grigoriadou, "The urban balcony as the new public space for well-being in times of social distancing," *Cities & Health* (2020), https://doi.org/10.1080/23748834.2020.1795405.

4 Tom Avermaete, *The impossibility of a Universal Balcony: mutations of a modern element across the Mediterranean*, vol. Elements - balcony (Venezia: Marsilio, 2014).

5 Alejandro Zaera-Polo and Jeffrey S. Anderson, *The Ecologies of the Building Envelope. A Material History and Theory of Architectural Surfaces.* (New York, Barcelona: Actar Publishers, 2021).

and isolated, a private space above the public and collective realm, that balances these two poles.[6] Considering a more generalist overview, the evolution of balcony design is mainly centred on the European context, with a special incidence in the specificities and needs of Southern European countries. Consequently, throughout the analysis of the literature and primary sources (such as drawings and architectural treatises, among others), this paper propose the main stages of evolution of balcony design according to some paradigmatic moments. While the approach is mainly historical, it aims to inform the contemporary debate about the more accurate balcony design options to improve the indoor environment of dwellings in the Mediterranean context.

2 The evolution of Balcony design throughout history

The overview of the literature on the evolution of balcony design allowed the identification of the main trends, each related to paradigmatic moments when concerns with the environment influenced the configurations of the limits of balconies. This study proposes the division of these trends on the design of balconies into distinct moments, as shown in figure 1. The proposed division is somewhat rigid and generalizes trends rather than being sensitive to them. It is relevant to note that the limits between the periods are blurred and that the earlier balcony trends continue to exist, as the new ones do not replace them.

However, this division into time periods allowed for the identification of the main closing boundary systems of each one,[7] which is

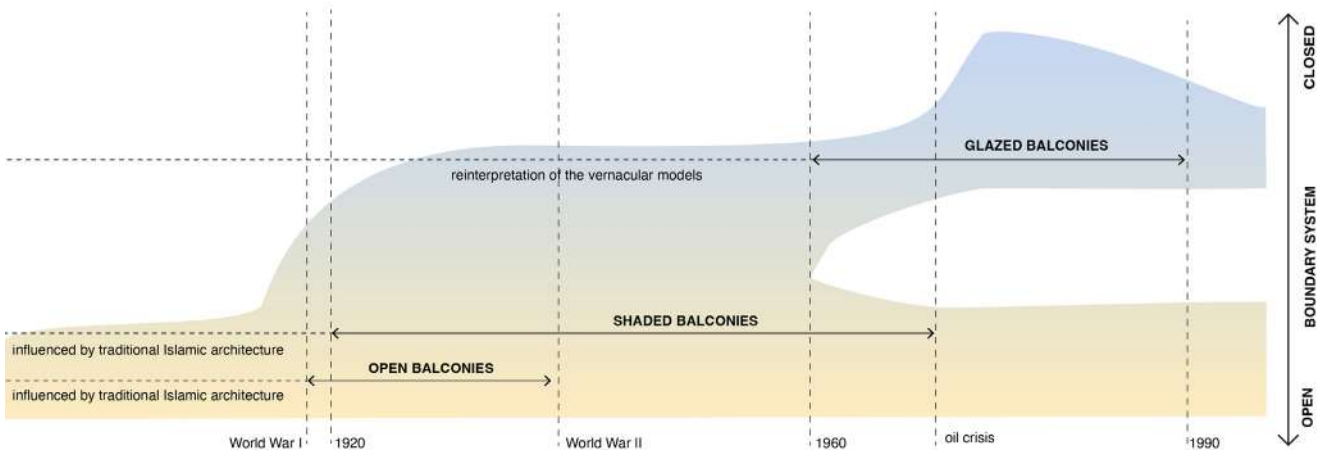
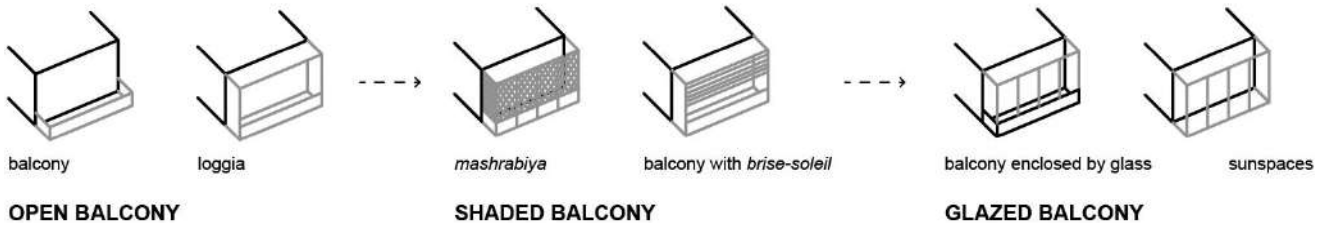


fig.1 The evolution of balcony design between the boundary system and the valorisation trend.

6 Tom Avermaete and Rem Koolhaas, *Elements — balcony* (Venezia: Marsilio, 2014).

7 Ravi Srinivasan and Kiel Moe, *The hierarchy of energy in architecture: emergy analysis* (Routledge, 2015).

fig. 2 Main balcony closing boundary systems.



fundamental to the redefinition of the balcony archetype, illustrated in figure 2, and could be defined as follows:

- open system to the outside, such as projecting balconies, loggias — related to the association of the open balcony with new health and hygiene standards in the late nineteenth century and the consequent importance they acquired in the period between the great wars as an element capable of introducing light, air, and openness into modern dwellings.
- open system to the outside protected by shading systems, such as balconies with brise-soleil, blinds, curtains, and with vegetation — linked to the exploration of shading elements on balconies in the middle of the twentieth century as new components to better control sunlight and ventilation influenced by traditional Islamic architecture, such as the *mashrabiyas*.
- closed system, such as balconies enclosed by glass at their outer edge, otherwise known as *sunspace*s, *wintergardens* and *conservatories* — associated with the reinterpretation of the vernacular models of balconies enclosed by glass during the 1970s energy crisis as a device for capturing and storing solar radiation and reducing energy consumption.

The following text presents the main environmental concerns that conditioned the configurations of balconies, illustrated with some relevant examples of housing buildings in the European context.

2.1 Air, light and openness in the modern way of life

It was during the nineteenth century that the balcony, more than a decorative element, became associated with the new ideals of the "modern way of life" and assumed a main role in housing buildings. In the opinion of architectural historians, this trend was so relevant that the "*mode des balcons*" became a widespread practice and "there is no modern house that does

not have several."[8] In conflict with the proliferation of this element, in his *Dictionnaire Historique d'Architecture,* De Quincy criticises the independent nature of balconies in relation to the main construction, adding that it is an element that disturbs the order of palace and house façades and is "foreign to good architecture."

The construction of Haussmann's boulevards in 1850s Paris is considered to be the moment when "modern balconies" took a central role in dwellings. The critic Tom Avermaete suggests that the conditions were created to accelerate the already ongoing process of turning balconies, which were reserved for aristocratic and public buildings, into a feature of the dwellings of the rising bourgeoisie.[9] The new boulevards were composed of imposing housing buildings, in which the balconies were a symbol of modernity, and the ornamented rails were an indicator of the social status of the dwellers, often portrayed by writers and artists of that time (figure 3).

The hygienist concerns of the late nineteenth century also contributed to the growing importance of the balconies in dwellings, associated with new standards of health and hygiene. The medical conviction in the benefits of fresh air and sunlight as cures for tuberculosis and pulmonary disease that shattered the European cities led to the proliferation of sanatoriums, in which large balconies for treatment in the fresh air became one of the main design characteristics.[10]

Between the 1920s and '30s, modern architects identified the balcony as an element of common application which was capable of introducing sun and fresh air into modern dwellings.[11] In a small book

fig.3 Balcón, Boulevard Haussmann (Cailebotte 1880).

8 Quatremère De Quincy, *Dictionnaire historique d'architecture* (Paris: le Clere, 1832).

9 Tom Avermaete, "Paris, 19th century: La mode des balcon," in *Elements - balcony*, ed. Tom Avermaete, Rem Koolhaas, and Amo (Venice: Marsilio 2014).

10 Ken Worpole, *Here comes the sun: architecture and public space in twentieth-century European culture* (London, UK: Reaktion Books, 2000).

11 Xhulio Binjaku, "Vitamin D Architecture," *e-flux Architecture* Sick Architecture (2022), https://www.e-flux.com/architecture/sick-architecture/453875/vitamin-d-architecture/.

fig.4 "Baby cage," London, 1930s (Cox 1935).

published in 1929, *Befreites Wohnen* (*Liberated Dwelling*), which followed the first *Congrès International d'Architecture Moderne* (CIAM), Siegfried Giedion presented "air, light and openness" as the main tenets of modern architecture.[12]

In this sense, in existing buildings that did not have balconies in England and the United States, having "baby cages" or "bird cages for babies" (figure 4) became a widespread practice during these decades. The advantages of these structures for putting young children in the fresh air outside housing buildings were advertised, and the Royal Institute of British Architects (RIBA) released a memorandum advocating the importance of "balconies for babies in flats," adding that a dwelling without a balcony is "as incomplete as a flat without a bathroom."[13] This practice was abandoned in the middle of the twentieth century when tuberculosis decreased thanks to vaccines, new treatments, and better ventilated dwellings.

According to Nikolaus Pevsner, the modern movement did not emerge because of the new potentialities of the steel frame and reinforced concrete; but instead because the new spirit of the time required them to.[14] Indeed, for Kenneth Frampton, it was the diffusion of reinforced concrete and new modern thought that brought the balcony, after a period of further magnificence recognisable in the art nouveau floral evolutions, to less lavish, more composed and rigorous forms.[15]

With modernity, the idea of the possibility and responsibility of transforming the world also arose in architects.[16] Therefore, in parallel

12 Sigfried Giedion, *Building in France, building in iron, building in ferroconcrete*, vol. 1995 (Canada: Getty Publications, 1995 [1928]).

13 Re Inald John Hands Cox, "Balconies for babies in flats," *The British Medical Journal* (1935), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2459502/pdf/brmedj07551-0079a.pdf.

14 Nikolaus Pevsner, *An outline of European architecture* (Harmondsworth: Penguin Books, 1988).

15 Kenneth Frampton, *Modern Architecture: A Critical History* (London: Thames and Hudson, 1985).

16 Ana Tostões, *A Idade Maior. Cultura e tecnologia na arquitectura moderna portuguesa* (Porto Faculdade de Arquitectura da Universidade do Porto 978–980–8527–04–2, 2015).

with the political exploitation of the balcony as an instrument to exert power in several dictatorial regimes around Europe in the twenties and thirties, some architects adopted the balcony as a tool to promote social emancipation.[17] Due to already being considered a symbol of bourgeois leisure and health, the balcony became an element that architects associated with their newfound social mission.

In the modern and social utopias that followed the period of huge housing demand post World War I, the balcony became a primordial element in the construction of the large complexes that emerged across Europe.[18] Based on the ideals of efficiency and "minimum existence," massive high-rise housing complexes were constructed according to the concept of a house as a *machine-à-habiter (*a machine for living in),[19] to respond not only to the growing population but also to the challenges presented by the change on family structures.

Within the remarkable housing schemes that emerged mainly in the centre of Europe, several examples explored the social role and plasticity of balconies. From a wide range of examples, the present overview underlines some that illustrate the fundamental role that balconies assumed in Europe during the period between wars (1918–39), as well as the impact that this moment still has in contemporary architecture, which is placed on the map in figure 5.

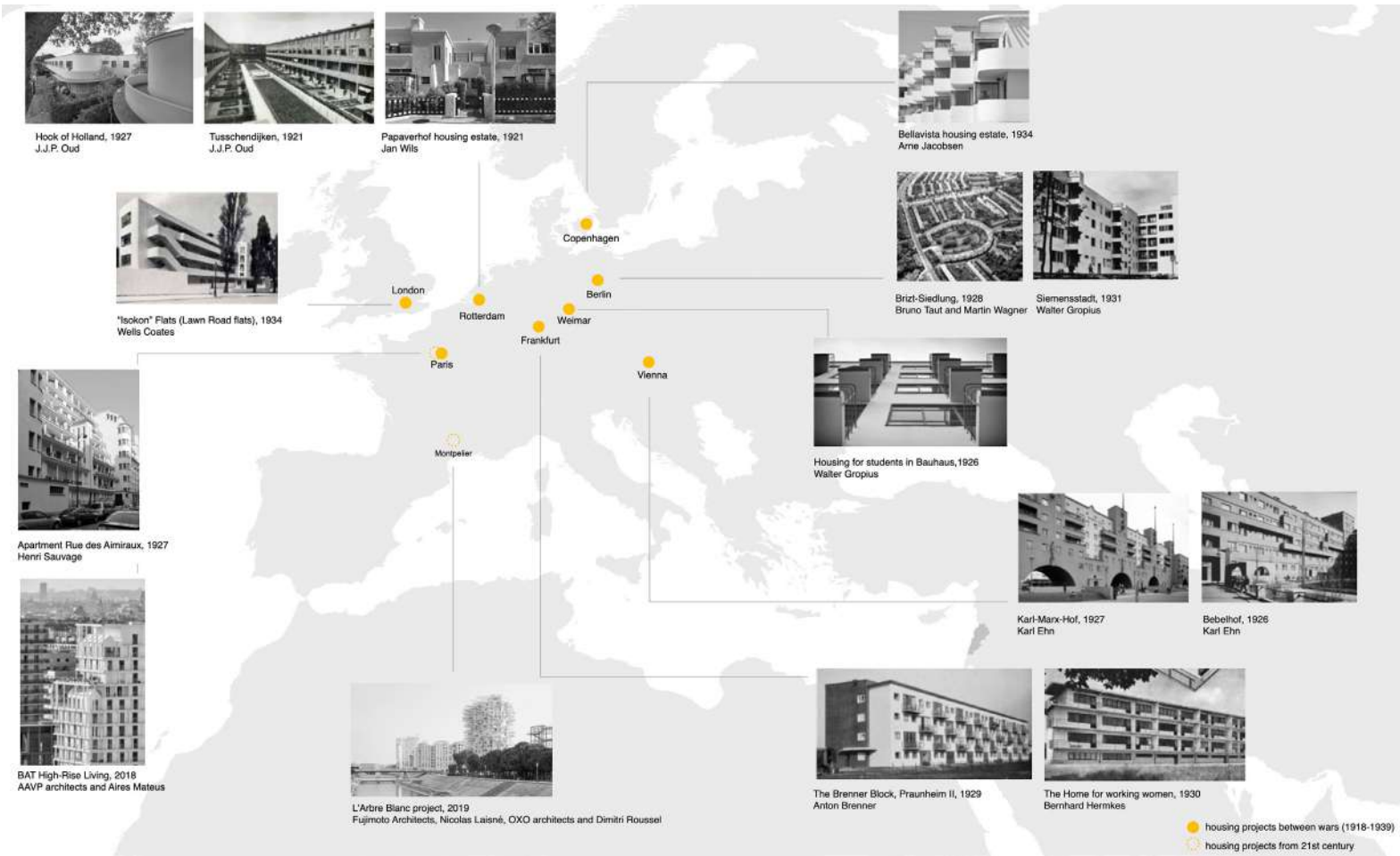
Among those, the early modernist examples of Rotterdam housing reform can be highlighted, such as the Hook of Holland, designed by J.J.P. Oud, in 1927, due to the outstanding expressive formal design of the balconies with round extremities.[20] This construction contrasts with the austerity of the previous complex Tusschendijken, designed in 1921 by J.J.P. Oud; and with the Papaverhof housing estate, designed by Jan Wills in 1921, that maintained the importance attributed to access to the open air.

In Frankfurt, where the trade unions and social democratic co-cooperatives were most effective in influencing politics during the Weimar Republic, some of the most emblematic housing schemes of the 1920s were built. Under the direction of Ernest May, who was invited in 1925 to work as a city architect, in Brenner Block, Praunheim II, projected by Anton Brenner in 1929, the cantilevered balconies were constructed to be interleaved, in order to provide each of the apartments with their own outdoor space and the same amount of light. In this and other examples, such as the Home for working women, projected by Bernhard Hermkes in 1930, the large balconies contrast with the efficiency and economy of the interior spaces designed according to "existence-minimum" spatial patterns.[21]

Although patronage in Berlin worked differently from Frankfurt, according to William Curis, there were also some remarkable housing schemes there.[22] Curtis highlighted those by Walter Gropius for the Siemensstad in 1931, in which the balconies have an identical shape to

17 Avermaete, *The impossibility of a Universal Balcony: mutations of a modern element across the Mediterranean*, Elements — balcony.
18 Manfredo Tafuri, *Vienna rossa: la politica residenziale nella Vienna socialista, 1919–1933* (Milano: Electra, 1980).
19 Le Corbusier, *Towards a new architecture* (Courier Corporation, 2013 [1931]).
20 William JR Curtis, *Modern architecture since 1900* (London: Phaidon, 1996).
21 Frampton, *Modern Architecture: A Critical History*.
22 Curtis, *Modern architecture since 1900*.

fig.5 Mapping of housing projects in which balconies assumed a central role between wars and their repercussion in Mediterranean housing from twenty-first-century projects.



those he designed five years earlier for his Housing for students in Bauhaus; and those by Bruno Taut and Martin Wagner at the Brizt-Siedlung (1929).

The massive demand for housing in 1920s Vienna, shaped by the social-democratic ideals of the Red Vienna Movement, led to the construction of colossal super-blocks with their own collective facilities — known as "Hof." In these large complexes, such as the Karl-Marx-Hof, in 1927 and Bebelhof, in 1926, both projected by Karl Ehn, balconies had a great prominence, highlighting the democratic access to the open air and the image of robustness of these enormous structures which became known as "worker's fortresses."

The exploration of the plasticity and potential of balconies was also notable in the Apartments Rue des Amiraux (1923–24) in Paris, built on the HBM (Habitation à Bon Marché) social housing programmes. In this building, designed by Henri Sauvage for the working class, the façade was made up of a stepped-terrace system with a pyramidal shape. This ziggurat structure, which was a recurring theme in Henri Sauvage's work, provided multiple balcony platforms and allowed sunlight and air to penetrate the central core of densely packed housing units.[23]

As modern architecture spread to Britain and Scandinavia in the mid-1930s and these regions became some of the most active centres of modern experimentation, balconies remained a central element in the housing scheme. In the High Point I flats (1935), designed by Berthold Lubetkin and the Tecton group in London and considered by Kenneth Frampton as a masterpiece for its indoor organization and arrangement on the plot, balconies were assumed as a fundamental element for the connection between the outdoors and the indoor living area.[24] Similarly, in the Isokon Flats (1938), designed by Wells Coates, considered an emblem of a new way of life in the British context, deep balconies connected the longitudinal apartments and collective spaces, such as a bar and a terrace, as a tribute to public and social life. In Copenhagen, the Bellavista Housing Estate, designed by Arne Jacobsen (1934), was a reinterpretation of the Siedlung housing blocks where balconies acquired greater plasticity to achieve maximum sunlight and views of the sea.

In comparison to the exceptional pre-war character, balconies began to multiply in buildings as architectural elements that allowed all inhabitants to access the city. The spatial continuity between interior and exterior was considered by Alison and Peter Smithson as one of the tenets of the modern architecture period.[25] This understanding was shared by the critic and architect Tom Avermaete, who, in his historical retrospective of the balcony element, wrote that one of the primordial roles of balconies in post-war housing projects had been to connect the relationship between individual and collective, between the particular and the ordinary, and between the public and the private.[26] According to this author, these modern concepts of connection had been especially experimented with in

23 Margaret Campbell, "Strange bedfellows: modernism and tuberculosis," in *Imperfect health: The medicalization of architecture* (Montreal, Quebec: Canadian centre for architecture and Lars Müller Publishers, 2012).
24 Frampton, *Modern Architecture: A Critical History*.
25 Alison and Peter Smithson, *The Charged Voided: Architecture* (New York The Monacelli Press, 2001).
26 Avermaete, *The impossibility of a Universal Balcony: mutations of a modern element across the Mediterranean*, Elements - balcony.

the Mediterranean basin, in a pivot between new social democratic regimes and decolonizing countries.

In Portugal, following the movement that began primarily in central Europe in the inter-war period, it is considered that the continuity between inside and outside was only intensely explored in housing buildings starting in the 1950s, when the ideals of the modern movement were fully assimilated into the architecture.[27] One of the earliest modern examples was considered to be the Edifício Carvalhosa, projected by the architects Arménio Losa and Cassiano Barbosa for the Rua da Boavista, a private income-generating building, in Porto in 1945 (constructed in 1953). This example is recognised as an innovative typological solution based on rationality,[28] in which, following the principles of the modern movement, each house was provided with a south-facing balcony-solarium as an extension of the indoor living room.

From Barcelona to Athens, Tel Aviv, and Lisbon, the design of balconies in the Mediterranean basin took advantage of favourable climatic conditions. The experimentation with the relationship between interior and exterior in dwellings, which characterised the architecture of Mediterranean countries in the modern movement, has had repercussions to this day. Due to the risk of leaving out relevant current examples, a portrait of ongoing architectonic experiments with the balcony element will not be made in this work. Instead, I will only mention the projects L'Arbre Blanc in Montpellier, designed in 2019 by the architects collective composed of Fujimoto Architects + Nicolas Laisné + OXO architects + Dimitri Roussel, and BAT High-Rise Living, in Paris, designed in 2018 by AAVP architects and Aires Mateus, in which the long, deep balconies are assumed as part of the project core and defined the image of these housing collective buildings.

2.2 From "mashrabiya" to the deep envelope

Since the Middle Ages, the benefits of *mashrabiya* have been explored as an element of protection in traditional Islamic architecture. These three-dimensional carved wood lattice screens are composed of small wooden balusters, circular in sections and arranged at specific regular intervals, often in a decorative and intricate geometric pattern, and were applied to windows and balconies of some traditional houses to create protection from the outside. Based on the principles of privacy, which state that strangers should not be able to penetrate the intimacy of the home, the *mashrabiya* worked as an architectural veil, similar in function to its textile counterpart, allowing the inhabitants, especially women, to see the movement of the street through the screen, while ensuring their privacy.[29]

Mashrabiya is considered to have emerged in traditional Egyptian architecture in the early Middle Ages and that from there it spread through the Umayyad Caliphate to the Middle East, North Africa and the Iberian Peninsula, and later to South America. However, its diffusion in domestic

27 Tostões, *A Idade Maior. Cultura e tecnologia na arquitectura moderna portuguesa*.

28 Sérgio Fernandez, *Percurso pela Arquitectura Portuguesa 1930–1974* (Porto Faculdade de Arquitectura da Universidade do Porto, 1985).

29 Bechir Kenzari and Yasser Elsheshtawy, "The ambiguous veil: On transparency, the Mashrabiy'ya, and architecture," *Journal of Architectural Education* 56, no. 4 (2003).

architecture can historically be traced to Mamluk and Ottoman periods (1517~1905). Due to being assumed as a suitable solution to improve the indoor environment in arid and tropical climates, the Egyptian *mashrabiya* had a wide dispersion and acquired a considerable variety of styles, identities and designations depending on the location. These devices are known in Yemen as *takhrima* (that which is full of holes), in Tunis as *barqli*, in Algeria as *shamashil*, in Jeddah, Saudi Arabia, as *rowshin*, and similarly, are called *confesionarios* in Spain, *coloniales i*n Peru and *muxarabis* in Northeastern Brazil.[30] In Portugal, the Survey of Portuguese Architecture conducted by the Portuguese College of Architects in the 1960s identified some of these wood screens structures (figure 6), dating back to the seventeenth and eighteenth centuries.[31]

According to Hassan Fathy, the *mashrabiya* had a social but also an environmental purpose. Fathy attributes five main functional roles to *mashrabiya*: controlling the passage of light; controlling airflow; reducing air temperature; increasing air humidity; and ensuring the privacy of the inhabitants, adding that it remains a useful device for improving the indoor environment in housing design.[32] Moreover, indeed, the influence of these traditional elements on modern architecture is recognised.[33] In this period of significant constructive innovations, these screen structures were explored for their capacity to control indoor environmental conditions.

According to several authors, after his journeys to South America (1929) and later to Algiers (1933), Le Corbusier reinterpreted traditional elements, such as *musharabi,* loggias, courtyards, and *mashrabiya,* as new components for protection and passive control of sunlight and ventilation.[34]

30 P. Privitera, M. Diodato, and S. García Sáez, "Solar radiation influence on pre-modern openings features: La Coruña and Valletta," in *Vernacular Architecture: Towards a Sustainable Future* (CRC Press, 2014).

31 AAVV Francisco Keil do Amaral, *Arquitectura Popular em Portugal* 4ª edição ed., ed. Ordem dos Arquitectos – Conselho Directivo Nacional (2004 [1961]).

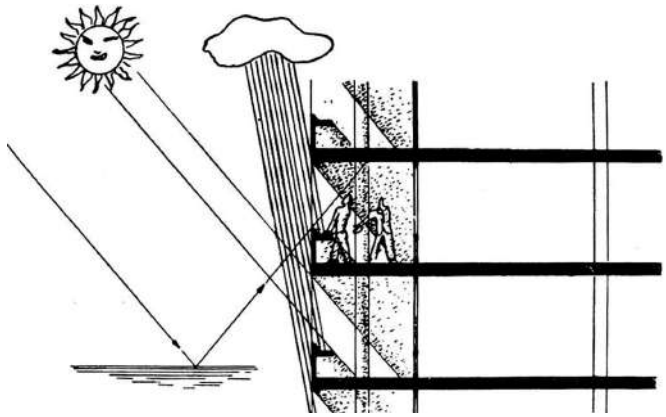
32 Hassan Fathy, *Natural energy and vernacular architecture* (University of Chicago Press, Chicago, IL, 1986).

33 Kenzari and Elsheshtawy, "The ambiguous veil: On transparency, the Mashrabiy'ya, and architecture."

34 C. E. Pastor, "The integration of light: LeCorbusier," Article, *EGA Revista de Expression Grafica Arquitectonica* 23, no. 32 (2018), https://doi.org/10.4995/ega.2018.9804, https://www.scopus.com/inward/record.uri?eid=2-s2.0-85047768747&doi=10.4995%2fega.2018.9804&partnerID=40&md5=623bc4e279a5a791dd0566b86d99a2f1.

fig.6 Mashrabiya, Guimarães, 2018.

fig.7 Le Corbusier sketch (Frampton 2001).



This exploration originated the development of the brise-soleil shared loggia, which for architectural critic Reyner Banham was one of the last structural (passive) innovations for controlling the environment. Banham considers that Le Corbusier returned to the advantages of traditional massive walls after his other master concepts had not been as successful for environmental management: le *mur neutralisant,* a hermetically sealed air cavity system tempered and controlled by the *respiration exacte* effect.[35]

After testing a screen system composed of distinct layers of curtains in La Clarté, in Geneve (1932), some decades later, in Marseille's Unite d'Habitation (1952), Le Corbusier applied independent loggias protected by brise-soleil, creating a "semi-lifted mask" that screened the outdoor environmental factors across the indoor living spaces. Using sunlight as an important design tool, Corbusier systematically studied the capacity of *loggia-brise-soleil* (figure 7) to generate shadows and protection.[36]

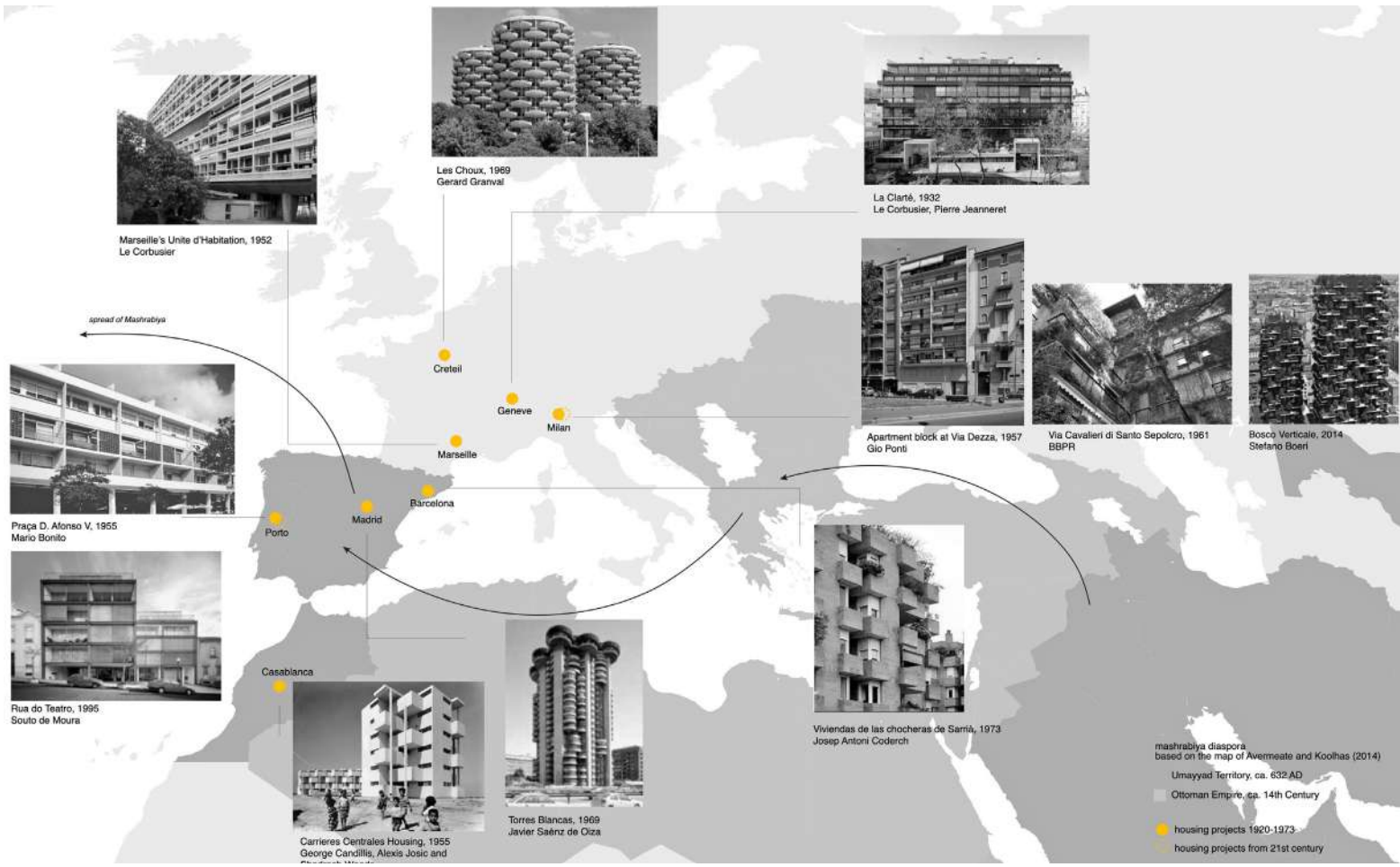
In the decades following World War II, the design of outdoor collective spaces decreased in importance. Mainly in high-rise housing developments, terraces and galleries almost disappeared, and the private balcony was considered an attempt to compensate for the loss of these collective spaces. From there, the depth of the envelope with cavities and the dissolution of the façade boundaries through a variety of shading systems were tested as ways to control the interior environment and ensure maximum privacy while maintaining a view of the outside.

On the map in figure 8, some examples of balcony shading systems dating between 1920 and 1973 are placed in their geographic locations. These were referred to in the following overview because traditional Islamic wood screens strongly influenced them and were a reference for the shading systems tested during the early twenty-first century.

35 Reyner Banham, *The architecture of the Well-temepered Environment*, ed. Second Edition (Chicago: The University of Chicago Press, 1984 [1969]).

36 I. Requena-Ruiz, "Bioclimatism in the Architecture of Le Corbusier: The millowners association building," Article, *Informes de la Construccion* 64, no. 528 (2012), https://doi.org/10.3989/ic.11.121, https://www.scopus.com/inward/record.uri?eid=2-s2.0-84874003447&doi=10.3989%2fic.11.121&partnerID=40&md5=8fd96b498032754589350a2328a4d6dc.

fig. 8 Mapping of housing projects between 1920 and 1973 and their repercussions in the twenty-first century.



In Milan in 1957, the architect Gio Ponti reinterpreted the archetype of the Mediterranean balcony basin in the design of the Apartments Block at Via Dezza. Gio Ponti updated the traditional *mashrabiyas* and loggias of the region, designing the balconies as a screening element between the house and the city. The balconies, which he called "inhabitable viewing frames," were composed of multiple layers of frames, screens, and surfaces, a created canvas for distinct forms of appropriation through everyday objects, plants, and art. In his projects, mostly not realised, Gio Ponti addressed the importance of the balcony, highlighting its ability to offer inhabitants an active role in defining the environment through their intervention in the closing elements of the façades.

In the Mediterranean context of the following decades, deep balconies were designed not only to control indoor environmental conditions but also to create individuality in mass housing projects. In Madrid, in 1969, Javier Saénz de Oiza used circular balconies on the Torres Blancas project to redefine the image of the modern skyscrapers and to emphasise the collective character of Mediterranean culture.

The appropriation of housing buildings by their inhabitants was also explored by Antonio Coderch. At the TEAM 10 group meeting in Royaumont in 1962, Coderch presented a collage of balconied structures, coining the balcony as an element that promotes the participation of the future user, suggesting new shared responsibilities in the co-production of new buildings. His conception of the balconies in Viviendas de las chocheras de Sarrià in Barcelona in 1973 as polyvalent spaces reflects the ongoing exploration of the connection between the private and the public domains.[37] Almost simultaneously, the plasticity of the balcony elements was also explored in the massive housing project Walden 7 (1975) by Riccardo Boffil in Barcelona, and in Les Choux, in Creteil, near Paris, by Gerard Granval, to reduce the feeling of anonymity in emerging mass housing projects.

Shading systems on existing balconies were also developed due to the inhabitants' preference for closing them. The complex and multifunctional shading systems that emerged in Tel Aviv in the 1930s and 1940s were a paradigmatic example of this practice. In the 1960s and 1970s, this system became not only a clandestine practice but was also adopted by builders and architects.[38]

During the following decades, across the Mediterranean, from Spain and France, to Italy, and from Israel and Algeria to Mocorro, shaded screened balconies were subject to constant revisions and mutations. Alongside systems for sifting light and creating privacy on balconies, such as curtains and wooden structures, the use of vegetation on façades has also been intensively tested. In Milan, the collective of architects BBPR, famous for the Torre Velasca, developed a series of projects

37 Julio Barcena, "JA Coderch y "Las Cocheras de Sarrià" (1968–75): de la domus al Team 10" (paper presented at the Pioneros de la arquitectura moderna española: el proceso del proyecto = Pioneers of modern Spanish architecture: the design process, 2021).

38 Carolin Aronis, "The balconies of Tel-Aviv: cultural history and urban politics," *Israel Studies* (2009).

across the city recapping the concept of "*edificio a gradoni*" with thick vegetation protecting the balconies. The 1961 building on Via Cavalieri di Santo Sepolcro, with a cascading green balcony, became a reference for similar housing projects of the twenty-first century, such as the Bosco Verticale, designed by Stefano Boeri and constructed in 2014 in Milan, which is a tower with large planters for vegetation inserted at the edges of its balconies.

In Portugal, precast concrete brick assembled panels have been widely applied as a current system to screen light and views on balconies. The building of Praça D. Afonso V (1952–55) in Porto, designed by Mario Bonito, where open concrete bricks create shade over the west-facing balconies, is an outstanding example of this practice. During the following decades, other systems were tested, such as the openable metallic shutters to create distinct degrees of permeability, that contributed to emphasizing the geometric and abstract image of the housing building at Rua do Teatro (1992–95), in Porto projected by Eduardo Souto de Moura.

The intense experimentation of the shading systems in balconies between 1920 and 1973 influenced the contemporary trend towards a deep, porous, spatial envelope as an architectural assembly that allows view, shade and air to breathe across the depth of the facade, operate alongside performance concerns as a set of filters capable of mediate the outside atmosphere.

2.3 From vernacular architecture to energy concerns

The development of the first greenhouses of the eighteenth century, together with progress in the glass industry, and the beginning of large experiments with iron and glass, led to adaptations in traditional constructions to the specific climate conditions of each context. The arrival of large-space glassmaking technologies coincides with the so-called Era of Enlightenment, a moment when the transparency in buildings was associated with liberation from the obscurity of the *Ancien Régime*.[39]

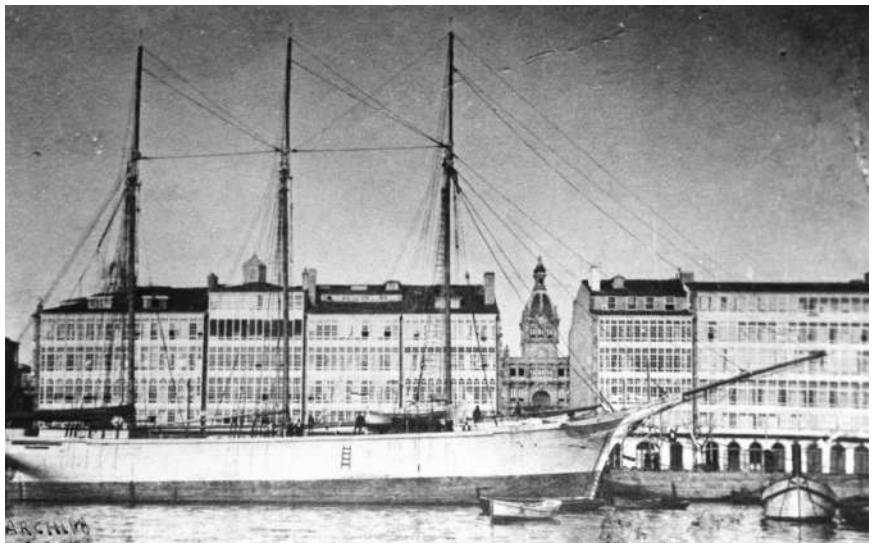
However, while the spread of glass in construction was associated with this ideological content, the application of double-glazing was related to the incorporation of concerns over comfort in the façade. Some authors have traced the application of a double layer of glass in construction to two phenomena: first, the development of the greenhouse effect and its capture of solar radiation, and second, the ability of the air cavity to act as buffer space and create thermal insulation.[40]

Therefore, in the beginning, the introduction of glass in balconies was an adaptation of the envelope of the buildings to specific climatic constraints in particular regions. A paradigmatic example of the transformation of the balcony occurred in the cities of La Coruña and Ferrol at the end of the eighteenth century (figure 9). Facing a peculiar climate condition, derived from the lack of protection against the Atlantic

39 Zaera-Polo and Anderson, *The Ecologies of the Building Envelope. A Material History and Theory of Architectural Surfaces*.

40 Maria Wall, "Climate and energy use in glazed spaces," (Lund University, Lund Institute of Technology, Department of Building Science, 1996).

fig.9 Galerías de La Marina in Coruña (Aniorte 19–).



winds and the reduced solar radiation compared to the average of the Iberian Peninsula, traditional Galician architecture developed many systems of protection.[41] One of these was the *galería*, a balcony enclosed by wooded frame windows that replaced the pre-existing wood screens of *mashrabiya (confesionarios)*.[42] Some authors argue that the foundation of the *galería* is related to the shipbuilding tradition in Ferrol, and that during the nineteenth century, in parallel with the new production of windowpanes in the region that reduced previous imports from Germany and lowered the prices, these *galerías* rapidly spread throughout the region of Galicia, where they were considered a more coherent environmental solution against the peculiar windy and humid conditions.[43]

Due to the suitability of local climate conditions, the use of glass in balconies also spread throughout the north-eastern region of Portugal (Terras da Beira). The *Arquitectura Popular em Portugal* (Popular Portuguese Architecture) survey published in the 1960s presented several examples of vernacular glazed balconies in this region. This study pointed out that these balconies, usually oriented south and west, became a characteristic element of rural architecture and one of the most used spaces in the house throughout the year.[44]

By the end of the nineteenth century, a range of technologies, mostly associated with the glass industry, became widely available, and replacing the traditional wood *mashrabiya* began to be a trend even in places where it had fewer environmental benefits. In Valletta, Malta, the glass balcony *gallarjia*, which substituted the old louvered shaded balcony,

41 Xose de Castro Arines, *O libro das galerias galegas* (La Coruña: Edicios do Castro, 1975).

42 Jesús Ángel Sánchez García, "En el balcón, en el palco, en la galería. Estrategias de la mirada en la arquitectura del siglo XIX," (2012).

43 Privitera, Diodato, and García Sáez, "Solar radiation influence on pre-modern openings features: La Coruña and Valletta."

44 Amaral, *Arquitectura Popular em Portugal*

created relevant modifications in the indoor environmental conditions leading to severe overheating problems.[45]

Simultaneously, in northern European cities, such as Vienna, Berlin, or Prague, the double window (*Kastenfenster)* became a common solution. It was developed and largely applied due to the dual demand of daylight and openness while creating a well-tempered environment and preventing heat loss. These experiences were soon adopted in the modern Soviet experiments, which influenced Le Corbusier in developing the use of double windows and the development of the *mur neutralisant* — a system that consists of an air cavity created by a double façade and tempered by controlled ventilation, the *respiration exacte* effect (figure 10). With this system, Le Corbusier aimed to create a consistent internal temperature regardless of the exterior environment. Even though these concepts were highly criticised and were never implemented due to the amount of material and equipment required,[46] the ideas came to influence the creation of other solutions based on the advantages of double glazing.[47]

45 Privitera, Diodato, and García Sáez, "Solar radiation influence on pre-modern openings features: La Coruña and Valletta."

46 Banham, *The architecture of the Well-temepered Environment*.

47 Harvey Bryan, "Le Corbusier and the 'Mur Neutralisant: An Early Experiment in Double Envelope Construction" (paper presented at the Proceedings of the Ninth International PLEA Conference, 1991).

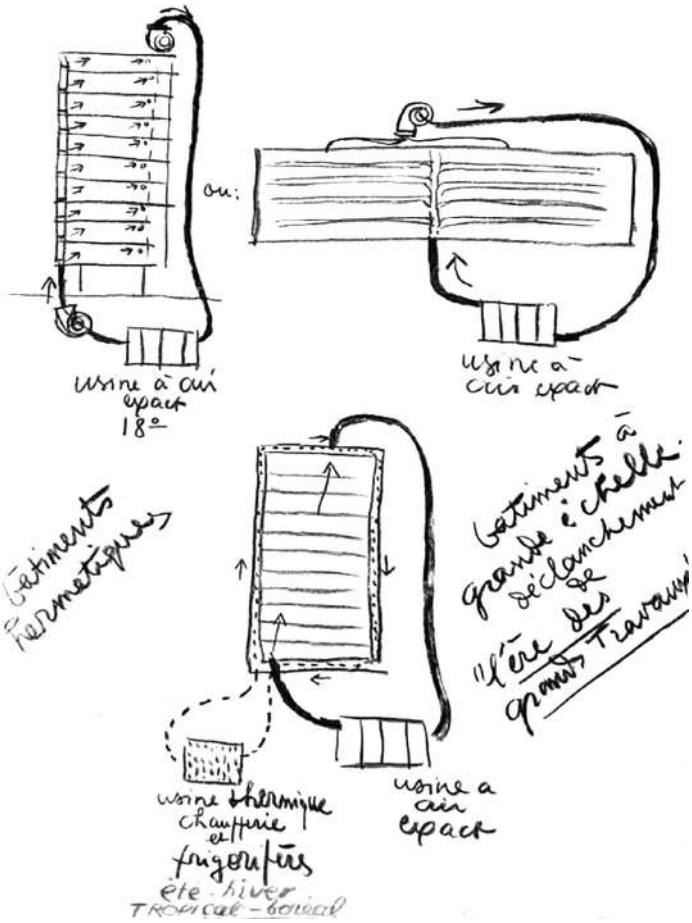


fig.10 La Maison a respiration exacte (Le Corbusier 1930).

As a result of these failed technological attempts in the first decades of the twentieth century, and due to the new mechanical environment management techniques that freed architecture from local climate constraints, the benefits of glazed structures were neglected for almost forty years.[48] Only when energy prices rose due to the energy crisis of 1973 did the environmental thermal advantages of the greenhouse return to the composition of the building envelope.[49]

After OPEC (Organization of the Petroleum Exporting Countries) proclaimed the oil embargo on some Western countries, reducing energy consumption became a priority in construction. Architects and engineers reacted to this crisis by intensifying ongoing studies on new techniques and solutions for more efficient use of energy and natural resources. However, despite the strong commitment to investment in the study of solar devices in construction,[50] the experimental ecological design of the 1960s and 1970s was not properly addressed in the major histories of modern architecture of this time.[51]

At that moment, in parallel with the reinterpretation of the low-tech double-glazing façade technologies, glazed spaces were considered solar collectors with the capacity to gather large amounts of energy and reduce the energy demands of the adjacent buildings.[52] From the reinterpretation of Le Corbusier's *mur meutralisant* to the study of the Trombe wall, the glass double-façade envelope and solar device solutions, among which the widespread glazed balconies can be highlighted, have become some of the most explored passive-building technologies. Some examples, which are placed on the map in figure 11, represent the relevance that the glazed spaces adopted to achieve energy efficiency in the second half of the twentieth century and their influence on the glazed systems adopted during the twenty-first century.

The Trombe wall, invented before the 1960s as a solar collector-accumulator, composed of a massive south wall covered with external glazing, was developed further after the oil crisis to achieve energy efficiency with passive heating and natural ventilation. The main objective of the first experiments, such as the house designed by French engineer Félix Trombe and architect Jacques Michel in 1967 in Odeillo, France, was the solar efficiency of the dwelling. The Trombe wall closed the house completely to the south, and left the indoor space with little natural light and views. However, with the development of the Trombe wall, gradually the air cavity of the system began to be transformed into a usable greenhouse space, creating a glazed area, which, due to its distinct operation between summer and winter, could be used almost all year round. This was the case of Maison à Argenteuil, in Val d'Oise, also in France, designed by Marc Vaye and Frédéric Nicolas in 1979. In this house, the space between the glass and the thermal mass wall is used as a greenhouse space and integrated with the entrance. Nevertheless, like the previous examples, the adjacent room

48 Banham, *The architecture of the Well-temepered Environment*..

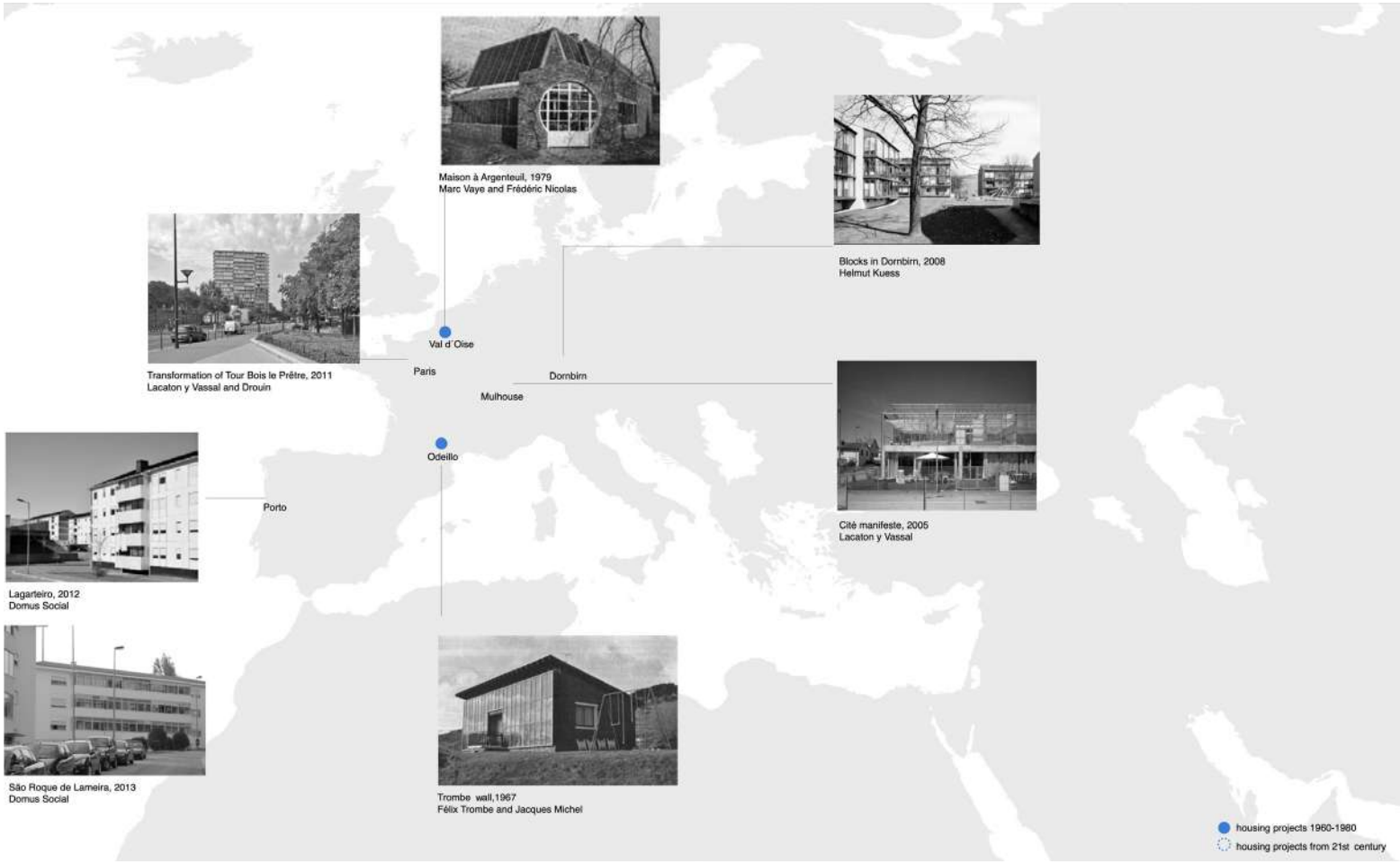
49 Giovanna Borasi and Mirko Zardini, *Sorry, out of gas. Architecture's response to the 1973 oil crisis*. (Montéreal, Québec: Canadian Centre for Architecture, 2007).

50 Victor Olgyay, *Design with climate: bioclimatic approach to architectural regionalism* (Pinceton: Princeton University Press, 2015 [1963]).

51 Piero Medici, "The Trombe Wall during the 1970s: technological device or architectural space? Critical inquiry on the Trombe Wall in Europe and the role of architectural magazines," SPOOL 5, no. 1 (2018).

52 Wall, "Climate and energy use in glazed spaces."

fig.11 Mapping of housing projects in the second half of the twentieth century and in the twenty-first century.



maintains a lack of transparency and natural light due to the absence of an opening in the wall between the greenhouse and the indoor living room.[53]

When, during the 1980s, energy prices declined in Europe, the investigation of the Trombe wall apparently lost its appeal. However, the exploration of the previous decade influenced the introduction of greenhouses and glazed spaces in buildings. In the 1980s and 1990s, large, glazed courtyards and atriums were incorporated in public buildings and offices, while glazed balconies and glazed galleries became a generalized practice in housing buildings around Central and Northern Europe,[54] due to the easy and simple adaptation of the original open balcony systems.

In the 1990s, the passive solutions of glazed balcony structures became increasingly sophisticated with each site-specific condition. Nevertheless, with the industry developments of the prefabricated aluminium frames, the tendency to close the balconies also extended to other contexts regardless of their particular climatic conditions.[55] In some Mediterranean countries and contexts with hot climates, this practice became generalized as an informal adaptation done by the inhabitants, mainly motivated by reasons other than energy efficiency.

Therefore, some authors have considered that, at the turn of the new millennium, the in-between liminal glazed spaces inhabited by people and plants become a noteworthy contemporary trend, in contrast to double glass façades that were almost abandoned due to the difficulty of recovering the substantial amount of space used in terms of rental efficiency.[56]

Lacaton y Vassal often exploited the potential of greenhouse technology to provide a substantial increase in building area with a space that was neither internal nor external. In their projects, the aim of introducing glazed balcony derivations in housing buildings was to add an extra multifunctional space to dwellings, as is the case with the housing project *Cité manifeste* (2001–05) in Mulhouse, where the very morphology of the building resembles a greenhouse. As an alternative to the policies of demolition of housing blocks built in France after the second war, together with Frédéric Drout, they developed the research project *Plus – Les Grands Ensembles de logements – Territoire d'exception*, where they proposed the radical transformation of the existing building with the insertion of intermediate spaces, which they called *wintergardens*. The principles of the study were first applied when they won the competition for the rehabilitation of Tour Bois le Prêtre, a typical 1960s residential block in Paris, and the success of the intervention led to the application of the same ideas to other buildings that were at risk of demolition.[57]

Several other examples across Europe have used similar strategies for rehabilitating housing complexes. In the refurbishment of housing blocks in Dornbirn (2008), in the Austrian region of Vorarlberg, the architect Helmut Kuess introduced glazed balconies, called *conservatories*, to add extra indoor space, which also work as thermal buffers.[58] In Porto, the

53 Medici, "The Trombe Wall during the 1970s: technological device or architectural space? Critical inquiry on the Trombe Wall in Europe and the role of architectural magazines.

54 M. P. Wilson, O. B. Jorgensen, and G. Johannesen, "Daylighting, energy and glazed balconies: A study of a refurbishment project in Engelsby, near Flensberg, Germany," Article, *Lighting Research & Technology* 32, no. 3 (2000), https://doi.org/10.1177/096032710003200304, https://www.scopus.com/inward/record.uri?eid=2-s2.0-0039339562&doi=10.1177%2f096032710003200304&partnerID=40&md5=80556feae69e32a0f923e7dbe0ec8115..

55 Zacka, "An Ode to the Humble Balcony."

56 Zaera-Polo and Anderson, *The Ecologies of the Building Envelope. A Material History and Theory of Architectural Surfaces*.

57 Frèdèric Drout, Anne Lacaton, and Jean-Philippe Vassal, *Plus: large-scale housing developments. An exceptional case*, ed. Editorial Gustavo Gili (Barcelona, Spain: Editorial Gustavo Gili, 2004).

58 Helmut Küess, Manfred Koller, and Thomas Hammerer, "Residential complex in Dornbirn," *Detail Green-English Edition,(1/11)* (2011).

interventions for improving social housing constructed in the 1960s followed in some cases the informal process of enclosing balconies initiated by the inhabitants. In Lagarteiro (2012) and São Roque da Lameira (2013), some parts of the access galleries and balconies were already closed, and the option taken in the rehabilitation project was to homogenize the block by closing all intermediate spaces with glass.

Faced with operations like these on ordinary housing for which the design strategy contributed to the existing fabric, some academics point out that the common practice was not so successful. Franz Graf and Giulia Marino consider that these major interventions normally do not take into account the impact on heritage nor the intrinsic qualities of the buildings.[59] It has become consensual that rehabilitation interventions, and on this matter, the transformations of balcony spaces, should be defined according to the intrinsic qualities and heritage value of the building itself, balancing heritage conservation with the environmental paradigm.[60]

3 Final remarks and conclusions

This examination of the literature on the evolution of the balcony reveals that this liminal space has been characterized over time as an archetype of well-being. It has been the search for inhabitants' well-being, defined by the *Cambridge Dictionary* as "the state of feeling healthy and happy,"[61] that has motivated the major evolutions in the design of balconies. In this search for well-being, the evolution of balcony design has reflected the paradigms of the times, and has a direct attachment to the ecology of economics, politics, and social structures of these contexts. During the last decades, this archetype has acquired distinct shapes and boundaries to attend to the modifications in the notions of health and comfort and to respond to the changes in the inhabitants' valorisation of contact with the street and the existence of private outdoor spaces for leisure and recreation.

In this paper, it was proposed that the paradigms and main concerns of each time, motivated by the search for well-being, together with technical developments, conditioned the specificities of balcony design. The present overview identified three moments of particular relevance to the evolution of balconies design:

The association of the open balcony with new health and hygiene standards in the late nineteenth century and the consequent importance they acquired in the period between the great wars as an element capable of introducing light, air, and openness into modern dwellings.

The exploration of shading elements on balconies influenced by traditional Islamic architecture in the middle of the twentieth century as new components to better control sunlight and ventilation.

The reinterpretation of the vernacular models of balconies enclosed by glass during the 1970s energy crisis as a device for capturing and storing solar radiation and reducing energy consumption.

59 Franz Graf and Giulia Marino, "Housing Reloaded Collective. Housing in Europe, 1945–2015," *Docomomo Journal* 54, no. ARTICLE (2016); Franz Graf and Giulia Marino, "Modern and green: heritage, energy and economy " in *La cité du Lignon 1963–1971*. Étude architectural et stratégies d'intervention (Lausanne Infolio 2012).

60 Nuno Valentim, "Projecto, património arquitectónico e regulamentação contemporânea. Sobre práticas de reabilitação no edificado corrente." (Faculdade de Arquitectura da Universidade do Porto, 2016)..

61 "Cambridge Dictionary - English Dictionary," 2023, accessed April 2023, 2023, https://dictionary.cambridge.org/dictionary/english/well-being.

62 Srinivasan and Moe, *The hierarchy of energy in architecture: emergy analysis*.

In summary, the overview of the evolution of the definition of the balcony demonstrates that, throughout history, it has become consensual that balcony design is defined by the relation between three domains: the outside, the inside and the in-between. This review also reveals that the importance given to each balcony domain has been influenced by the demand for inhabitants' well-being, which modified construction paradigms over time and consequentially originated distinct balcony boundary system.[62] The aim of identifying these stages of balcony design is to inform the redefinition of the Mediterranean balcony, which in this current critical and symbolic moment, characterised by the attempts to respond to climate change, could contribute to developing more sustainable housing models for a growing urban population.

The extreme exploration of the design of in-between inhabited spaces is considered a noteworthy contemporary trend at the turn of the new millennium, and it highlights their potential as passive elements which are capable of improving the interior environment quality within dwellings and contributing to the well-being of the inhabitants.

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Environment--Trouble

In Celebration of the 60th Anniversary of Banham's "Environment Bubble"

Keywords
– Reyner Banham; Crisis of Modernity; Technotopia; Plastics in architecture; Satire

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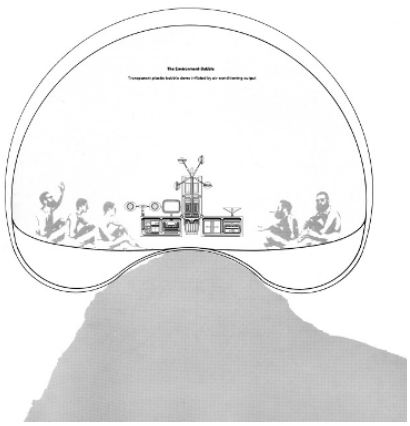
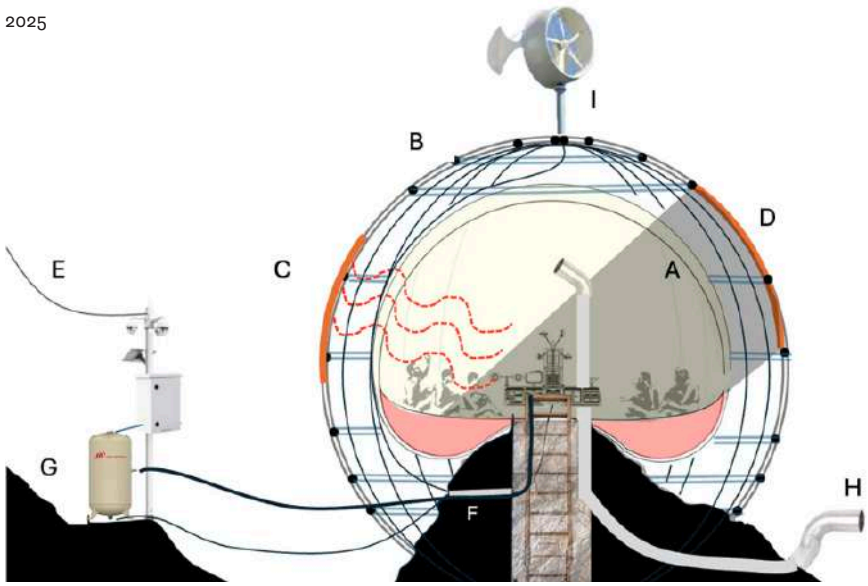
"Environment-Trouble" is a satirical commentary on "A Home is not a House," a 1965 article authored by Reyner Banham and François Dallegret that included a now famous cross section through an imagined, self-contained, "Environment-Bubble." In 2024, a group of five friends decided to build the Banham bubble on the rocky shores of Capri to celebrate the sixtieth anniversary of the publication. Pretty soon, of course, the men ran into all sorts of trouble, thus the title of the piece: "Environment-Trouble." The article describes what the Office of Uncertainty Research learned when its members went to Capri to interview the men, in particular about the material contingencies, social forces and planetary and cosmic realities that derail even the best-laid plans. "Environment-Trouble" will be on view at the Palazzo Diedo, May 8 to November 23, 2025 as part of an exhibit called 'Core Samples', curated by Ana Miljacki, and is part of the Venice Architecture Biennale (2025).

fig.1 Cross section through the Capri Bubble. A: Plastic bubble; B: Bucky Dome anchored to rock; C: Mobile sun tracker for summer months; D: Rain shield; E: Power cable and junction box; F: Channel for air hoses and electrical wires; G: Air compressor; H: Vent; I: Wind power generator. (Not shown) Porta potty; shower; water tank; wine cooler; refrigerator; shade umbrella; lounge chairs; flowerpots; sleeping cots; chest of drawers for blankets. By the authors.

1965



2025



In 1965 Reyner Banham — together with his friend François Dallegret — published a now famous article, "A Home is not a House," which included a cross-section through an imagined, self-contained, "Environment-Bubble."[1] It was described as "a transparent plastic bubble dome inflated by air-conditioning output."[2] It housed five naked men (Dallegret, his ditto, and Banham and his two dittos) siting around a TV and stereo console, with one of the Banhams puffing on a cigar.[3] It was sited somewhat precariously on a rocky outcrop. At its centre there was a console with radio, TV, lamps and air vents that included an air-conditioning kit that, as Banham wrote, was meant to "deal with most of the weather most of the time."[4]

> To the man who has everything else, a standard of living package such as this could offer the ultimate goody—the power to impose his will on any environment to which the package could be delivered; to enjoy the spatial freedom of the nomadic campfire without the smell, smoke, ashes and mess; and the luxuries of appliance-land without those encumbrances of the permanent dwelling.[5]

The whole thing was a tongue-in-cheek critique of the "cubicular interiors of the European traditions" as well as life in the suburbs of America. It was also the hippie-esque critique of the over-engineered Bucki Dome. This flexible "un-house," as it was called in the article, was a barely disguised, masculinist return to the primordial campfire, but now enhanced by modern gadgetry.[6] Like an automobile with its dashboard of vents and knobs, but obviously without its metal cladding and motor, it was meant to be a place where one could crank up the air conditioning, chat, listen to music, have sex, and otherwise pass the time. "Dirty old Nature could be kept under the proper degree of control (sex left in, streptococci taken out)."[7]

Since there was no kitchen or bathroom, this "un-house" had some obvious limitations.[8] It was commodious without a commode and as to how long the car battery that drove the equipment would last or be recharged is anyone's guess. And, of course, to stay in the bubble without air conditioning would soon have been problematic since it would be little more than a greenhouse. As to what it might be like to sit naked on the rocks without cushions is anyone's guess. Comfort and privacy seem to not have been Banham's concern. In other words, how inhabitable was it?

Banham was not alone in his interest in ostensibly inhabitable bubbles. The theme was also taken up by the Italian artist Mario Merz, who designed a vast number of semi-spherical "igloos," as he called them, some of metal and glass, some of plastic and cloth. They were supposed to allude to the evolution of the cosmos and man, and to the vital impulses and energies that animate the universe. They also referenced the nomadic artist who resists stylistic uniformity (figure 1).

1 Reyner Banham, "A Home is not a House," Art in America (1965), vol. 2, pp. 70–79. Peter Reyner Banham (1922—1988) was an architectural critic, journalist and writer best known for his *Theory and Design in the First Machine Age* (1960) and his 1971 book *Los Angeles: The Architecture of Four Ecologies*. François Dallegret (1937–) was trained as an architect at the École des Beaux-Arts in Paris in the late 1950s. He moved to North America; first to New York and then Montreal in 1964. He has variously been described as an engineer, artist, designer, inventor, absurdist, and philosopher.
2 Ibid., 77.
3 For the use and meaning of "ditto" see: *Kiln People*, a 2002 science fiction novel by David Brin.
4 Banham, "A Home is not a House," 76.
5 Ibid., 75.
6 Ibid., 74, 76.
7 Ibid., 74.
8 Ibid., 76.

fig. 2 Mario Merz, Igloo, exhibited at the Hirschhorn Museum, Washington D.C., USA.

Though Merz was not as literal as Banham in suggesting inhabitation, he often placed typewriters or other objects in them. In one igloo, *Acqua Scivola* (1973), he staged a performance where two men sat inside the igloo reading, writing and speaking, pretending (without any irony it seems) to make it a place for living and relating.[9] In the 1985 show of his work at the Kunsthaus in Zürich, the igloos became even more quasi anthropological as they were arranged to form a "village," a "town," and an "unreal city."

Banham was trying to avoid the trope of "anthropological" art. It was not ice on tundra that he was interested in, nor glass on smooth concrete floors in temperature-controlled museums, but plastic on a wind-swept, rocky outcrop. Yet, like Merz, he relied on the classic, Eurocentric fascination with the proverbial return to nature and to an imagined — but artificially staged — cosmology of primitive man.

One would hardly think that anyone would be interested in these ideas in this day and age. And yet in April 2020, five friends decided that the Banham's Environment-Bubble would make a perfect Covid bubble. They picked Capri because they loved the temperate climate of the Mediterranean and had read in a fashion magazine that it could provide the "Quintessential Mediterranean Experience."[10] There they would reconnect with modernism's techno-utopian, anthropo-fetishized possibilities. As software engineers, they had plenty of money and, because of Zoom, they could "work from home" and so bring new meaning to Banham's phrase "A Home is not a House." Through a friend, they were able to find a site on the south side of the island that was isolated and yet had a foot track down to the rocky shore.

Members of the Office of (Un)certainty Research went recently to Capri to visit the site and interview these men. After all, how was the "sex left in"? What did they do for food? How did they spend the time?

As it turns out, though Banham claimed that the bubble would allow its inhabitants to impose their will on any environment, the men encountered several problems. The first was getting it manufactured. This was not as hard as they first thought since, after all, ninety million metric tons of polyethylene are produced per year. That is 1.2 tons of plastic sheeting for every ten people per year. Plenty to go around. And, needless to say, it comes in all shapes and sizes. They eventually found a company in Pacoima, California that specializes in making "bouncy houses" for backyard parties. A bouncy house is sort of a "un-house," anyway. The company guaranteed that their house would be made with the finest lead-free vinyl material and netting on all sides to ensure "safety, high performance, and longevity."[11] The shipping through the Panama Canal and installation by a local engineering firm took several months, but the next problem, once they got the bubble to the site, was to figure out a way in and out. Banham noted the problem when he commented that "fighting your way out of an air-dome can be worse than trying to get out

9 Mario Merz, Igloos, 25 October 2018–24 February 2019, Pirelli HangarBicocca, curated by Vicente Todolí in collaboration with Fondazione Merz (Milan, 2019), p. 18.

10 The Quintessential Mediterranean Experience: The Perennial Style," https://theperennialstyle.com/2024/02/26/capri-italy-the-quintessential-mediterranean-experience/

11 https://inflatablefactories.com

12 Banham, "A Home is not a House," 76.
13 https://domespaces.com

of a collapsed rain-soaked tent if you make the wrong first move."[12] To solve the problem, the men hired a local mason to carve a shaft out of the rock so that they could enter the bubble via a ladder from below. Chthonics saved the day! An exhaust vent was added to purge the interior of cigar smoke and bodily gases along with the toxic chemical vapours coming off the plastic. They also had a porta potty installed on the rocks behind the bubble.

Once the men had settled in, they discovered that the Mediterranean climate was different from that advertised in the travel magazines. The weather could be really hot, really cold and really windy. Unlike Merz's igloos that enjoyed the controlled environments of the museum, the men had to stabilize their bubble against the sometimes powerful winds that blow off the Mediterranean Sea. Eventually they had to buy a Bucky Dome to go over the bubble. Unlike the Banham dome, Bucky Domes are now commercially available for a few thousand dollars. In their view, the combination of the two domes, though certainly not what Banham had wanted , was not completely inconsistent with the original concept. But they really had no choice. The cheapest dome they could find was from a US company that claimed to "create your dreams, while aligning design and quality."[13] Most of their domes were intended for companies that specialized in glamping, so it seemed like a good fit, even though custom installing the dome with spikes hammered into the rocks was a bit tricky, and illegal, since the dome was supposed to be temporary, at least that was what they promised the authorities. They also modified the dome so that in summer, a moveable aluminium panel could be positioned to provide shade. In winter, the panel could be positioned to protect it from rain or to reflect warmth back into the bubble. Some nights it gets really cold, and so the men bought an antique chest of drawers to hold their blankets. It did not fit inside, so they placed it out by the entrance.

For the console that held the air conditioning, stereo equipment and TV, the men had to buy the equipment on the antique market since they wanted to be authentic as possible to the technology Banham had in mind in the mid 1960s. A local fabricator assembled the elements onto an aluminium frame. It was quite heavy and getting it made as a kit of parts so that it could be assembled inside the dome meant that it was nothing less than a masterpiece of engineering. Unfortunately, the town required that the men install an electrical transformer rather than drape the extension cord down over the rocks as they had initially done. That turned out to be a benefit since electricity was need for a high-power air compressor that they had to install, since the bubble had begun to leak at ever higher rates. The noise of the compressor was a bit irritating to the men, so they limited its use to the mornings and just before bedtime. A wind turbine was needed to charge their batteries and nightlights.

Since there was no kitchen in Banham's "un-house," food had to be delivered from a local restaurant with which they negotiated a relatively reasonable, long-term contract. Fortunately, it specialized in a healthy

fig.3 Mario Merz, Igloo, exhibited at the Hirschhorn Museum, Washington D.C., USA.

Mediterranean diet that included fried calamari, ravioli *alla caprese*, goat cheese and wine. The restaurant also delivered their cigars. When the men get tired of the Mediterranean fare, they order from a restaurant called Mr. Billy that serves Chinese and Thai dishes. A path was made through the rocks so that waiters could deliver and remove the food without slipping. The men installed a wine cooler next to the outdoor shower so that they did not have to wait for their drink orders to arrive.

Locals nicknamed the site the *bolla rocce* (bubble rocks), which is the name now used when a letter is sent through the post office. Over time, the families of the people who helped service the *bolla rocce* moved close by and built an increasingly large shanty town on the nearby cliffs. A friend who came over to check on them brought a potted orange tree. Recently, a monk from the nearby Certosa San Giacomo monastery decided to travel to the site to offer the men his supporting prayer. He comes now every Sunday.

It took some time for the men to develop a routine where they would wash and shave in the Mediterranean. One of the men decided, however, to let his beard grow and soon he looked quite unfamiliar. They also had to do physical exercises so as to keep moderately trim. One of the men, it seems, developed the habit of talking to himself while another began scratching diagrams on the rock face.

News of the site has already begun to spread; design students from Rome now make the pilgrimage, but *i cinque nudi*—as the men are now referred to in the local pubs—have so far refused to give them access. A police barricade had to be set up to keep well-wishers, photographers, curiosity seekers, and the occasional nudist and yogi, from encroaching on the property. A Banham impersonator now shows up every Sunday and gives free interviews.

The men hope to live in the bubble at least until the end of 2025 to celebrate the sixtieth anniversary of Banham's publication. They are crossing their fingers since the plastic skin—with all the sun in the summer and freezing rain in the winter—is not very durable and will inevitably fall apart.

The Office of (Un)certainty Research would like to remind readers that human agency is always culturally and temporally emplaced within — and subject to — an unstable array of industrial processes, material contingencies, social forces and planetary and cosmic realities. For that reason, we need to always remind ourselves of the strangeness of that thing called "architecture." But how do we bring that strangeness to the centre of the conversation, especially since in the world of contemporary architecture, there seems to be a desperate search for salvation often along technological or social vectors. Banham's masterpieces of satire that prompted our piece — a satire of a satire — is just a small attempt to challenge the over-determined fantasies of intelligibility and the narcissistic teleologies of completion.[14]

14 Because of the over-determining emphasis on practice and theory in our discipline, satire has been a much undervalued and under explored genre, which is a bit odd given the out-scaled and historically grounded validations of pretentiousness and seriousness that are foundational to the discipline. But for those interested, we suggest starting with Leon Battista's *Somnium* (Dream: 1440s) and Bruno Taut's *Nieder der Seriosismus!* (Down with Seriousism, 1920).

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with Margherita Lurani, Philip Lutken and Jovan Minic, assistants

To Understand the Territory to Be Part of It

Extracts from the course programme of the Atelier Mayol at the Accademia di Architettura di Mendrisio 2023–24. Second-year students

Keywords
– Architecture, Climate, Tradition, Ecosystem, Mediterranean.

DOI
– 10.14195/1647-8681_16_7

This essay delves into the course programme of the Atelier Mayol at the Accademia di Architettura di Mendrisio 2023–24. The atelier focused on the topic of the summer house, understanding summer as a moment where daily routine is temporary suspended and conventional domestic spaces are questioned.

The semester was an occasion to collectively discuss living and to re-think the way we approach the theme of habitation. Learning to doubt. To think the building as an ecosystem. To approach the house as part of a territory. To observe, understand and interpret the local tradition and identity of a place. To work locally. To make responsible use of local resources. To value the logic of construction. To understand that form follows climate. Learning from tradition to revert the global warming tendency.

The atelier worked in three different places located in three distinct areas of Mallorca. Banyalbufar, a terraced landscape in the north of the island. Sant Joan, a flat landscape in the centre. Es Salobrar de Campos, salt flats next to the sea. Three locations that explain Mallorca.

The Mediterranean Sea as a common ground.
The Mediterranean Sea as a common territory.
The Mediterranean Sea as a common culture.
The Mediterranean Sea as a common tradition.
The Mediterranean Sea as a common identity.

The Mediterranean islands and seashore will be the fields where we will work during the upcoming semesters.

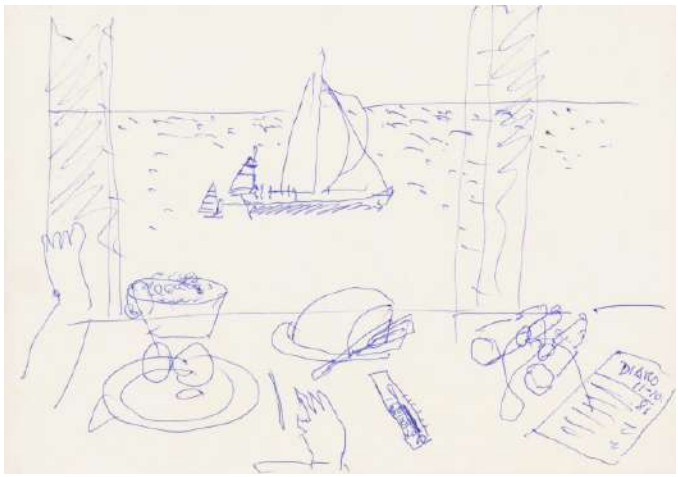
The same history, the same latitude, the same climate... but a wide range of local identities... identities inside a common identity... ultra-local specificities. Every particular place in this world has its own peculiarities.

Local climate needs.
Local typologies.
Local resources.
Local craftsmen.
Local material.
Local culture.

To value every tiny specificity of each place.
To root intentionally in the place where we work.
To become ultra-local.
To respond to the climate needs.
To reduce the impact on the territory.
To become part of the territory.
To reverse the climate tendency.

fig.1 Jorn Utzon. Sketch from Can Lis. 11 October 1981.

fig.2 Abraham and Jafuda Cresques. Mediterranean sea map. 1375.



Decarbonizing

The construction industry accounts for 38% of total global energy-related CO_2 emissions.
UNITED NATIONS ENVIRONMENT PROGRAMME

The Way We Build Has a Direct Effect on the Global Carbon Footprint

The Mediterranean Sea is a pole of attraction for tourists.

On the other hand, the Mediterranean Sea is a radiography of the climate change. The progression of its temperature and sea level shows the pressure of the actual climate emergency.

Climate change is one of the biggest threats to the Mediterranean Sea. Its water masses have exhibited increased temperature and salinity over the entire depth range since the mid-twentieth century. Sea surface temperature has increased since the early 1980s at a rate three or four times higher in the Mediterranean Sea than in the global ocean, and the intensity, duration, and frequency of marine heatwaves are increasing substantially. The sea level has risen since the end of the nineteenth century with an acceleration since the early 1990s.

We need to change the way we build in order to achieve carbon neutrality. We need to reduce the energy we need to build, but we also need to find solutions to reduce the energy which the buildings need throughout their lives.

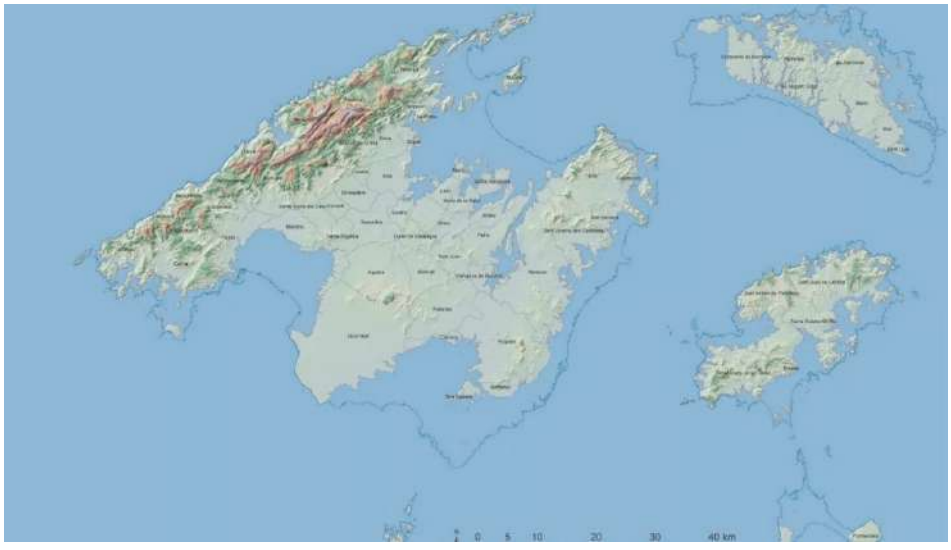


fig.3 *Viatge a unes illes imaginàries.* Travel to imaginary islands. Joan Bauzà. Ara Balears. 2018.10.02.

What do We Have? And What Can We do with the Things We Have?

A project is born from the surroundings. Always. Discovering the logics of the place itself. The intervention makes reference and reverence to the place where it is inserted. To be autonomous and dependent. To depend on the environment and to achieve autonomy. To develop the intervention with this simultaneous purpose of dependence and autonomy. To anchor the intervention to the place. Rooting.

Use what you have available at hand. The material, a local resource. Use what is given to you. Use the resources at your disposal. Most of the time, the material is given, gifted or imposed, hinted or suggested. Imposed by local constructive logics, by compromise or by economic restrictions. We welcome restrictions and impositions; they facilitate the game.

On one hand, we have material resources. In Mallorca we have the well-known sandstone, called *marès,* or the strong stone called *pedra viva*, or clay to produce bricks or lime. At some point we can combine them to produce other materials, such as the rammed earth produced adding earth and lime. In Mallorca there's not much wood, but some. Good forest management in the Serra de Tramuntana would reduce fires and generate a surplus of material. On the island we can also find some secondary materials, such as *Posidonia oceanica*, the endemic Mediterranean seagrass, straw, the bales that farmers produce when harvesting cereals such as wheat and barley, or *llatra*, taken from the Mediterranean fan palm tree, called *garballó*.

fig.4 *Escar* in S'Estalella. Pic. TEd'A arquitectes.

fig.5 *Marès* blocks in Sa Teulada quarry in Sta Margalida. Mallorca. Pic. TEd'A arquitectes.

fig.6 Dry stone wall. Pollença. Mallorca. Pic. TEd'A arquitectes.

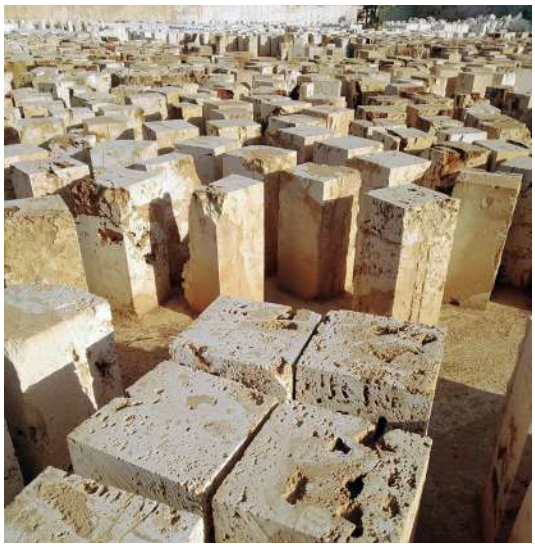


fig.7 Can Soler brick factory. Felanitx. Mallorca.
Pic. TEd'A arquitectes.

fig.8 BTC block. *Bloc de Terra Comprimida*.
Fet de Terra.

fig.9 Fat lime. Unicmall. Felanitx. Mallorca.

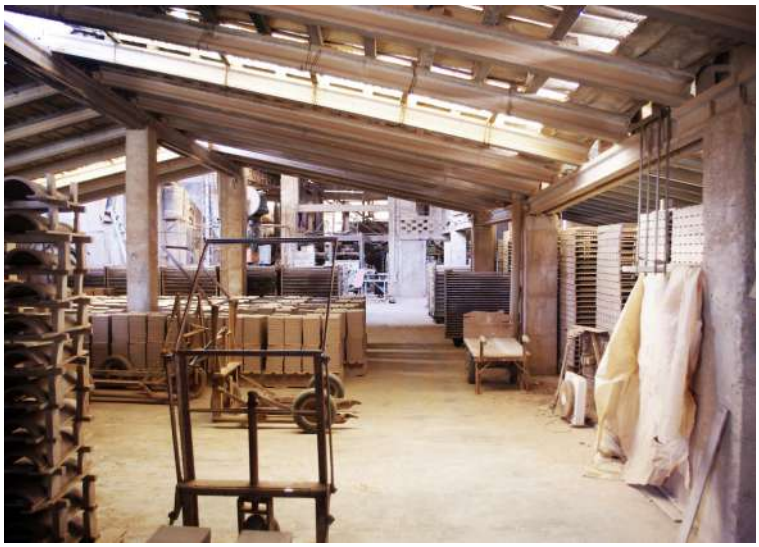


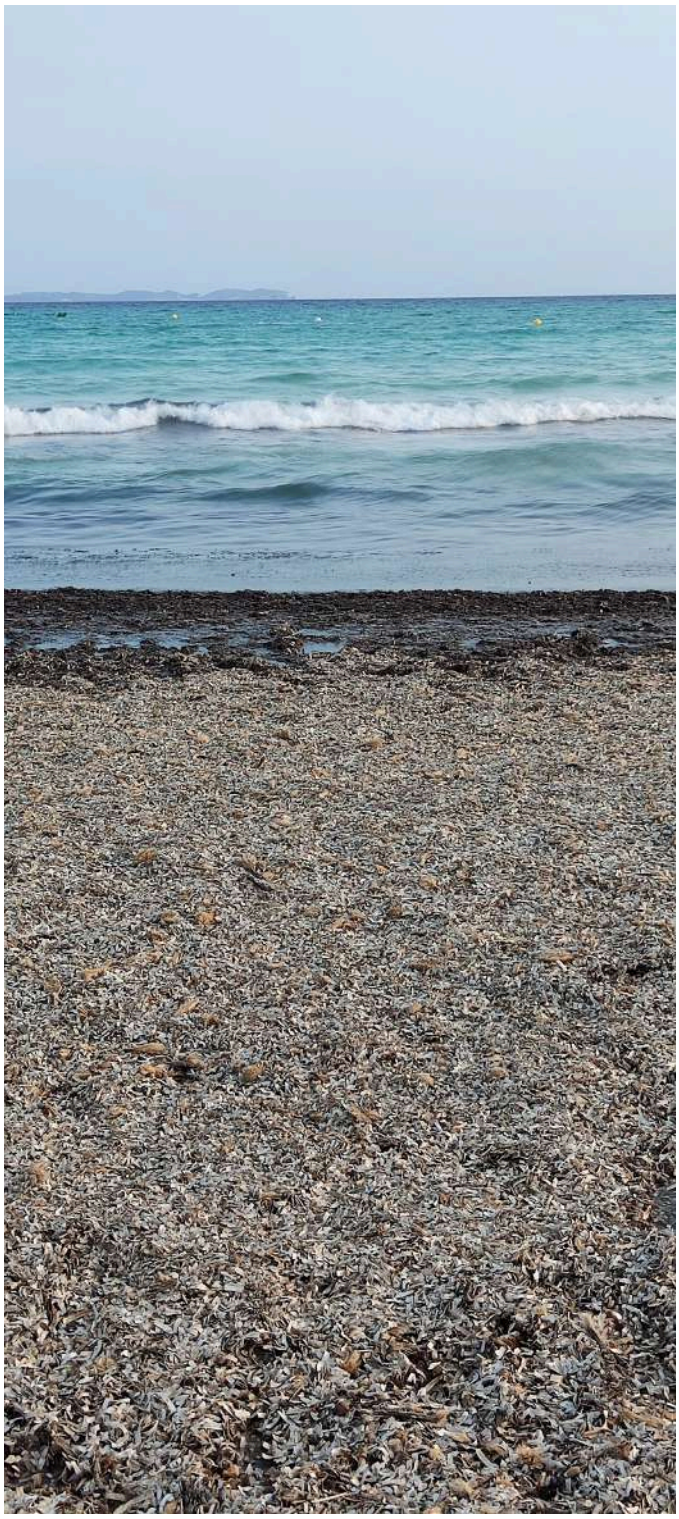
fig.10 Storm effects. Tramuntana area. Mallorca. 2020.

fig.11 Forest Management. *Amarar.* Mallorca.

fig.12 Straw bales in Villafranca. Mallorca.

fig.13 *Llatra* products. Mallorca.

fig.14 Posidonia oceanica dead leaves on Ses Covetes beach. Mallorca. Pic. TEd'A arquitectes.



Before using, reusing.
Before using recycled or optimized products.
Before using non-local eco-friendly products.
Before using local eco-friendly products.
We have to consider the possibility of *reusing local materials*.

To see what we have around, and to consider a second life for the materials, products, elements and spaces.
Reuse.
Pre-use.
Urban mining.
These are different strategies to give another life to our local resources.

fig.15 Sa pobla. Mallorca. Pic: Rafel Moranta.

In Mallorca, there's still an important network of people. Although it is becoming older and older every year, it's still there. They are people who have incredible knowledge of local materials and resources. They know all the conditions and possibilities of materials. They know all the techniques and detailing. They know all the tools and tricks to work with those materials. They have the knowledge and the skills to work on that specific material.

We have people extracting sandstone, cutting and building with it. We have people working with *pedra viva*. We have craftsmen producing tiles out of clay and cement. We have *margers*. We have carpenters. We have craftsmen weaving *llatra*. We have craftsmen blowing glass. Others producing *llengües* fabric and making objects out of it. All these people put together can help us to imagine new techniques and new solutions, born from old local traditions.

fig.16 Pottery craftsman. Pòrtol. Mallorca. Pic. TEd'A arquitectes.

Some of the resources are scarce, such as water, and we have to collect, keep and not waste them.

Qanats, acèquies, aljubs, safreigs, sínies, molins, cisternes, pous, albellons, basses, abeuradors, cocons, terrasses, etc are different specific words referring to the hydraulic infrastructure of the island. Many local and traditional devices to collect, to transport, to store or to generate water in Mallorca.

From Romans to Arabs, a vast traditional hydraulic technology was implemented in the territory. An anthropic transformation of the landscape. Reading and understanding the precise conditions of the landscape, they built a complex and multiscale infrastructure that organizes the whole territory of the island.

fig.17 *Aljub*. Alfàbia. Bunyola. Mallorca. Pic. TEd'A arquitectes.

Vegetation itself contains many passive climate strategies to learn from. Vegetation can help architecture in many ways.
Vegetation can provide protection from solar radiation in summer and, at the same time, can allow the sun to warm the building in winter. Vegetation can help to regulate the temperature. Trees and vegetation (e.g., bushes, shrubs, and tall grasses) lower surface and air temperatures by providing shade and cooling through evaporation and transpiration, also called evapotranspiration.

Other types of vegetation, such as the dead and dry leaves of the *Posidonia oceanica* can be found on the beaches in the early summer. It is a waste material and can be used as thermal insulation.

fig.18 *Vinetree in winter and summer. Sant Joan. Mallorca.* Pic. TEd'A arquitectes.

Form follows climate.
Typologies are strategies to answer to local climate needs with the help of local resources. The resulting local traditional typology shows the logic of construction, material and shape, that has been perfected over the centuries. Typologies are local examples that have formed over time. They are an expression of the knowledge that has been built over time.

Typologies are answers to local climatic needs. Historical and cultural testimonies, they are manifestations of the identity of a place.

Typologies and ultra-local typologies. The specific conditions of a place, whether they are meteorological, cultural, or linked to the logic of local economies, to the habits of the inhabitants, or the presence of a specific material, have given shape to typologies of typologies, ultra-local typologies.

A patio or *clastra* is probably the best-known Mediterranean typology. A patio is a strategy to double the façade in order to lose heat. A form that creates cross ventilation and a chimney effect. Passive strategies related to the shape of the building that help to fight against the climate.

Local typologies are resources to look at and to learn from.

Typologies have been tested over time. Typologies modified and adapted to the needs of people and to the properties of local materials.

fig.19 *Caseta de roter. Barraca de Curucull.* Somewhere between Santanyí and S'Amarador. Mallorca. Pic. TEd'A arquitectes.

fig.20 *Talaiots.* Son Fornés. Montuïri. Mallorca

fig. 21 *Caseta de roter.* On the way from Llucmajor to Palma. Mallorca. Pic. TEd'A arquitectes.

fig. 22 Patio Casal Solleric. 18th century. Mallorca.

fig. 23 Jorn Utzon. Can Lis. Portopetro. Mallorca. 1971–72. Pic. TEd'A arquitectes.

Local Landscape.
This is not about buildings, but about ecosystems.

Observing carefully the past and the existing.
Reading the precise conditions of the place.
Learning from tradition.
Becoming local.
Contributing to the local identity.
Using the existing as a tool.
Looking at the resources available around.
Diving into local knowledge.
Understanding processes.
Copying.
Rooting in that precise place.
Opening a pathway.
Placing a first stone.
Searching for water. Collecting it.
Shading under some trees.
Facing the sun. Protecting ourselves from it.
Catching the breeze.
Using existing traces.
Reusing the stone of a ruin.
Reducing the needs and impact.
Becoming landscape.
Becoming an inseparable part of the territory.
Building an ecosystem.

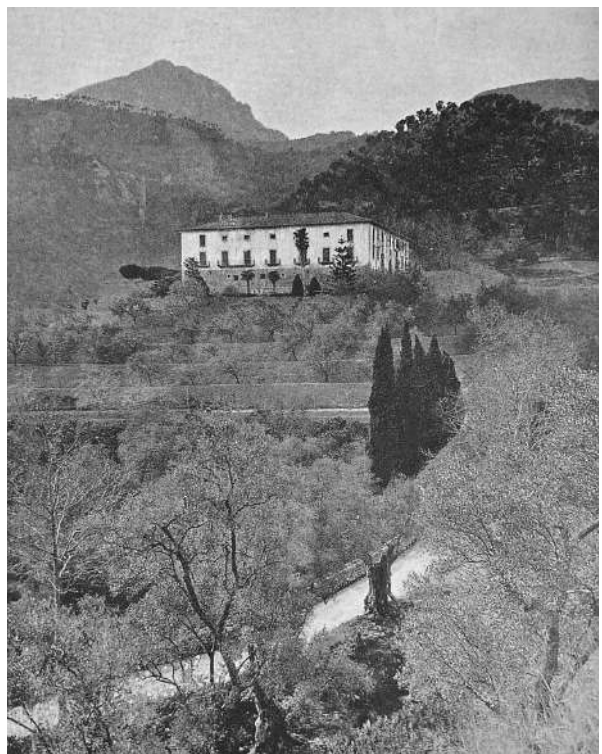


fig. 24 Possessió Son Zaforteza. Puigpunyent. Mallorca.

Design Brief

Learning to Doubt. Learning From Tradition
to Become Local.

The atelier focused on the topic of summer house. Understanding summer as a moment where daily routine is temporary suspended and conventional domestic spaces are questioned.
The semester was an occasion to collectively discuss living and to re-think the way we approach the theme of habitation.
Learning to doubt.

To think the building as an ecosystem.
To approach the house as part of a territory.
To observe, understand and interpret the local tradition and identity of a place.
To work locally.
To make responsible use of local resources.
To value the logic of construction.
To understand that form follows climate.
Learning from tradition to revert the global warming tendency.

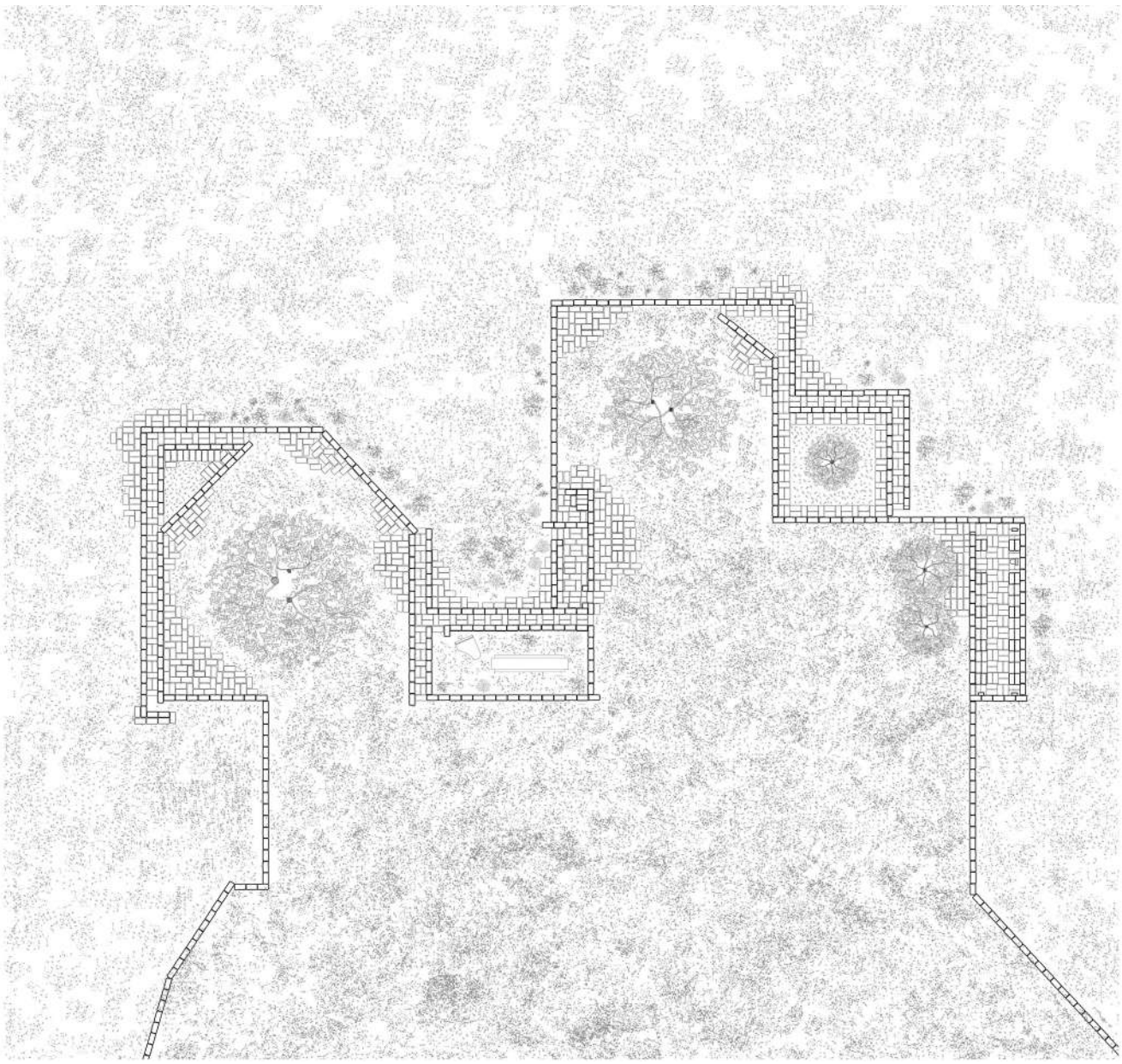
The atelier worked in three different places located in three distinct areas of Mallorca.
Banyalbufar, a terraced landscape in the north of the island. Sant Joan, a flat landscape in the centre. Es Salobrar de Campos, salt flats next to the sea in the south. Three locations that explain Mallorca.
These three places are incredible showcases of the diversity of landscapes, scales and vegetation of the island.
Three locations structured around the presence of old traditional water infrastructures.

Some Students' Responses

André Knagenhielm-Karlsson

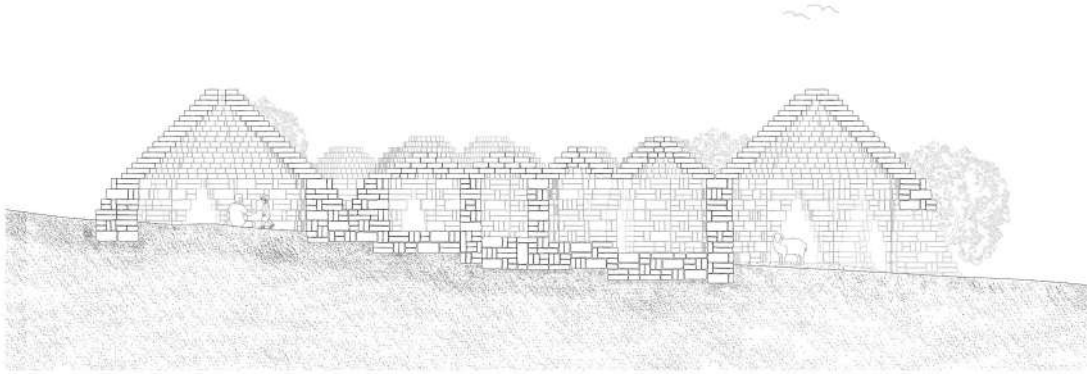
A wall defining the limit between two landscapes.
A wall containing the salt flats landscape.
A house in a wall.
A house facing south and protecting it from the north winds.
A house that catches the sea breeze as a cooling system.
A house built with the local *marès* sandstone, providing inertia and hygroscopy.
A house defined by a sequence of very different rooms.
Rooms as a result of structural testing of the stone.
Building as animals do, in balance with the natural landscape.

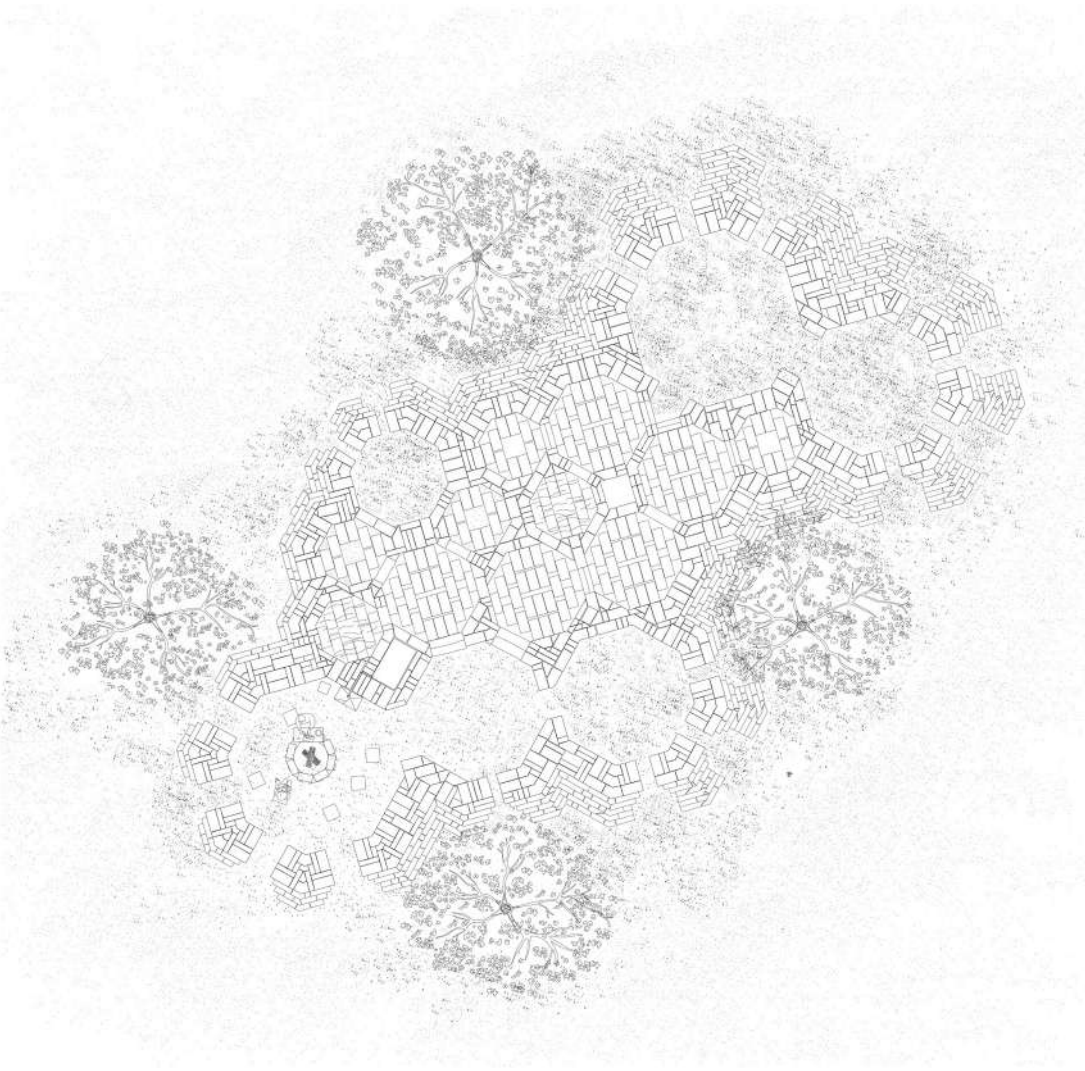
fig. 25–26 André Knagenhielm-Karlsson.



A house as a conglomerate of rooms.
Rooms built with the small stones taken from the plot in order to be able to plant local cereals such as wheat or barley.
Rooms built following the natural slope of the terrain.
Rooms built following the traditional system of the *casetes de roter*.
A traditional system that helps to build a roof as part of the topography.
A roof that is used to collect rainwater.
A roof that provides a lot of inertia.
A rough structure that provides natural comfort, using natural resources.

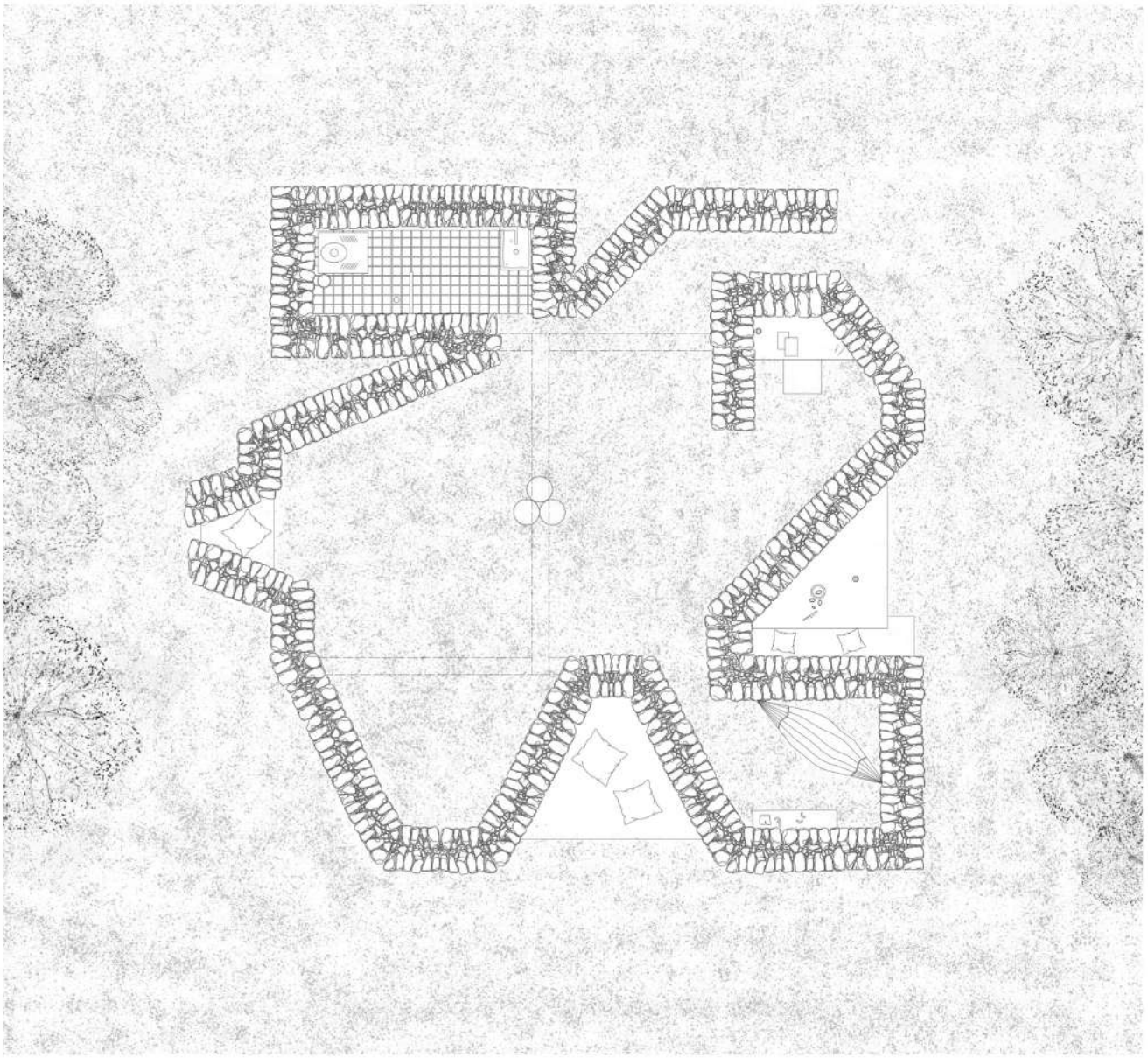
fig. 27–28 Daksa Lucas.





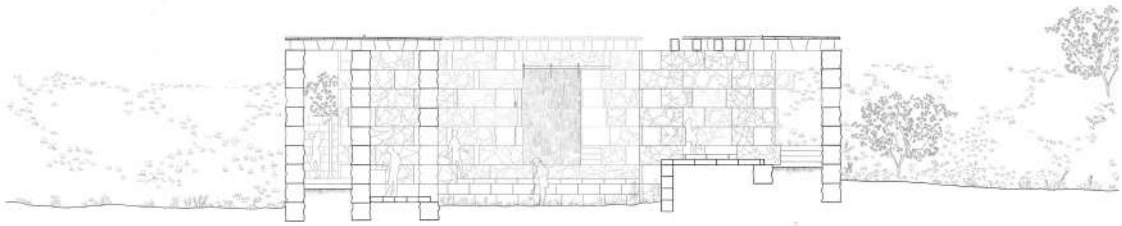
A house for both humans and birds.
A house that sits in a plot where birds stop when migrating during two seasons, twice a year.
A house that will be used for humans when birds are not there.
A house defined by a wall that folds, creating inner and outer corners and niches.
A house as a small tower.
A house built with irregular *pedra viva* and horizontal sandstone courses.
A house that passively moves the air, causing a chimney effect.
A small infrastructure as part of the local ecosystem.

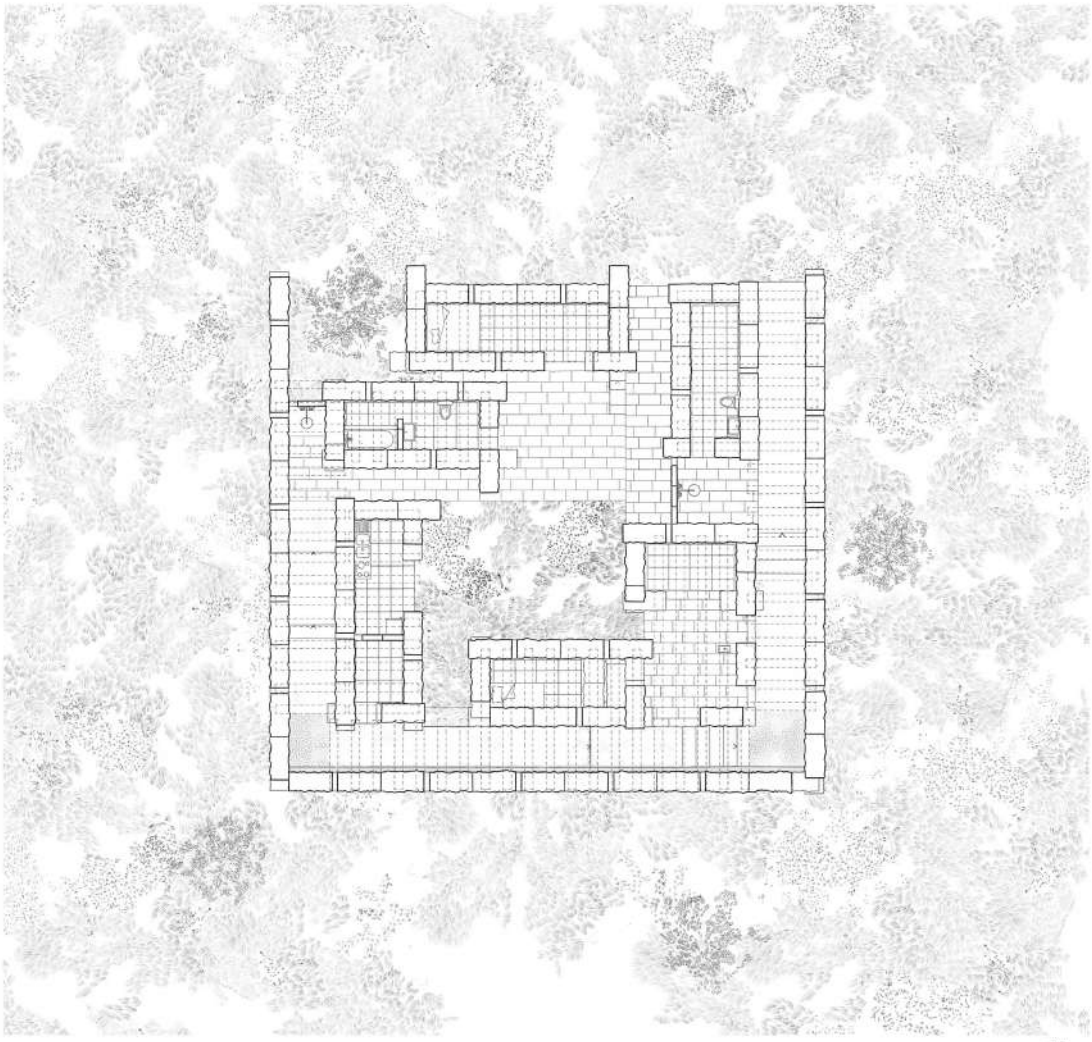
fig. 29–30 Damien Troilo.



An introspective house.
A house that aims to protect people from hot weather.
A house that uses the rough pieces of stone that are taken from the limits of a quarry for the walls. The *pell marès*. Enormous blocks directly from the quarry.
A house with a stone roof as well. A roof built with *llivanyes* of *marès*.
A roof that collects the rainwater into the patio, watering the native wild plants.
A patio understood as a thermal device.
A patio understood as an oasis.
An infrastructural and primitive construction as part of the local building typology.

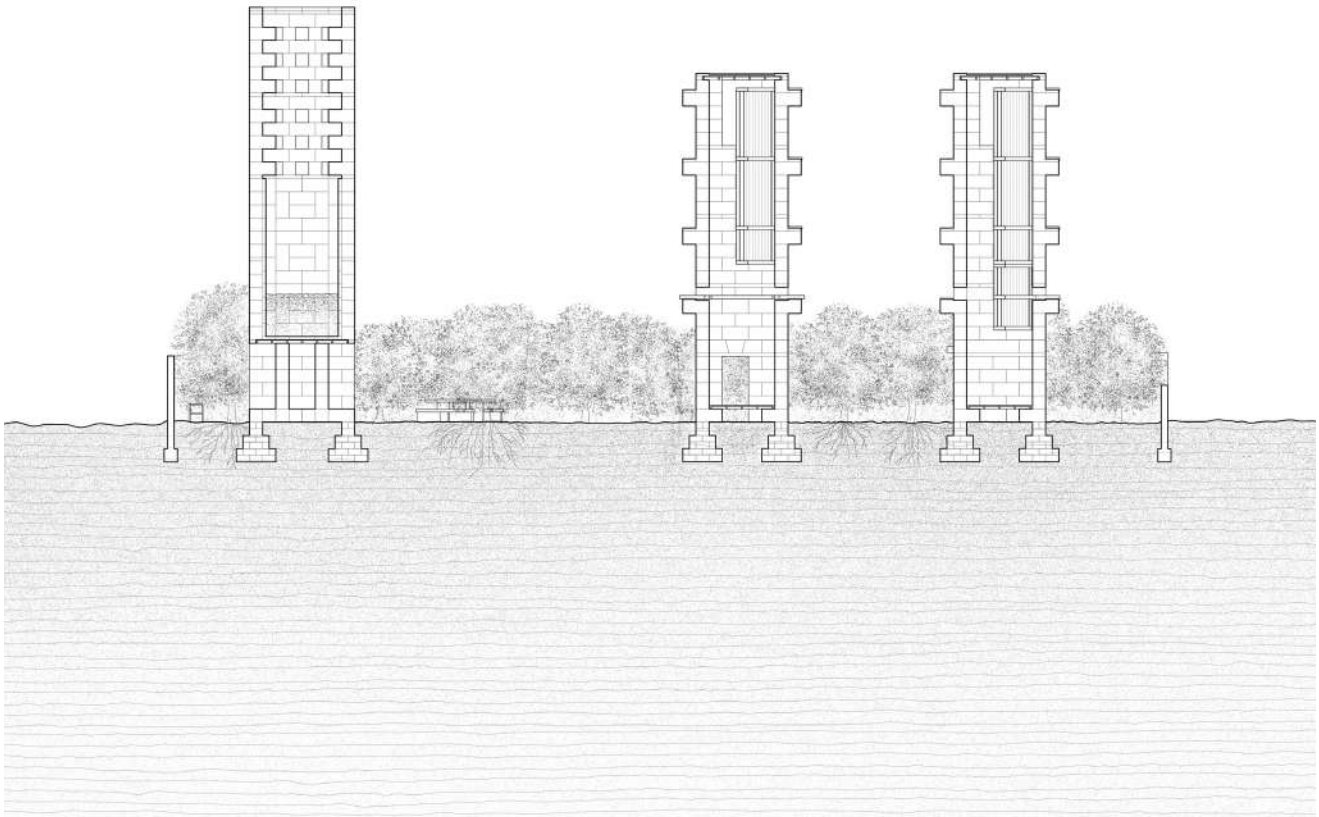
fig. 31–32 Horace De Portales.





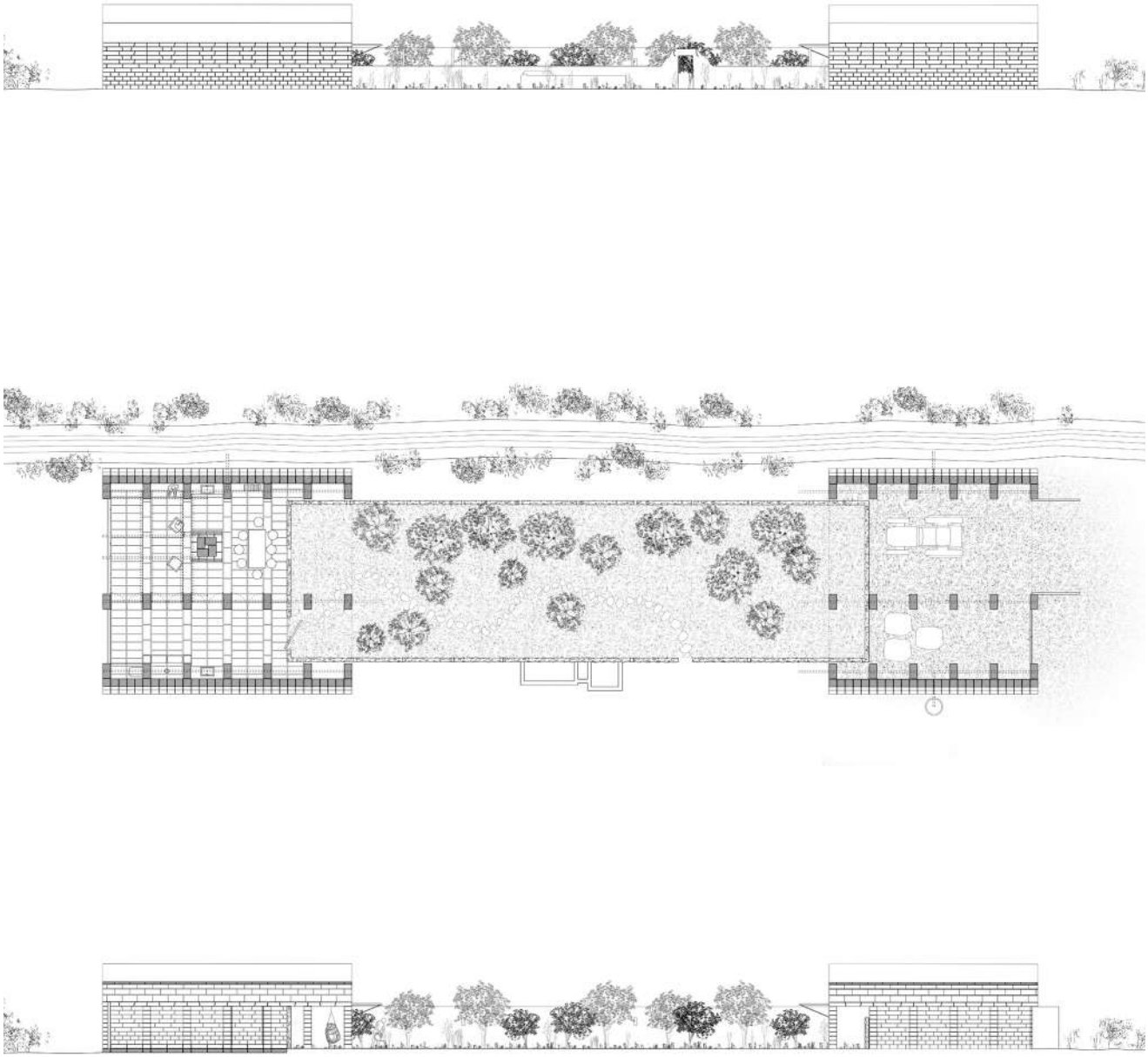
A house in an orange tree orchard.
A house as a group of independent rooms.
Rooms as towers.
Towers as infrastructural devices.
A tower as a water deposit.
A tower as a wind catcher.
A tower as a chimney.
Three towers that use and collect natural resources in order to provide comfort.
A strong landscape intervention as a result of using the natural resources we have at hand.

fig.33–34 Lucrezia Beard.



A vaulted structure as an interpretation of the bridge structure we have nearby.
A big vault and a small vault. A double vaulted structure divided in two.
A double vault, more open to one side rather than to the other, causing acceleration of the breeze when crossing the space.
A structure of vaults and pilasters. All the services are organized in the space between pilasters.
A structure as an expression of the local sandstone called *marès*.
A primitive structure that connects with the preexisting, providing the basics to live.

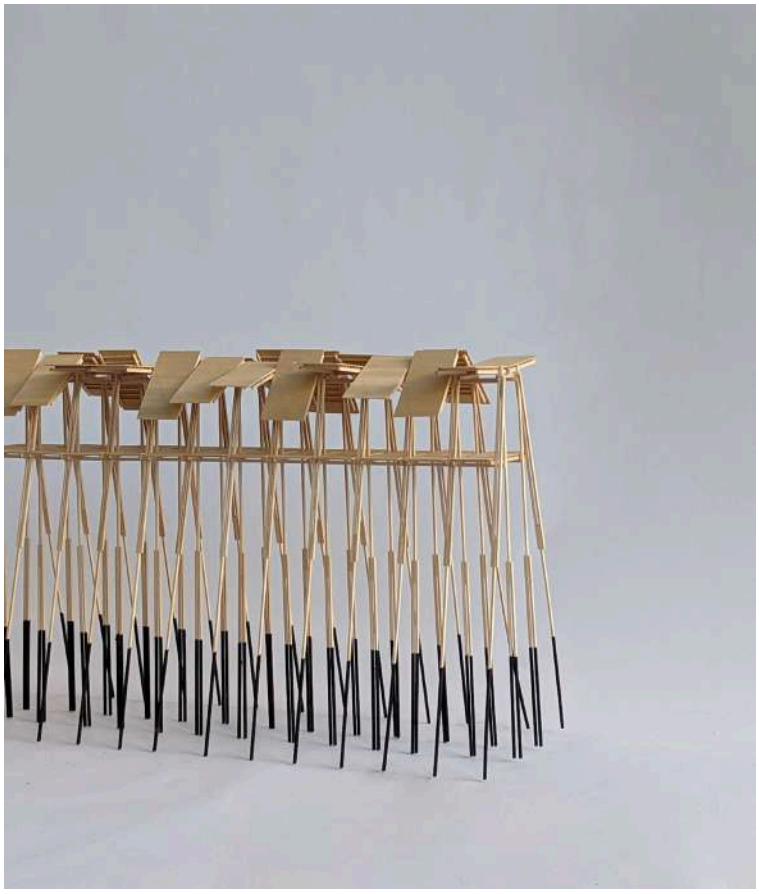
fig.35–36 Olga Engell.

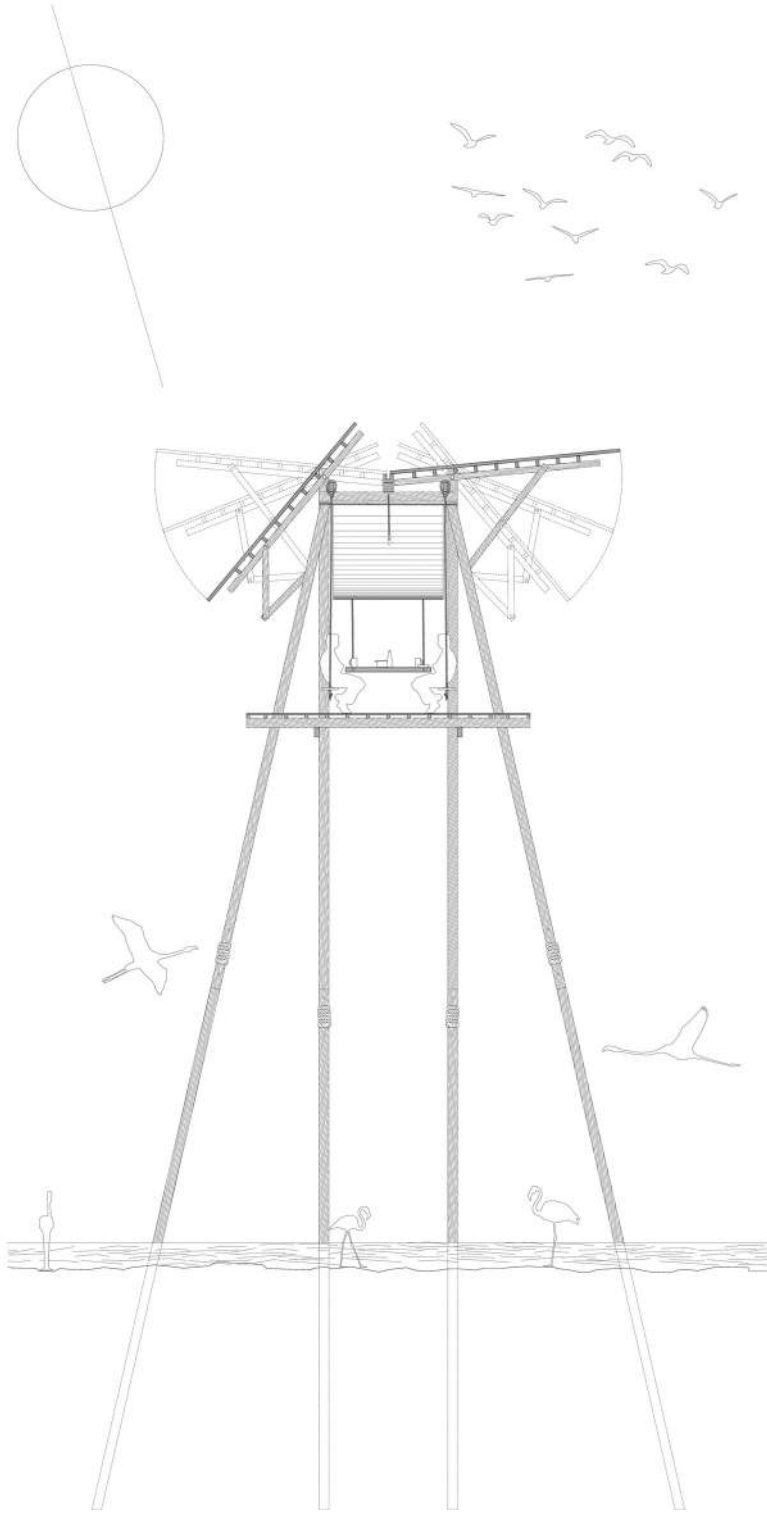


A house in a very sensitive landscape. A house in an old saline infrastructure.
A very light house on stilts.
A dry construction system.
A wooden structure defining a repeated portico.
A house for the salt workers.
A tall porch providing shade to work beneath.
A wooden skeleton with a mobile façade. Panels that can allow the light or provide shade; they can allow views or provide privacy; they can expose or they can protect.

...
Understanding the territory to be part of it.

fig.37–38 Veronica Giunti.





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3 works + 1

Editor's Note

DOI
– 10.14195/1647-8681_16_8

The aim is to add a reflection on the theme of this edition, based on practical cases, that is, with publications on already-constructed works.

Projects were selected from studios operating in a Mediterranean environment, with one exception that can still be placed within the geographical limits set out in the call for articles, despite its location outside the Mediterranean basin and its harsher climate.

The selection criteria implied a focus on buildings which are unique in character; when published together, they offer a comprehensive and complementary response to the questions raised in this issue of *Joelho*, namely the urgent need for a move towards sustainable architecture. This response can be found in the architectural language of each case, arising from specific considerations at the stage of designing and building in each setting.

When searching for solutions that contribute to reducing carbon emissions, both in the construction and use of buildings, the whole and its parts are, as usual, inevitably related; the use of a certain material implies a certain system of construction, which is a decisive factor in defining its spatial and typological features.

An approach to architecture is called for that guarantees interior thermal comfort and responds to the climatic conditions of the

location, without resorting to mechanical environmental control systems. The strategies for such an approach summon the accumulated experience which has been perfected over centuries by vernacular architecture, particularly in terms of materials, construction systems and spatial solutions. There is a recognizable constructive past born from the close, ongoing relationship between people and place; this often supplies the most appropriate option for the climate crisis we are going through today.

The project '6×6 block' (Girona) by the Bosch+Capdeferro studio puts forward a flexible-use typology, the result of a construction system with self-supporting CLT walls. The structural system harks back to traditional (pre-concrete) construction and a use of space with identical dimensions between load-bearing elements. The lack of areas for circulation optimizes the useful area of the house. The centrally located service area allows users free use and appropriation of the spaces adjacent to the façade. The access gallery and the balcony provide cross ventilation for the apartment, working to regulate the internal environment in both winter and summer.

The work 'Vivendas sociales 2104' (Mallorca) by the Harquitectes studio is considered a case of 'urban mining', with its reuse of material from a pre-existing building.

A public tender promoted by the Balearic Housing Institute (Instituto Balear de Vivienda – IBAVI) has certain similarities to the previous project. The construction system features self-supporting walls, consisting of stone blocks and cyclopean concrete, carried out on site, with horizontal self-supporting CLT elements placed upon them.

The construction option can be seen in the façade of the building, employing a language which is reminiscent of traditional stone construction; the thickness of the walls progressively decreases on each floor, leaving space for the slab structure to be laid. It has a very similar typology to the '6×6 block' project, but with three modules instead of six, the service area being located in the central module and the living spaces next to the facades.

Another project carried out by IBAVI in Santa Eugenia (Mallorca), coordinated by municipal architect Carles Oliver Barceló, is an example of quality, publicly promoted architecture. Indeed in Spain, state collective housing arising from public tenders is of more interest than that which is privately promoted. Public tenders serve as a catalyst for joint reflection on current issues in architecture, particularly sustainability.

Quarrying stone for direct use in construction allows for greater monetization of the material than that normally carried out for cement production and implies significantly reduced carbon emissions. The building uses a traditional construction system with local stone (Marés) and shows improvements over the cases previously carried out by IBAVI, the aim being a low-carbon construction system that is easier, faster and more economical to build. This project is founded on thorough, rigorous and near-obsessive research in the search for sustainable solutions for the construction,

performance and use of buildings in the Balearic Islands. These could be applied to other Mediterranean islands due to the similarity of their insular condition — with limited natural geological and climatic resources.

The K118 pilot project is by Swiss studio Baubüro in Situ, located in Winterthur, and changes the current paradigm of undertaking an architectural project. Circular construction changes the way the materiality and construction system of a work is defined. Reusing materials and elements from other buildings means that the architect is restricted to the opportunities that may arise and traditional freedom of choice is lost. Therefore, the spatial development of the project does not necessarily correspond to any pre-defined materiality and construction system, as these are part of the ensuing selection process.

The implications of this paradigm change also extend to the concept of aesthetics in architecture. A work's architectural language does not result from prior thinking and design that connects the programme to the space and the material; rather, it develops from the selection of diverse materials and elements that, with the support of the factor of time, build a self-defining aesthetic.

Bosch + Capdeferro studio
Girona, Spain

6 × 6 Block

Girona, Spain

DOI
– 10.14195/1647-8681_16_9

Located in an urban environment of transition between the compact city and the open block ensanche characterized by an important presence of public facilities, the project proposes the design of 35 apartments based on criteria of program flexxibility and reduction of the carbon footprint throughout the life cycle of the building.

The use of cross-laminated timber panels (CLT) for the construction of the volume above ground brings back the traditional structural wall typology and defines living spaces of similar dimensions between loadbearing elements.

The project draws on the local tradition of cantilevered galleries built on the ancient wall that separated the city from the Onyar River. The apartments are composed of six rooms of 12 m² each capable of containing a multiplicity of uses and designed to be connected at will, suggesting a free appropriation of each space and incorporating any possible changes in the program over time according to the wishes or needs of their inhabitant, as well as allowing for the possibility of housing community spaces (nursery, gym, workplaces, collective kitchen-dining room ...). The chaining of pieces allows, in both bays of each apartment, a complete perception of the total depth of the building and the simultaneous incidence of light from the south and from the north, even in the spaces furthest from the façade planes.

Typology
– Residential

Area
– 4,375.50 m²

Promoter
– Private

Collaborators
– Raül Elias (project leader)
– Arnau Arboix (architect)
– Xavier de Bolòs (technical architect)
– L3J arquitectura i enginyeria (facilities consultants)
– Societat Orgànica + 10 s.c.c.l., (sustainability consultants)
– Blázquez Guanter s.l.p. (structural consultants);
– SiS consultoria acústica s.l. (acoustic consultants)
– Incafust, Institut Català de la Fusta (quality control and counselling)
– Egoin technical services

Builder
– Estructuras Ultra, Egoin, Alumilux, Jaume Fusters, Placoguix, Elèctrica Riam, EIS Girona, Telecta

Completion date
– 2020

Photographer
– José Hevia

In addition to reducing the energy embedded in the construction, the project makes a significant effort to reduce the energy demand necessary to guarantee the comfort of the living spaces, combining good insulation and cross ventilation with the maximum use of solar radiation.

The location of a gallery as a habitable greenhouse on the south façade allows the passive preheating of the air intake of the ventilation system in winter, while in summer the direction of the circuit is reversed and the gallery is reconfigured as a shadehouse in contact with the environment.

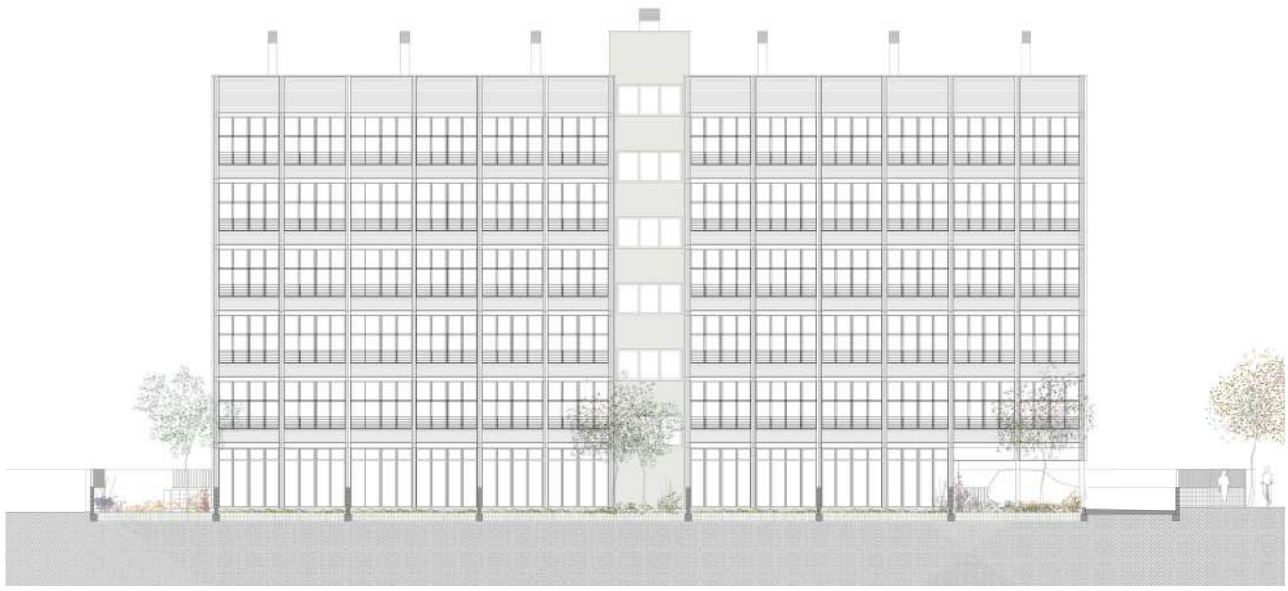
fig.1 Orthophotograph.

fig. 2 Site plan.

fig.3 North elevation.

fig.4 South elevation.

0 2 10 m



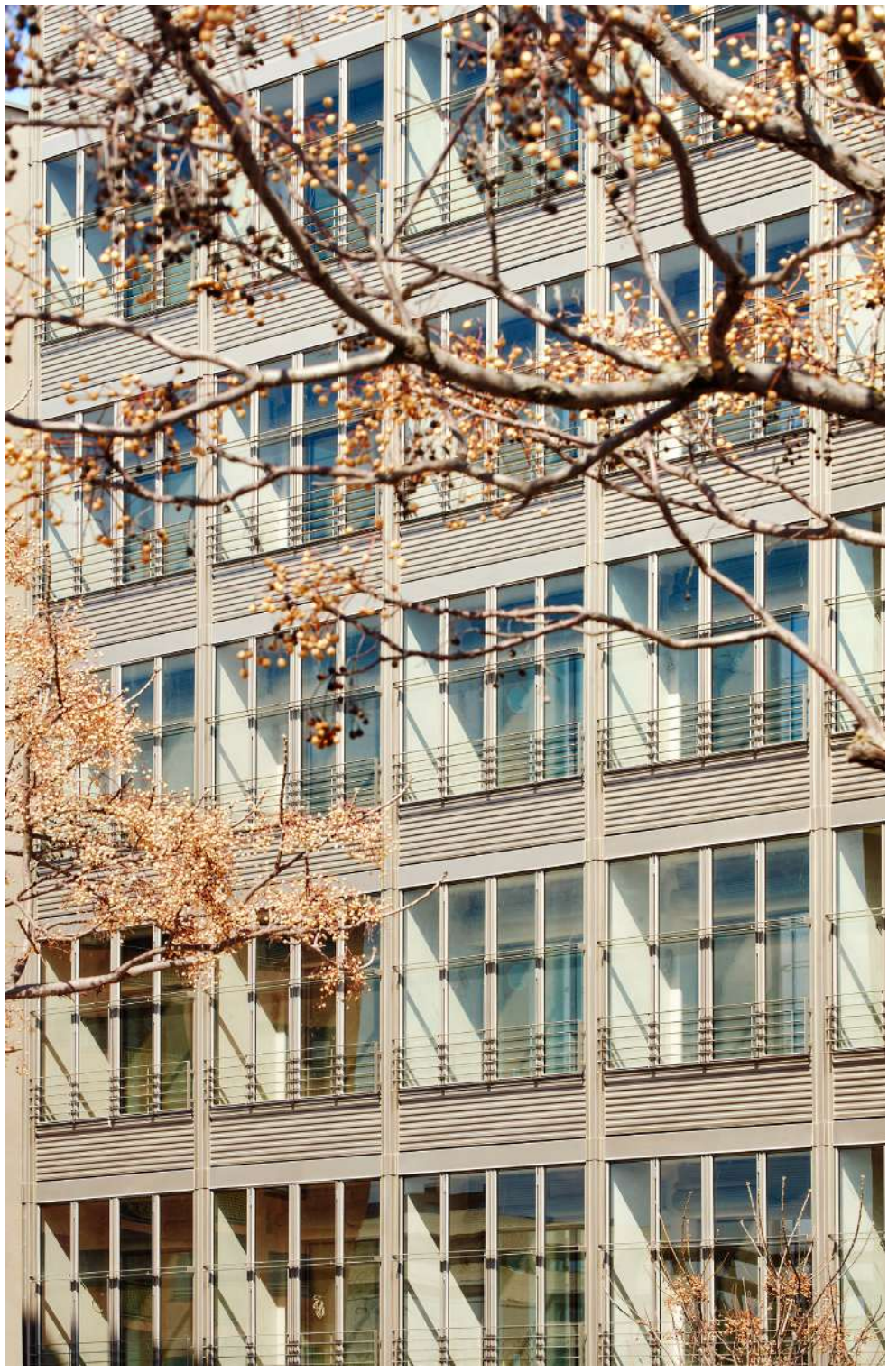
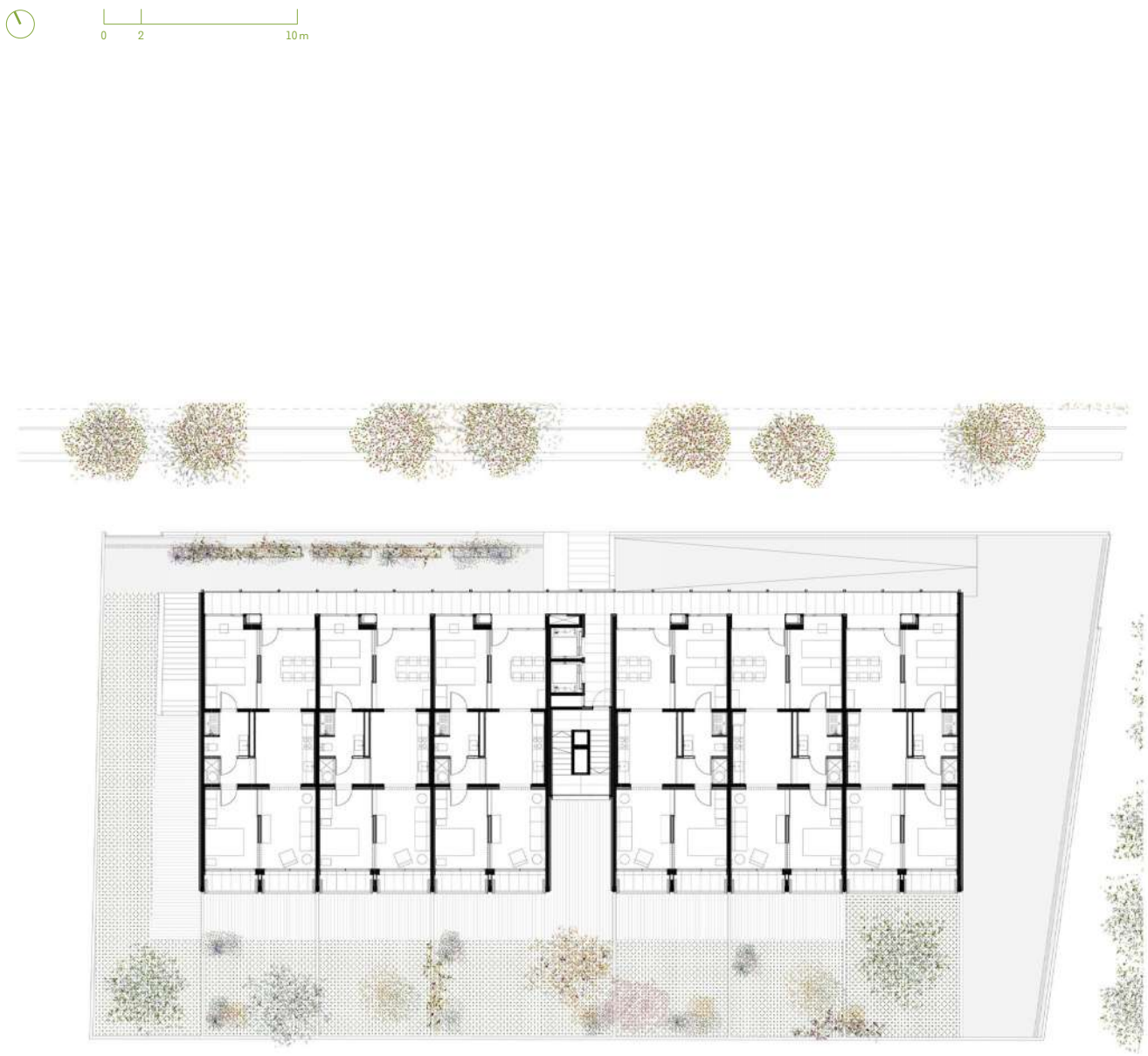


fig.5 Typical floor plan.



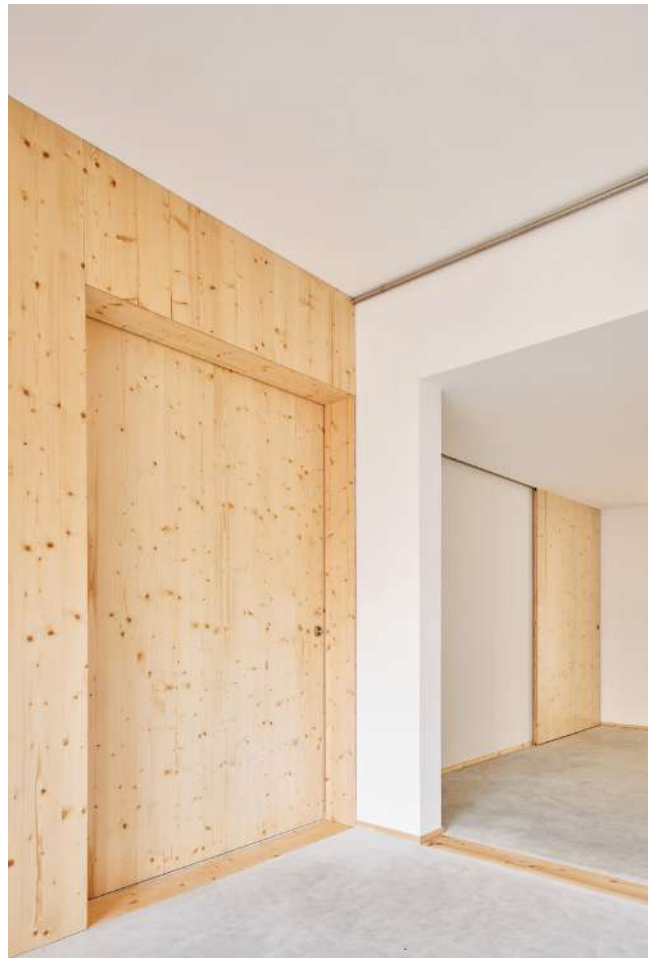


fig.6 Cross section.

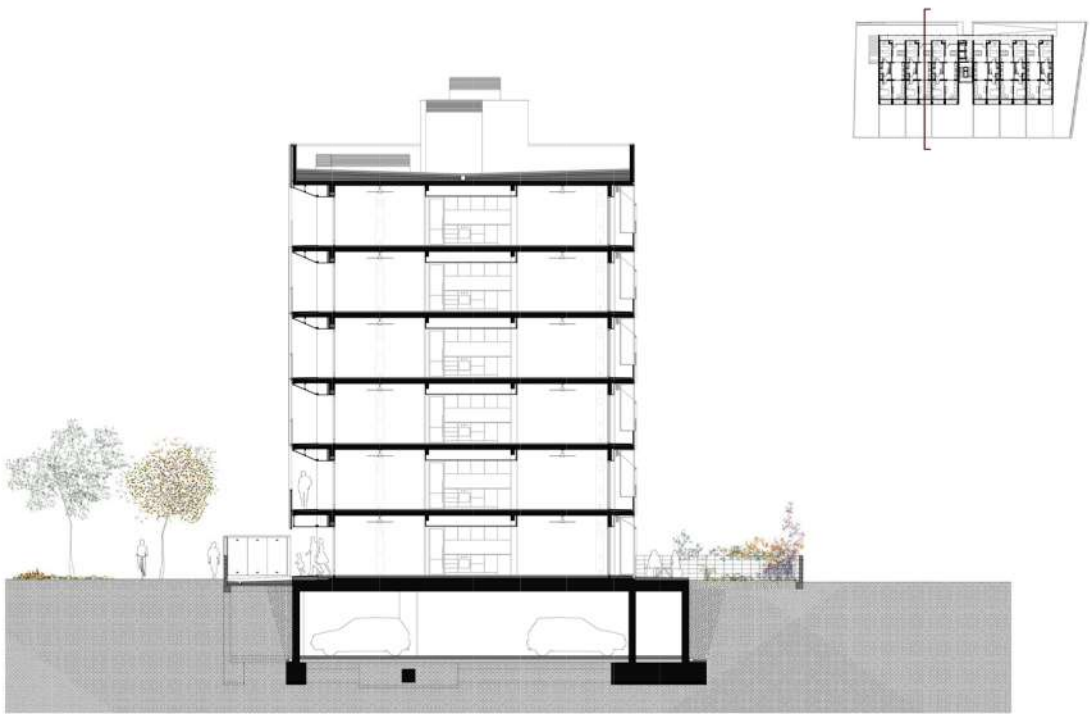


fig.7 Hosting domesticity (above) and the extraordinary hosting collectiveness (bellow)

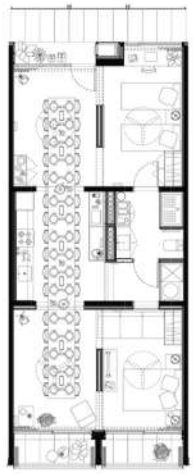
0 2 10 m

apartment unit

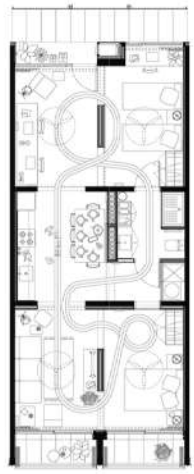
1 bedroom

2 bedrooms

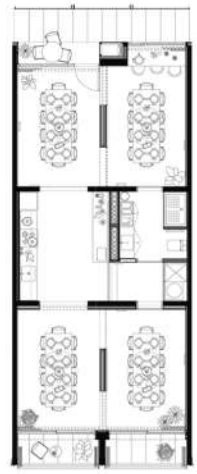
3 bedrooms



celebration dinner



slot car racing championship

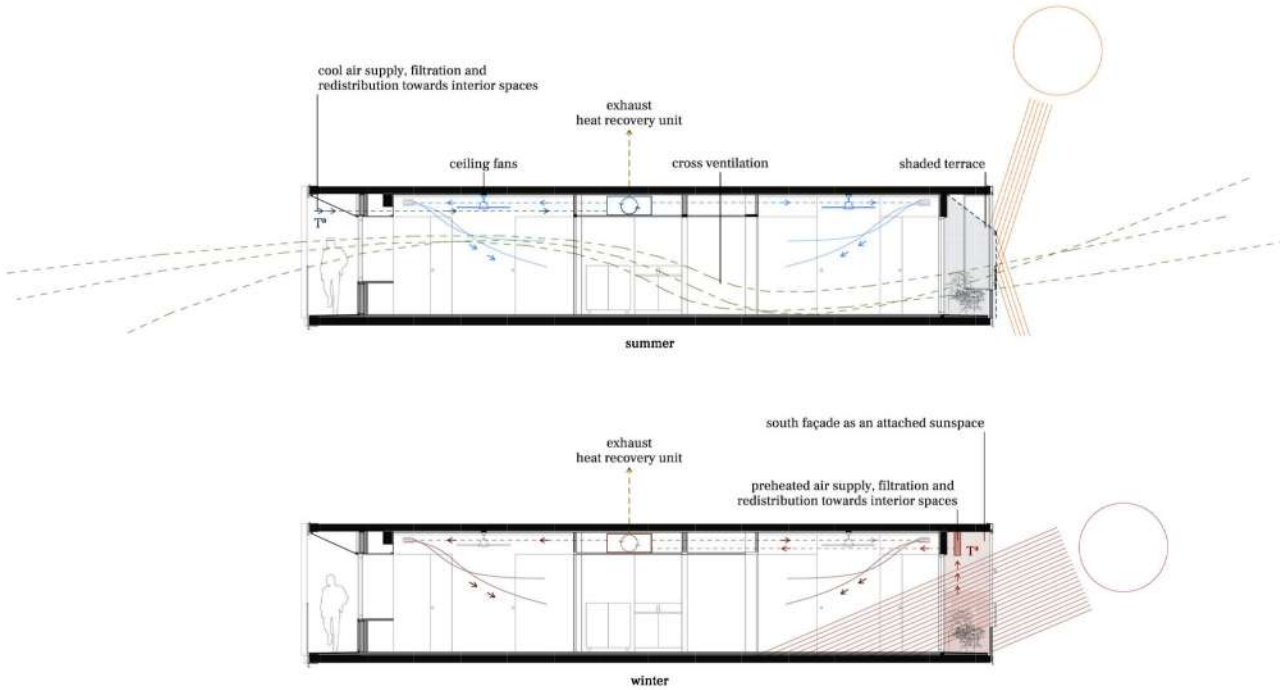


canteen

nursery

fig.8 Cross section.

0 1 5m



Harquitectes
Sabadell, Spain

25 Endowed Housing Units

Palma de Mallorca, Mallorca, Spain

DOI
– 10.14195/1647-8681_16_10

On the site where the dwellings are to be constructed is an existing unused school, the bad state of which makes it impossible to preserve. The main strategy of the project is to reuse the materials from the demolition of the old school to construct the new building, with an “urban mining” approach where the resources are mainly from the existing urban plot.

Almost all the debris from the demolition is reused, some just thrown into the shaft foundation, and the marés stone to create big blocks of cyclopean concrete. These are piled to build bearing walls perpendicular to the street, narrowing in each storey to allow the cross-laminated wood slabs to rest directly on the walls. Perpendicular to the main walls, thinner walls of the same materials fix all the structure of the building alongside the stairs and lift core.

The spatial and programmatic organization is in accordance with the structural system; the plan is organized with a stairwell core in a corner, giving access to a passageway in the inner courtyard, where the accesses to each dwelling are located, all of them double façaded except the semi-basement and the attics.

The façade clearly shows the structural system of the prefabricated blocks, thinning in each storey and supporting the wooden slabs. Each of the apartment façades highlights large wooden balcony frames with an opaque side and rolling shutters to protect from the east and west sunlight.

Typology
– Residential

Area
– 1,610 m²

Architects
– David Lorente, Josep Ricart,
Xavier Ros, Roger Tudó

Collaborators
– Anna Burgaya, Ángeles Torres,
Cynthia Rabanal, Victor Jorgensen

Team
– Xavier Suárez (quantity surveyor)
– DSM-arquitectes (structure)
– M7 enginyers (engineer)
– Societat Orgànica
(environmental consulting)
– MC acústica (acoustics engineer)

Project years
– 2021–2022

Construction years
– 2022–2024

fig.1 Site plan.

0 5 25 m

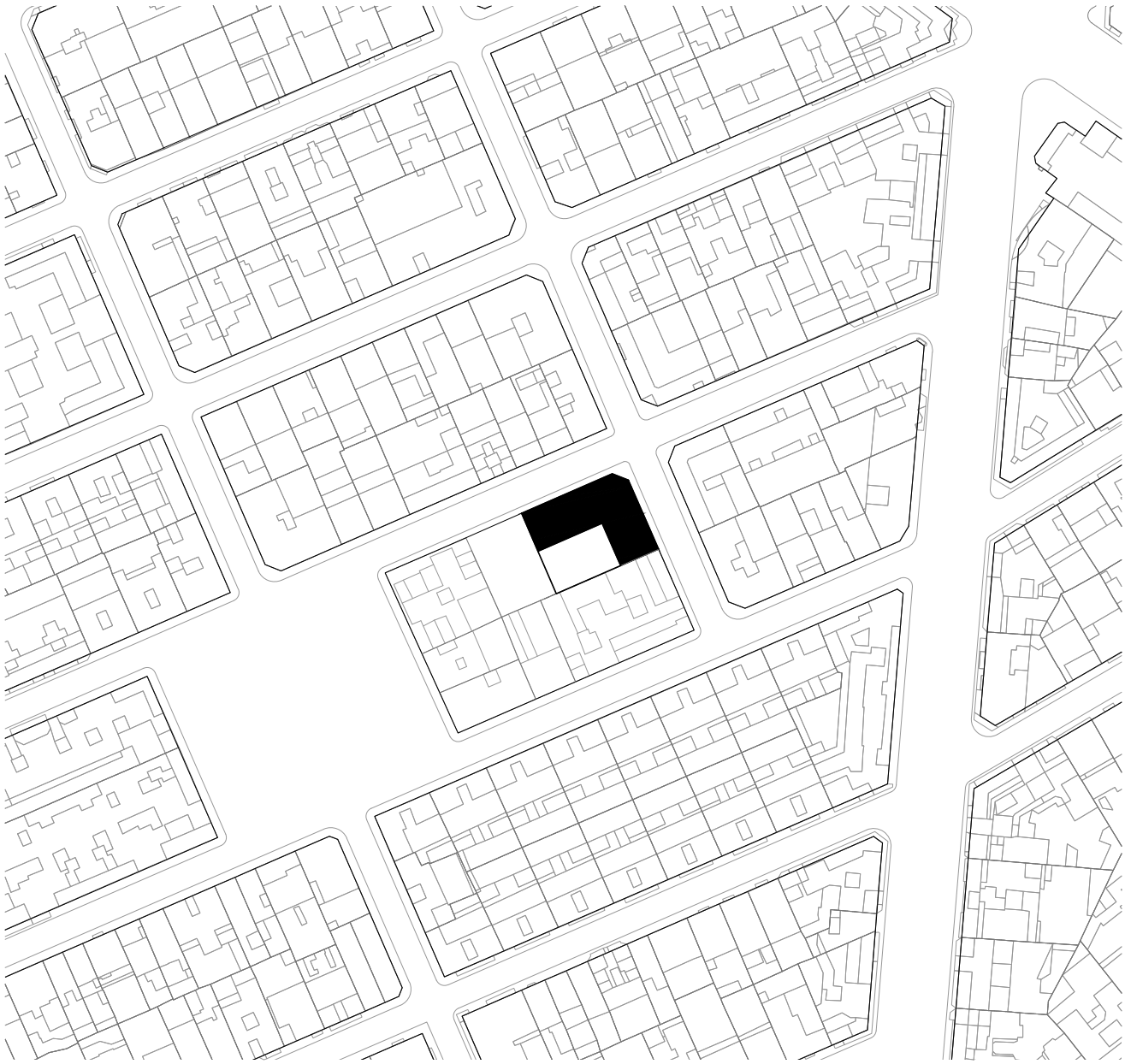
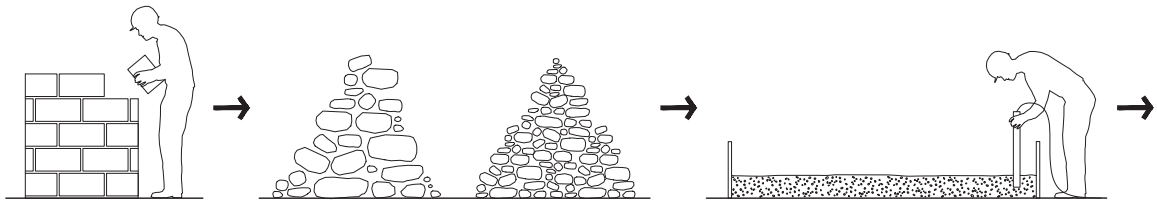


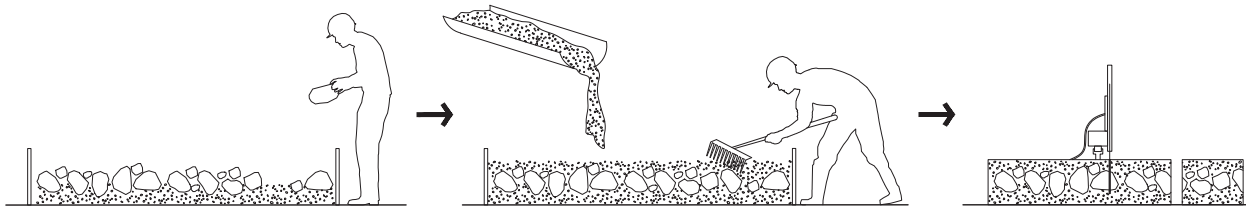
fig.2 Blocks construction process.



1. Selective dismantling of existing building.

2. Aggregate Selection
- 50% marès - Block production
- 50% concrete - Foundation pits

3. Slab Formation
- Poured and vibrated lime concrete base



4. Slab Formation
- Laying reclaimed marès

4. Slab Formation
- Lime concrete poured, vibrated, and leveled

5. Cutting the slab to make the blocks, using a disc

fig.3 First floor plan.

0 1 5m

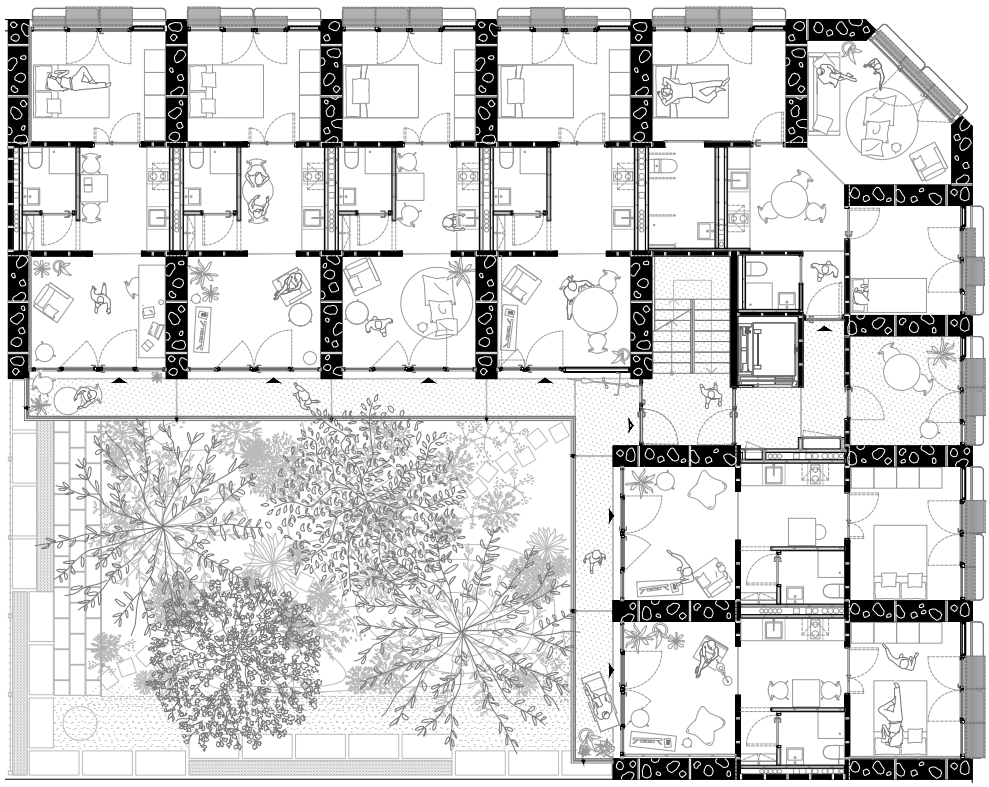


fig.4 Cross section.

0 1 5m

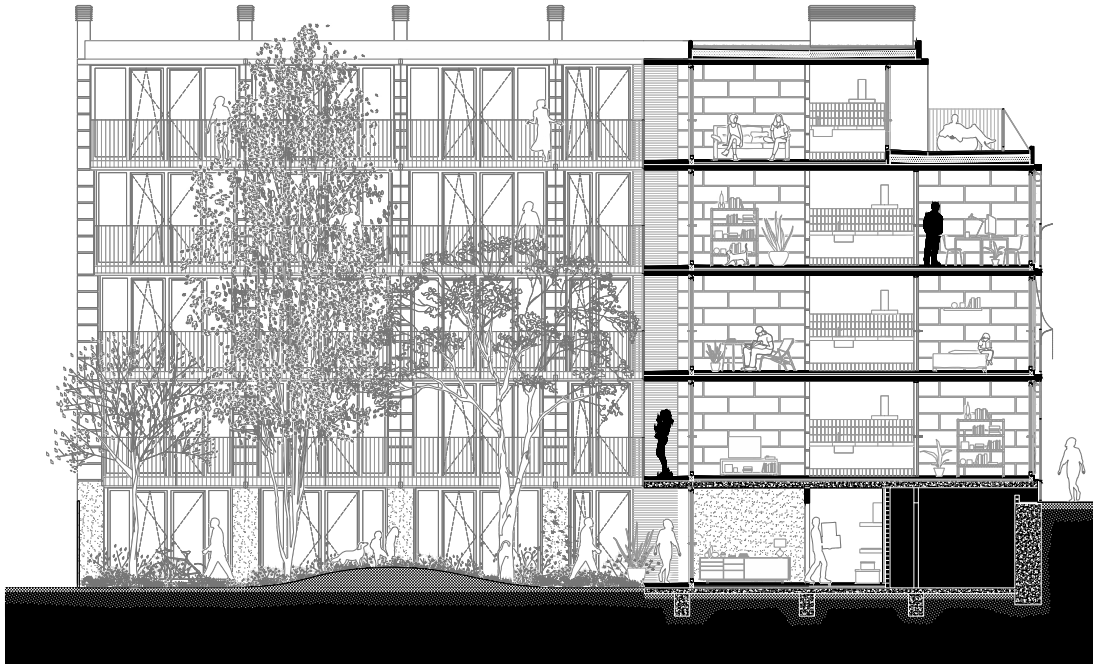


fig.5 Long section.

0 1 5m

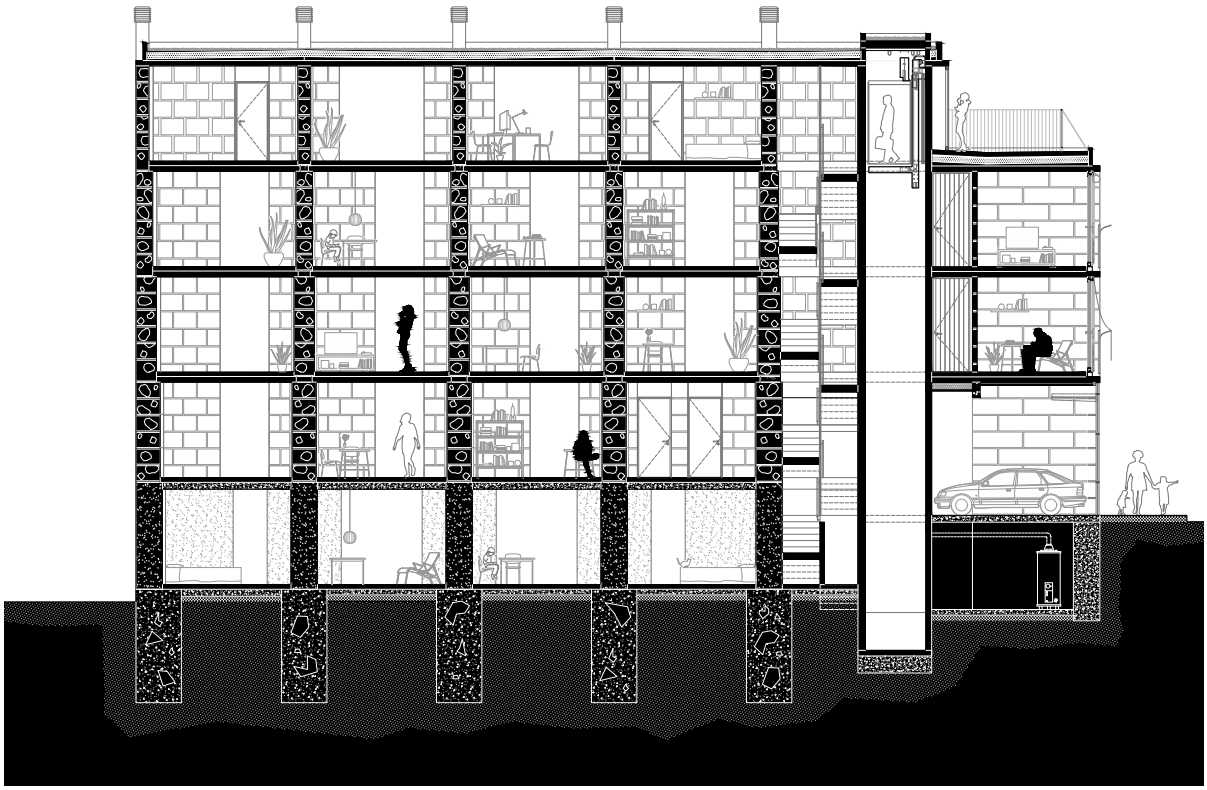


fig.6 Axonometry.

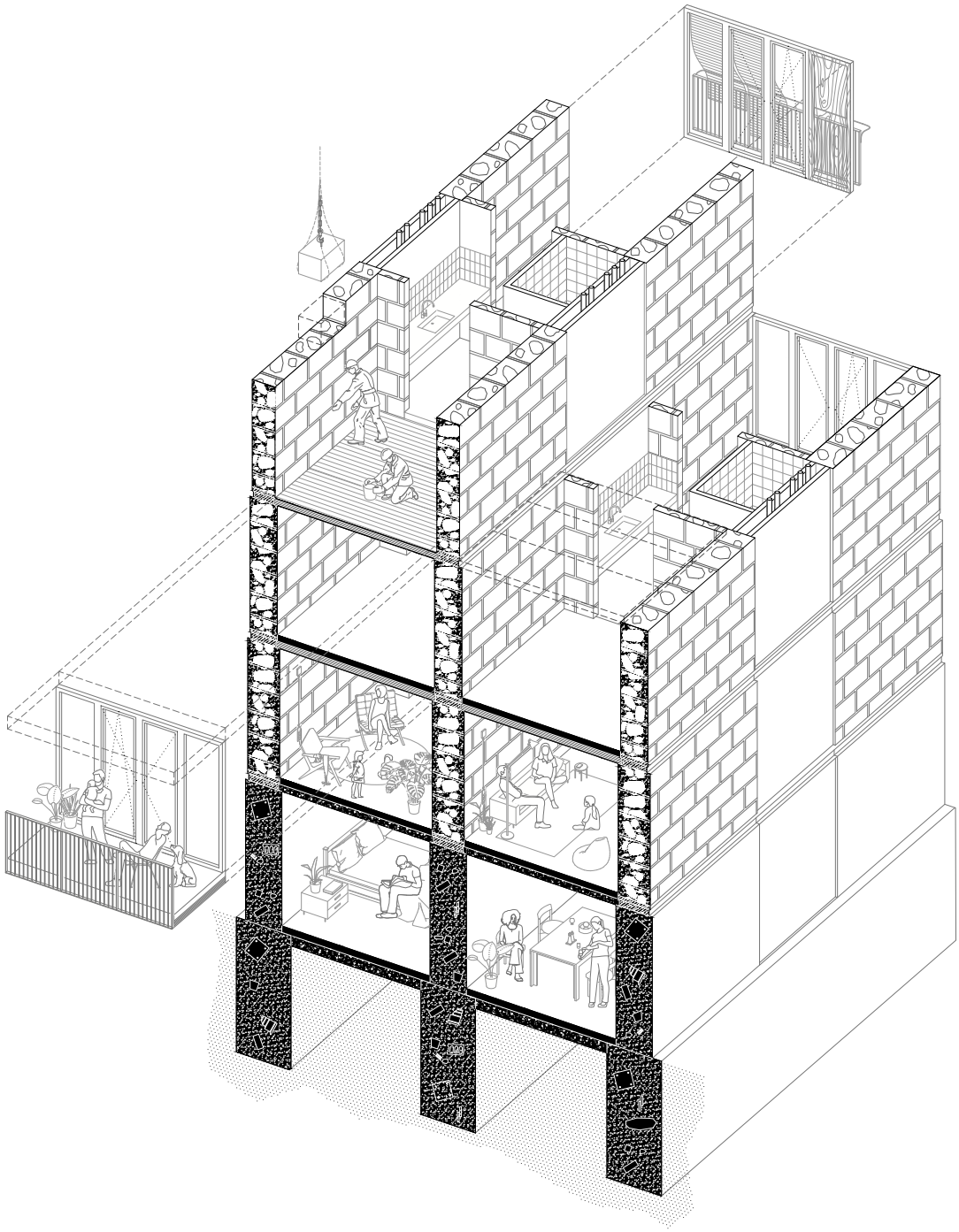
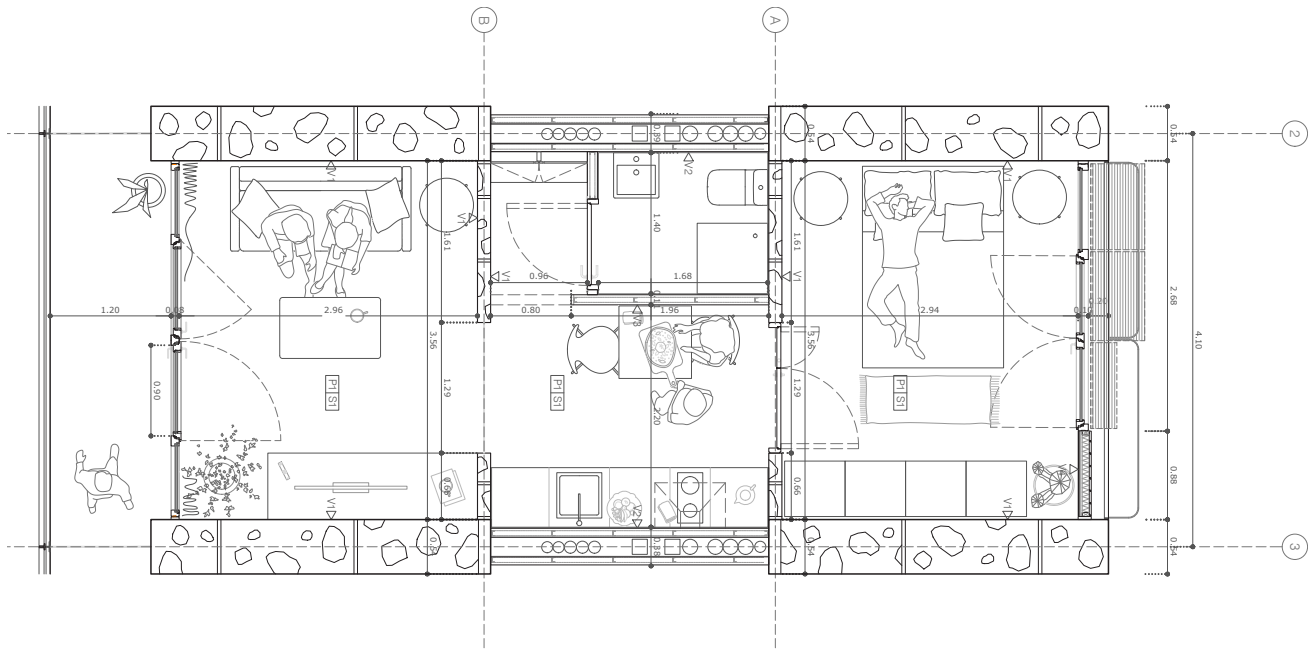


fig.7 Tipology.



Carles Oliver Barceló & Xim Moyá
Balearic Institute of Housing (IBAVI)
Palma, Mallorca

Six Social Housing Units

Santa Eugènia, Mallorca, Spain

DOI
– 10.14195/1647-8681_16_11

Programme

Completed in 2023, these six social housing units on a rental basis in Santa Eugènia, Mallorca, were designed by civil service architects of the Balearic Institute of Housing (IBAVI), a public agency of the regional Balearic government, responsible for providing and maintaining social housing.

There are three homes on the ground floor, and three homes on the first floor. Access to the dwellings is through the rear courtyard along the east-facing party wall, to provide a common space as green as possible for the neighbours, and to improve the sense of community. In addition, al the dwellings have a little private outdoor patio at the entry, which after COVID-19 has proved to be very necessary.

Urban Context

Santa Eugenia is a small, picturesque town with 1,800 inhabitants, twenty minutes from Palma. IBAVI has been developing social housing buildings around the four Balearic Islands, at the scale of every city and town. Since this is one of the first buildings you see when you arrive in Santa Eugenia from the Palma–Sineu Road, just below the main church of the town, landscape integration was essential to eradicate the stigma suffered by social housing. However, landscaping has not been solved with form, but with the

Typology
– Residential

Area
– 578.92 m²

Promoter
– Instituto Balear de la Vivienda (IBAVI)

Architects
– Carles Oliver Barceló, Xim Moyá

Collaborators
– Miquel Canyelles, Ernest Bordoy, Edu Yuste, Lara Fuster, Aina Pons

Structure
– Bernabeu Ingenieros S.L

Instalations
– Miquel Ramon Oliver, Esteban Font Hocke (EEI ingeniería)

Quantity surveyor
– Marco Menéndez

Environmental consulting
– Societat Orgànica

Builder
– Obras y Construcciones Tomeu Rosselló S.L

Completion date
– 2023.02

use of local low carbon materials and the update of vernacular construction techniques as the most efficient way to use these resources.

When the work was finished, the neighbours said, very surprised: "they have not destroyed the town!"

Design Approach/New Productive Model

This project develops research into a new model of production and consumption for global social justice, well-being and integral sustainability started in Life Reusing Posidonia LRP (2012–2020), a climate change adaptation project funded by the EU LIFE+ programme, and is an update to eight social housing units in 39th Salvador Espriu St, in Palma (2018–2021). It aims to develop a low-carbon construction system that is faster, cheaper, easier, and more refined than previous buildings designed by IBAVI. In this sense, one of the main improvements over the previous projects is standardisation with natural materials. In this case, all the spans between pillars are the same to make the building easier to build, in order to compensate the extra cost of local low-carbon materials. The same applies to the windows, which have been arranged on vertical axes to make the walls and lintels simpler to construct.

In relation to the dwelling design, the main priority was to ensure the comfort of the user and to prevent energy poverty through passive bioclimatic solutions and locally sourced materials. The total heating and cooling energy demand is 4.80 kWh/m², which is a 65% reduction compared to LRP, and 85% compared to Passivhaus standard limits (15.00+15.00 kWh/m²). The energy demand has been also calculated for the year 2050, and it would be 6.40 kWh/m² with a theoretical scenario of +2º C.

Environmental, Economic, and Social Sustainability: We Don't Live in a House, but an Ecosystem

During its useful life, the building will produce emissions of 0.85 kgCO_2/m² year, according to calculations. This constitutes an 80% reduction compared to the minimum threshold for consideration as energy class A. Aerothermal heat pumps are used to heat water, and most of the energy needed for this process comes from PV panels. However, we consider the hypothesis developed by A. Valero in *The Mineral Limits of the Planet: Thanatia* (2021), which demonstrates the reasons why there may be an increase in prices and total shortages that will make the minerals that are necessary for the production of all the renewable energies that are needed worldwide by the end of 2050 inaccessible. Thus most of the energy efficiency comes from passive solutions, this is, from architecture itself:

In summer, the passive strategies are inertia (mass) and hygrometric comfort provided by the stone, cross ventilation facing the prevailing breeze from the sea (Embat), sun protection through traditional wooden shades, and thick thermal insulation of 10 cm on walls and

24 cm on the roof. The active devices are fans on the ceiling with very low energy consumption.

In winter, the passive strategies are very thick thermal insulation, highly insulated wood-framed windows with low-e double glazed glass filled with gas, and a large number of windows to collect as much sun as possible. The active device is a low-tech Trombe wall that faces south towards the neighbouring plot, which cannot be built on according to current urban development regulations. During the cold months, the outside air is tempered by convection in the Trombe wall and distributed to the six homes by mechanical ventilation through individual pipes for each dwelling, consuming less than 50 W.

Comfort in the building will be monitored with the collaboration of the University of the Balearic Islands (UIB). It therefore not only improves energy efficiency in comparison with LRP, but also provides reference values for establishing future regulations on the environmental impact of construction.

Following a mapping of resources* in Mallorca, 52% of CO_2 embodied emissions were saved during construction in comparison with an equivalent conventional building. Thanks to sustainable sourcing and reuse of construction materials, like wooden formwork boards that support the 25 cm of dry *Posidonia oceanica* sea grass for thermal insulation $\lambda = 0.044$ W/mK, window blinds, traditional Arabic tiles, the wood for all the interior doors, or some sandstone that has been placed at the entry, 50% of waste production was also avoided during the construction phase.

The local sandstone is low-carbon, provides mass and endurance to extend the useful life of the building, and is 100 percent recyclable. The three homes on the ground floor are organized in two parallel 3.5 m stone barrel vaults supported on three axes of pilasters, also made of stone. The rooms can be marked out using movable wooden doors that are the size of walls.

The other three homes — on the upper floor, with independent access and staircases for private use — are organized in a single open space, in this case under the pitched roof supported by wooden trusses with 9.6 m spans and reused wooden boards. This layout provides a flexible plan that allows uses to change very easily over time, to reduce waste in future refurbishments.

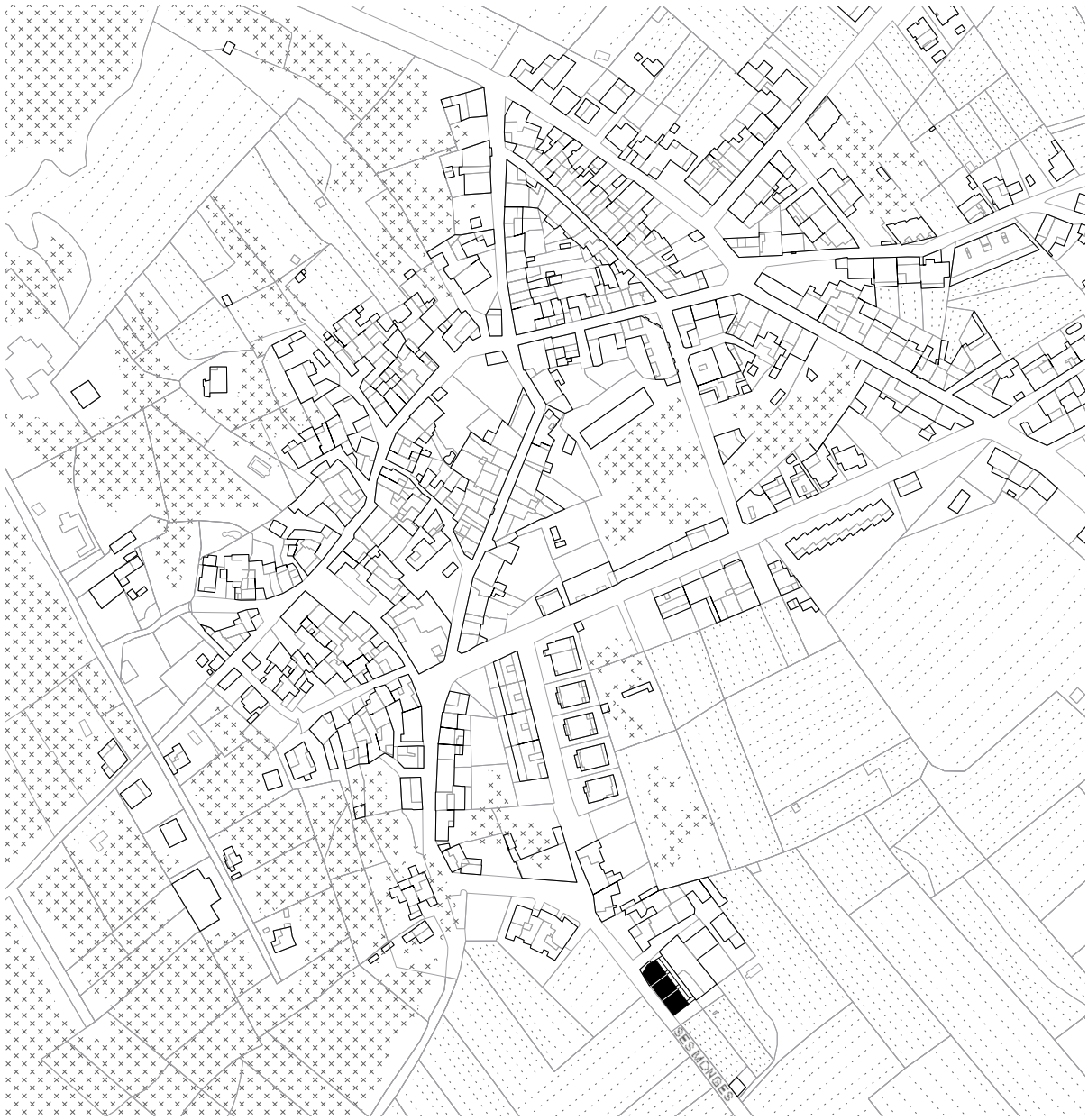
One of the main improvements of the project to build faster is to update the mortar for the joints, which has been studied and developed so several stone blocks can be stacked on the same day with a crane, rather than having to build in courses to wait for the mortar to set, as is the case with the traditional “Mallorcan cement” grout. The mortar used in this work is of a mixed type: white cement with lime cement, and “zero” type aggregate (the smallest one, but not as thin as sand). This mortar has more substance with a strength of 20 N/mm² after seven days, and is not crushed by the weight of the blocks.

To make the vault easier to build, one-piece stone lintels have been used between pilasters from a different quarry that provides stronger stone and weigh approximately 840 kg per unit.

Thanks to many efforts by IBAVI and other architects in the island to make feasible the construction with local stone, local sandstone quarries are not anymore in danger of extinction because of people retirement age. Investments to update the facilities have been made and new young workers have been hired.

The climate in Mallorca is semi-arid and the risk of drought is expected to increase with climate change. The green area at the inner courtyard becomes a bioclimatic device and is very useful for the thermal functioning of the building; thus, it is important that this area can continue to thrive in drought and high heat without a significant increase in the building's water use. Hardy native plants with low water requirements were selected for this reason and are irrigated with stored rainwater.

fig.1 Site plan.



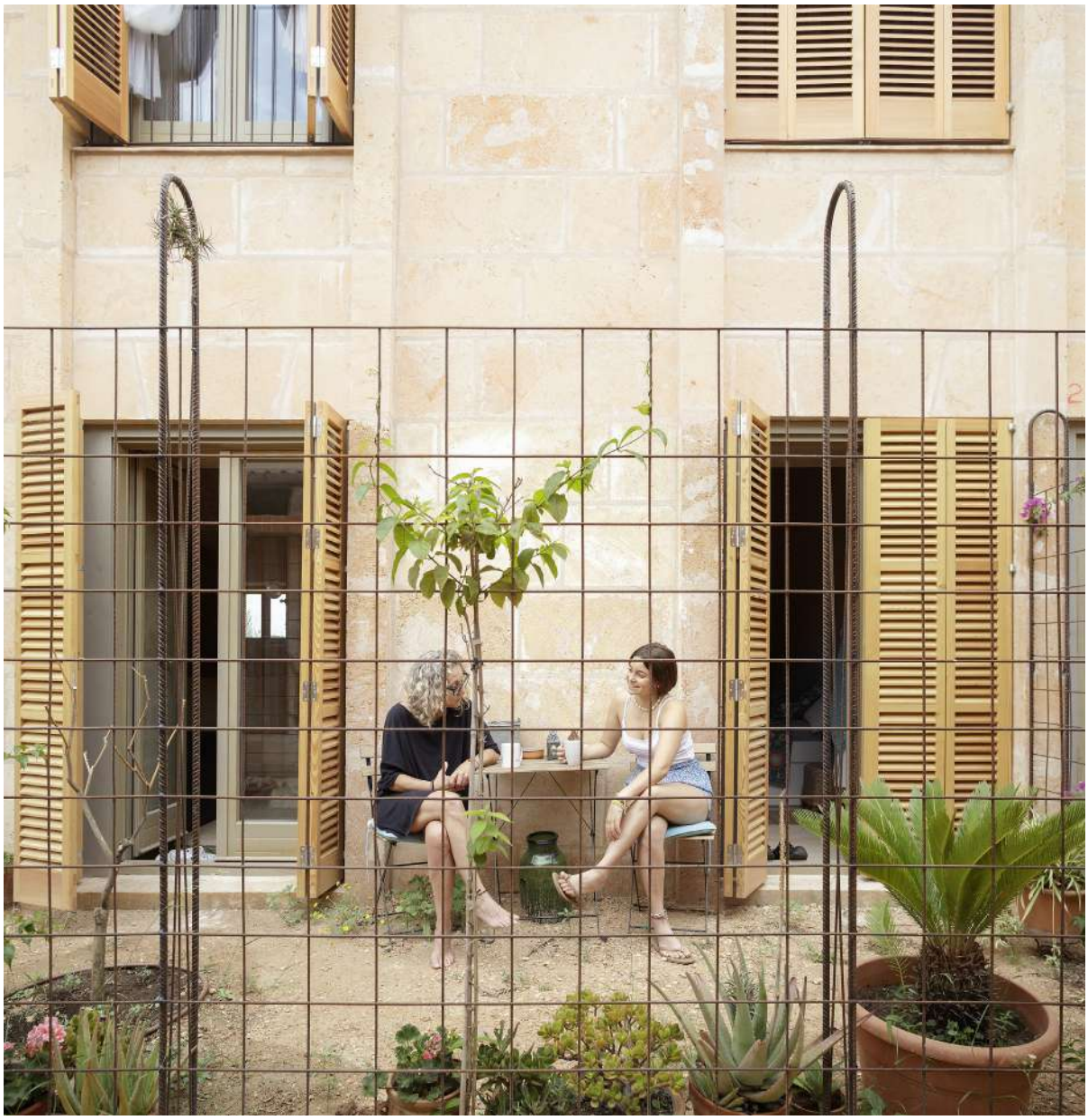


fig. 2 Ground floor and first floor plans.

0 1 5m

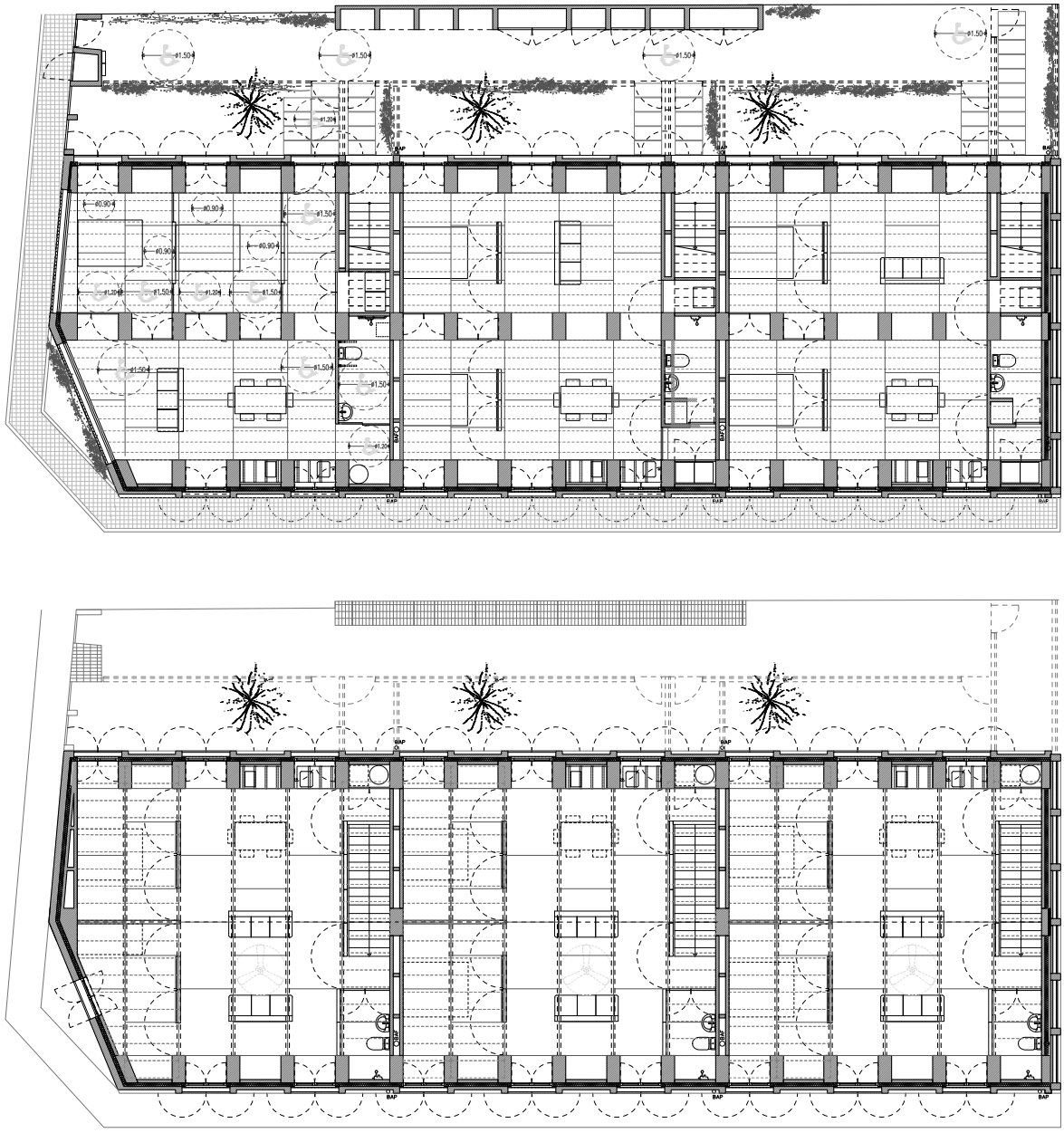
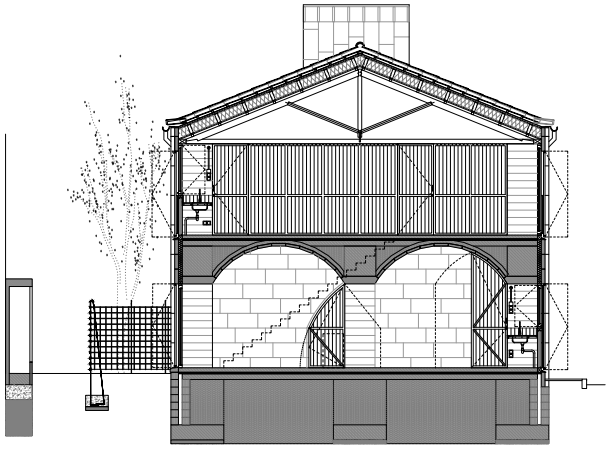


fig.3 Sections A and B.

0 1 5m



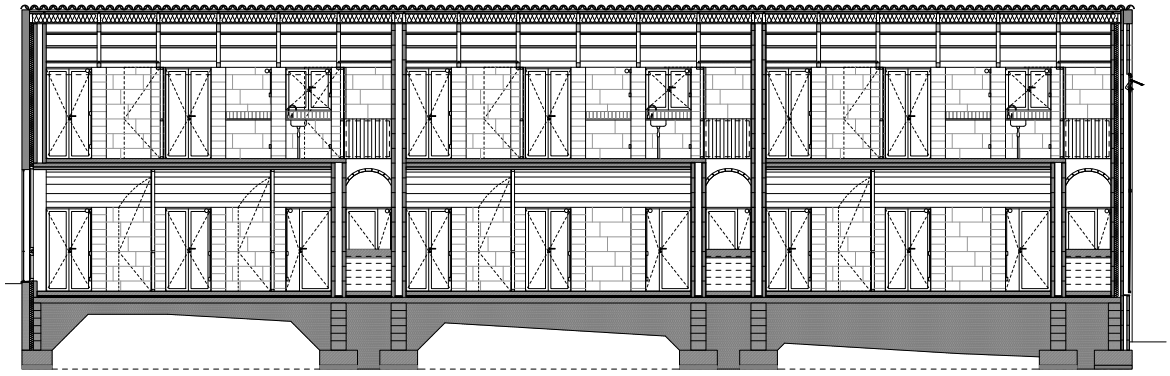
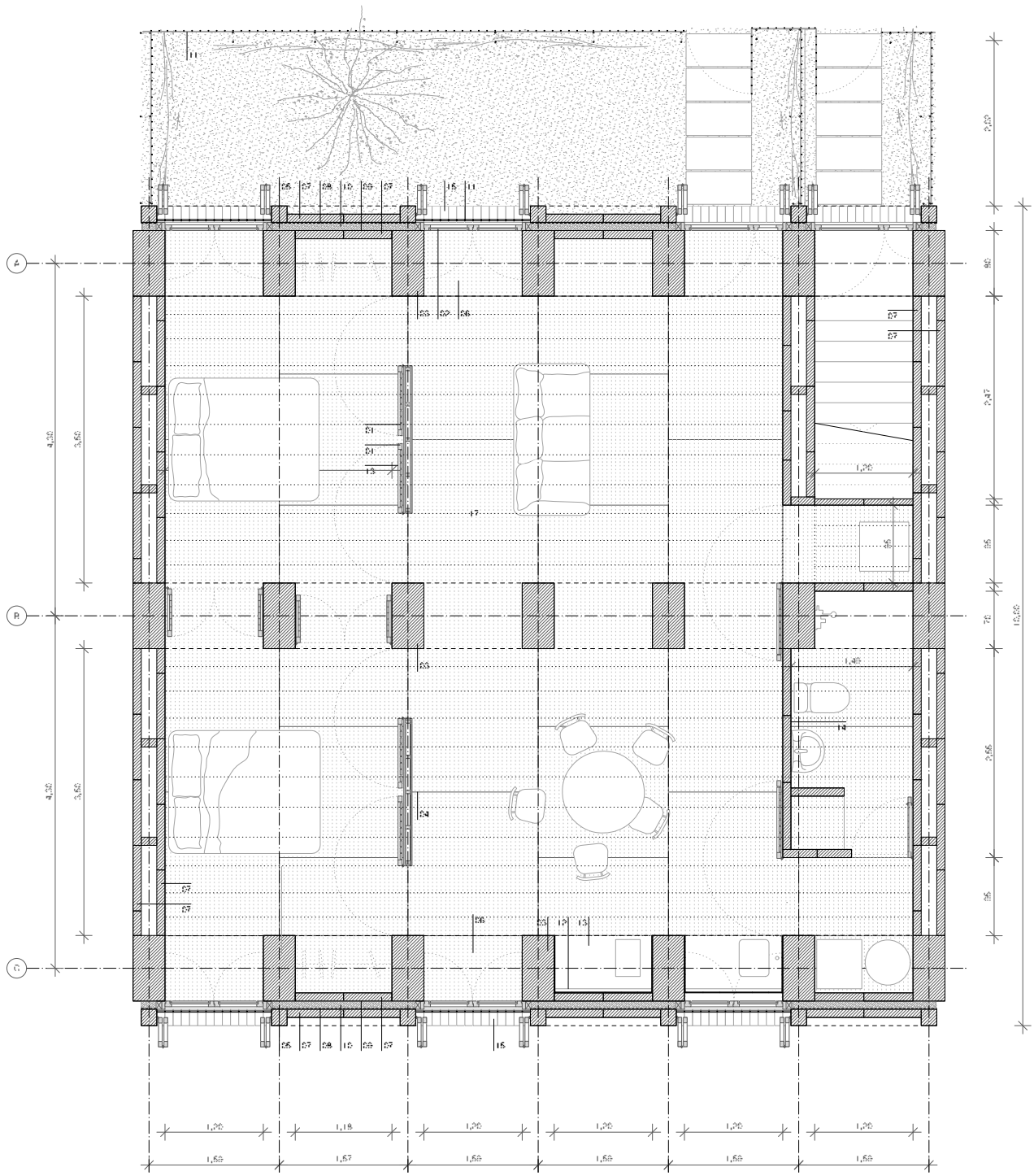


fig.4 Type 1 ground floor and first floor plans.

0 0.5 2m

1. Double-leaf folding door made of reused wood
2. Wooden hinged window frames, rot-proof and low-emissivity glass U: 1.00 W/m°C.
3. Inner piles of extra high quality Marés stone from the quarry 80 × 40 × 18 cm, with 2 parts white cement, 1 part NHL 3.5 lime and 9 parts sand.
4. Expansion joint in concrete paving using 5 × 45 mm PP propylene profile.
5. Corrugated stainless steel bolts of 10 mm (2/m* of marés) for fastening between the outer and inner leaf, taken by epoxy resins.
6. Lintel made of 1 piece of extra quality marés weighing 840 kg.



7. First quality Marés masonry with 80 × 20 × 10.
8. Breathable waterproof film.
9. High-performance, mesh-reinforced vapour-regulating and air-tightness sheet.
10. 2 layers e: 10 mm of recycled cotton geopanel for acoustic insulation.
11. Grille formed by 16 mm round perimeter and 10mm round inside perimeter.
12. Flooring tiles 20 × 10 × 1,5 cm fired with biomass.
13. Binissalem stone countertop e:25mm.
14. Toilet equipment.
15. Hand-glazed, biomass-fired, 30 × 15 × 1,5 cm tile paving.
16. In situ white concrete slab paving e: 12 cm reinforced with 210 c/20 cm mesh.
17. hand polished with a trowel. Colour according to DF.

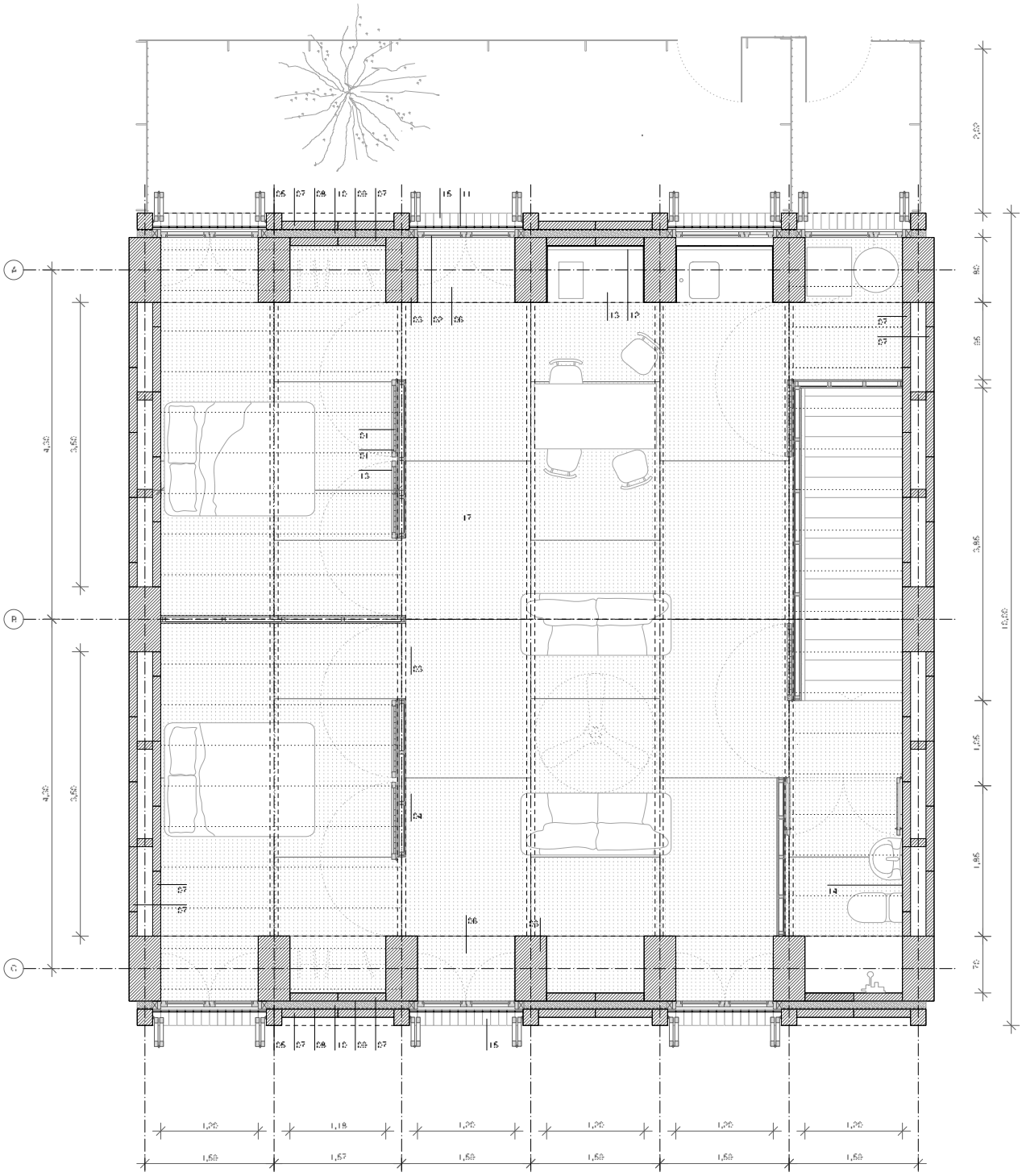
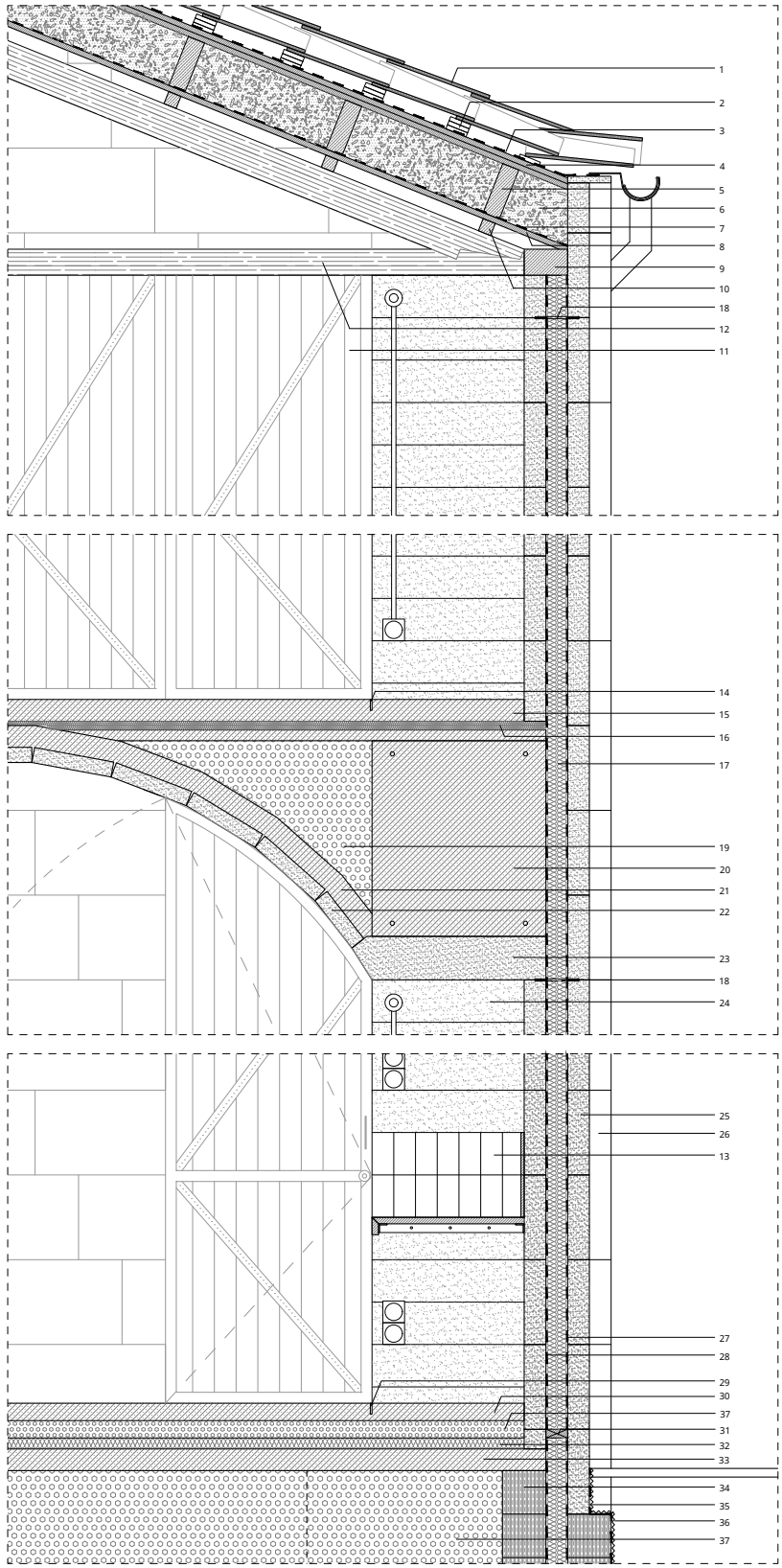


fig.5 Facade section construction.

1. Arabic ceramic roof tile fired with biomass and glued with glue mortar.
2. Tile plugs from broken pieces of tile.
3. Breathable waterproof membrane protected with a 4 cm layer of lime mortar.
4. OSB-IL wood board e: 20 mm.
5. Purlins on 24 × 8 cm Spanish sawn timber trusses.
6. Thermal insulation e: 24 cm of dry posidonia.
7. High-performance vapour-regulating and air-tightness sheet reinforced with mesh.
8. Reused wood board 70 × 120 cm e: 40 mm.
9. Edging on the perimeter edge of the roof, 10 × 20cm laminated wood.
10. Wooden rails of 60 × 60 mm.
11. Reused wooden door.
12. Spanish truss of 9.40 m in length (pairs, brace, pendulum and braces), on gable roof with 22% slope, formed by laminated wood elements.
13. Tiling with white tiles 10 × 20 cm.
14. Expansion joint of concrete paving with 5 × 45 mm PP polypropilene profile.
15. White concrete slab paving e: 8 cm.
16. 2 plates e: 10 mm each one of recycled cotton acoustic insulation.
17. 2 plates e: 50 mm each of recycled cotton acoustic insulation.
18. 10mm stainless corrugated steel bolts (2 × pilaster) for fastening between the outer leaf and the inner leaf, taken by means of epoxy resins.
19. Filling of the quarry vault kidneys with gravel e: 40 mm.
20. Poor concrete strips between the structural buttresses, 80 × 100 cm.
21. Compression layer of NHC-5 fibre-reinforced concrete marés vault.
22. 22. Extra high quality marés vault of 80 × 40 × 07 cm, taken with preocol mortar and joint 2 parts white cement, 1 part NHL 3.5 lime and 9 parts sand.
23. Stone lintel in 1 piece of extra quality marés stone 90 × 40 × 18 cm, for the formation of a flat arch between structural buttresses.
24. Interior pillars of extra high quality marés 80 × 40 × 18cm, and joint 2 parts white cement, 1 part NHC 3.5 lime and 9 parts sand.
25. Marés masonry 80 × 40 × 10cm first quality.
26. Marés pilaster 80 × 20 × 20cm first quality.
27. Breathable waterproof sheet.
28. High-performance vapour-regulating and air-tightness sheet reinforced with mesh.
29. Expansion joint of concrete paving by means of a 5 × 45 mm PP polypropilene profile.
30. In situ white concrete slab paving e: 8 cm reinforced reinforced with 010 mesh c/20 cm.
31. Pine wood block e: 10 cm.
32. Expanded polystyrene insulation e: 5cm.
33. Concrete slab e: 10 cm in situ without reinforcement.
34. German block of 20 cm.
35. EPDM waterproof sheet e: 1.5 mm.
36. Egg cup + geotextile.
37. Backfill recycled gravel from demolition.




ASVZ
hunziker

Baubüro in situ
Zurich, Switzerland

K.118

Winterthur, Switzerland

DOI
– 10.14195/1647–8681_16_12

On the former site of the Sulzer factory in Winterthur, the Swiss Pension Fund "Stiftung Abendrot" built a beacon for climate—friendly and sustainable building that shimmers red in its reused sectional metal sheeting. The extension of the head building of Hall 118 for twelve studios, think tanks and a tinkerer's laboratory on the first floor, was made mainly from used building materials.

All things that were already there plus wood, straw and clay.

Put radically, these are the only materials that are available for climate-friendly construction methods. Because of great advances in building operation, construction is now responsible for three-quarters of the emissions in a building's lifetime.

For the K.118, the focus was on reducing this embodied energy: 60 percent of greenhouse gas emissions and 500 tons of primary materials could be saved compared to new building components.

The pilot project quickly showed that circular building means thinking in loops. When starting from available building components, the planning process turns around: It follows opportunities as they arise and starts with finding materials.

Typology
– Commercial and residential

Area
– 1,100 m²

Promoter
– Stiftung Abendrot

Architecture
– Marc Angst, Pascal Hentschel, Benjamin Poignon, Barbara Buser, Eric Honegger

Structural Engineer
– Oberli Ingenieurbau AG, Urs Oberli

Timber Engineer
– Josef Kolg AG, Stefan Signer

MEP Engineer (HVAC)
– Russo Haustechnik-Planung GmbH, Nicola Grabiele

Timber Construction
– Zehnder Holz und Bau, Andreas Frieden

Steel Construction
– Wetter AG, Marc Kreissig

Completion date
– 2021

Photographer
– Martin Zeller

Selection is followed by cataloguing. In order to reinstall components, we need information and a precise idea of the requirements and installation options.

In this way, the design is created along the usual planning phases in a constant process of evaluating, checking and deciding.

A steel skeleton that once supported a distribution centre on the Lysbüchel site in Basel forms the supporting structure.

Concrete was used only where necessary and only where it was unavoidable for static reasons or for sound and fire protection: in the floor slabs, the chamber sound supports and in the foundations. The three new floors built on top of the hall are accessed by the steel exterior staircase from the demolished Orion office building in Zurich. This stair's landings determined the floor heights. Granite façades, which have been converted into slabs in the kitchens, toilets and on the balcony arbours, and the majority of the aluminium insulated windows also originate from the Orion building. The windows and the surrounding red facade sheet metal from Winterthur protect against the weather and define the appearance of the building and the Winterthur cityscape.

Since material and projected elements are not geometrically related, necessary leeway must be created: Once elements and functions are decoupled in layers, they can overlap and follow their own rules. The scaled facade and visible support structures in K.118 illustrate this. Surrounding reused elements with adaptable materials is another way of overcoming the geometrical difficulties: In the prefabricated wooden façade elements, waste-free compartment insulation made of straw bales and interior plaster made of local excavated clay fill the space around the reused windows. Processed with minimal energy input, these natural *materiali poveri* remain compostable and provide a comfortable indoor climate. Interior walls made of wood accommodate reused doors and reused triple-layer panels from stage construction. Glued wood materials and elements should be reused, as their climate impact is far less positive than one expects from wood because of the adhesives.

While the CO_2 emissions in construction were more than halved, the costs remained within the limits of the expected costs for a similar new building, the difference being that the vast majority of the expenses were for the labour of the craftsmen involved. The inexpensive reused material requires a certain amount of manual labour and expertise before it can be installed, thus implying sustainability also for the local economy.

fig.1 Site plan.

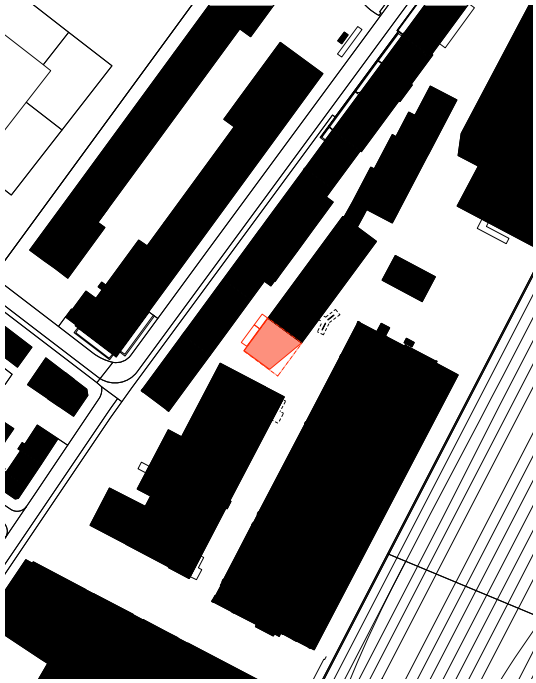
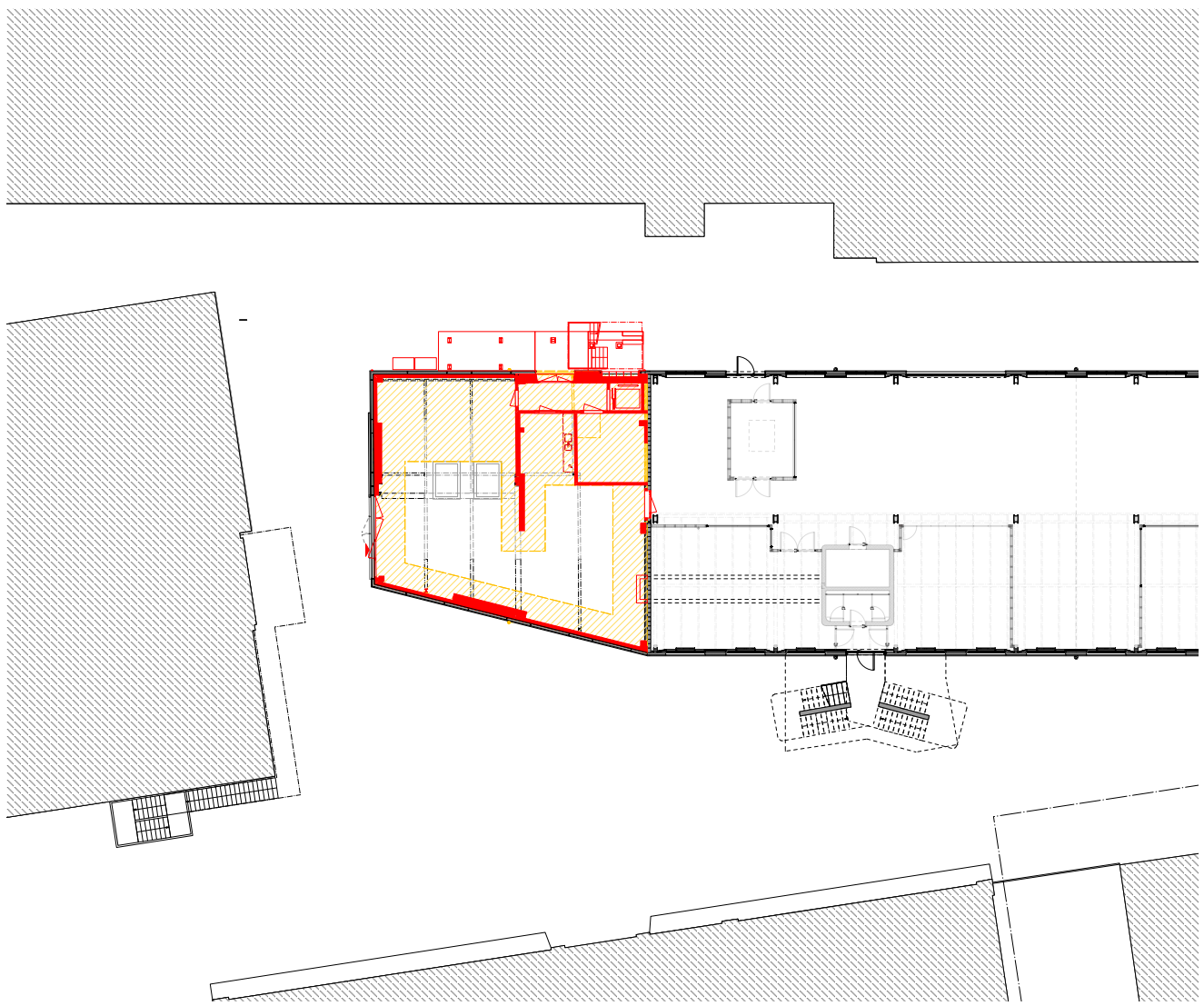
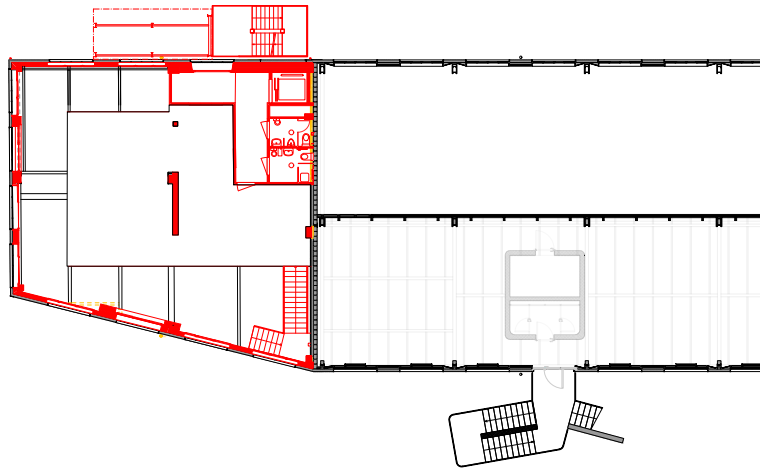


fig. 2 Ground floor plan.





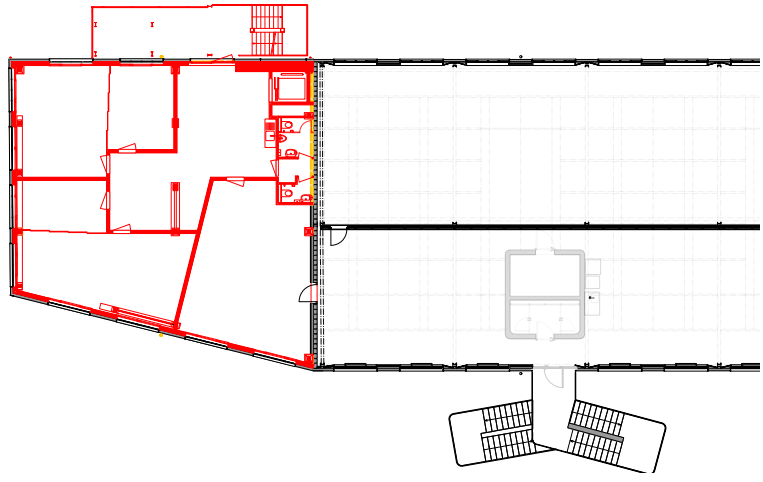
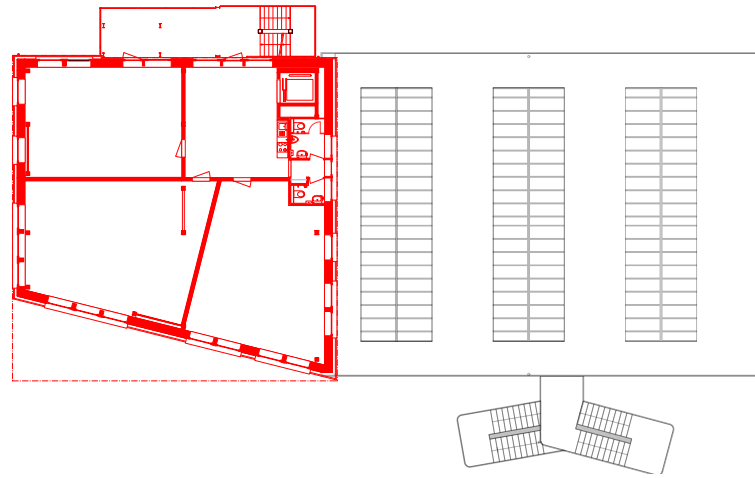
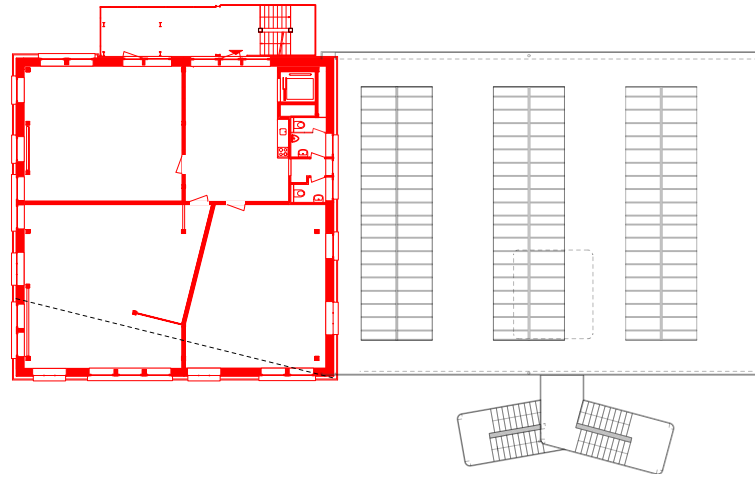


fig.3 Gallery, 1st floor, 2nd floor, 3rd floor and 4th floor plans.





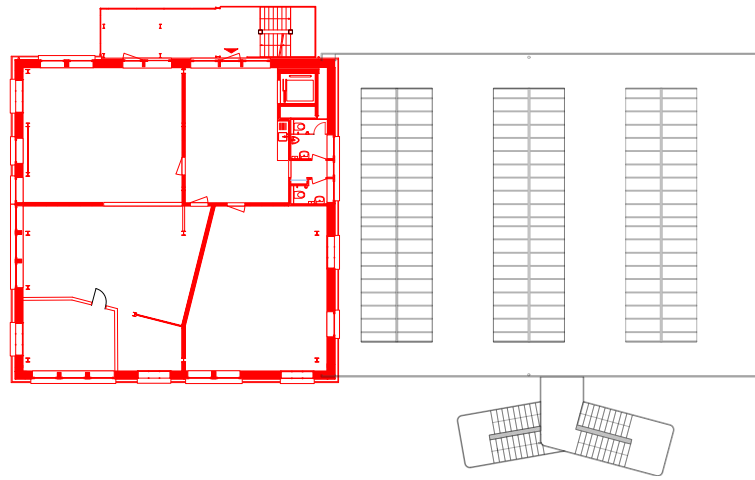


fig.4 Northwest and southwest facades.

0 1 10 m

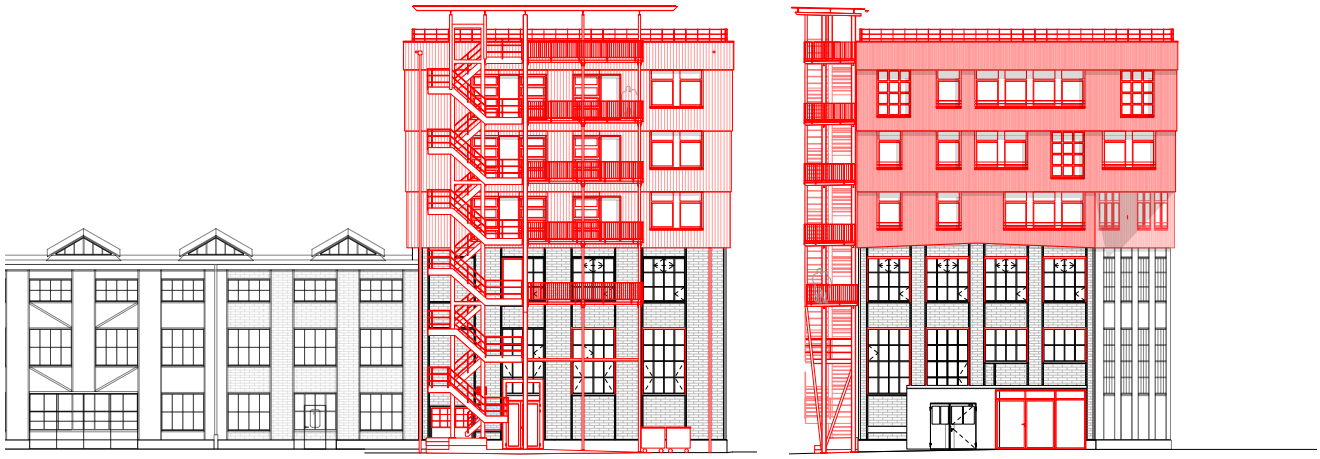


fig.5 Section A–A.

0 1 10 m

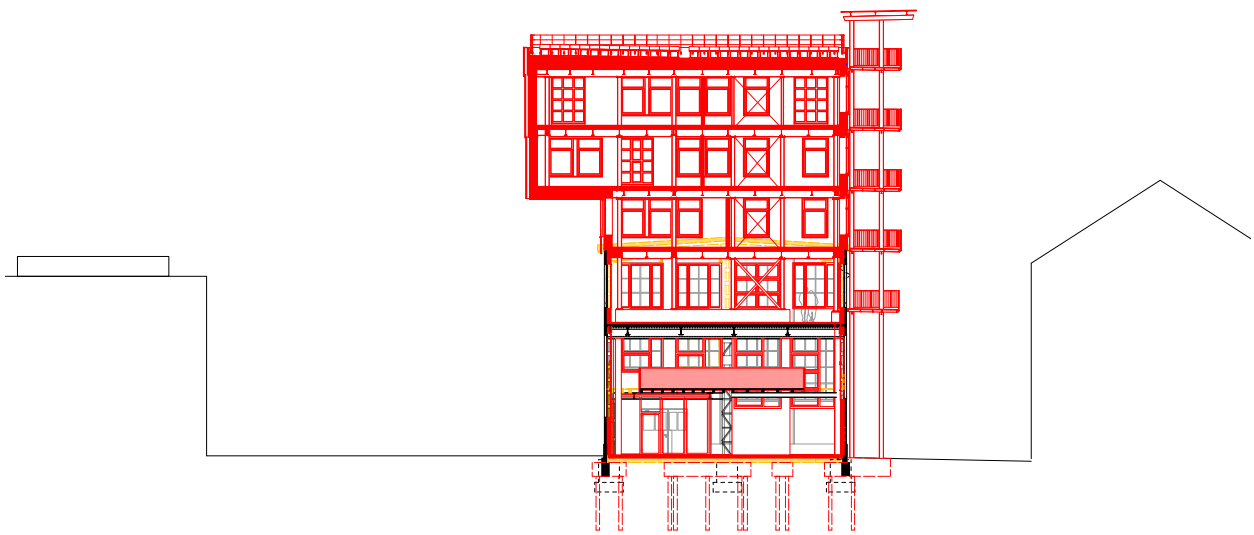


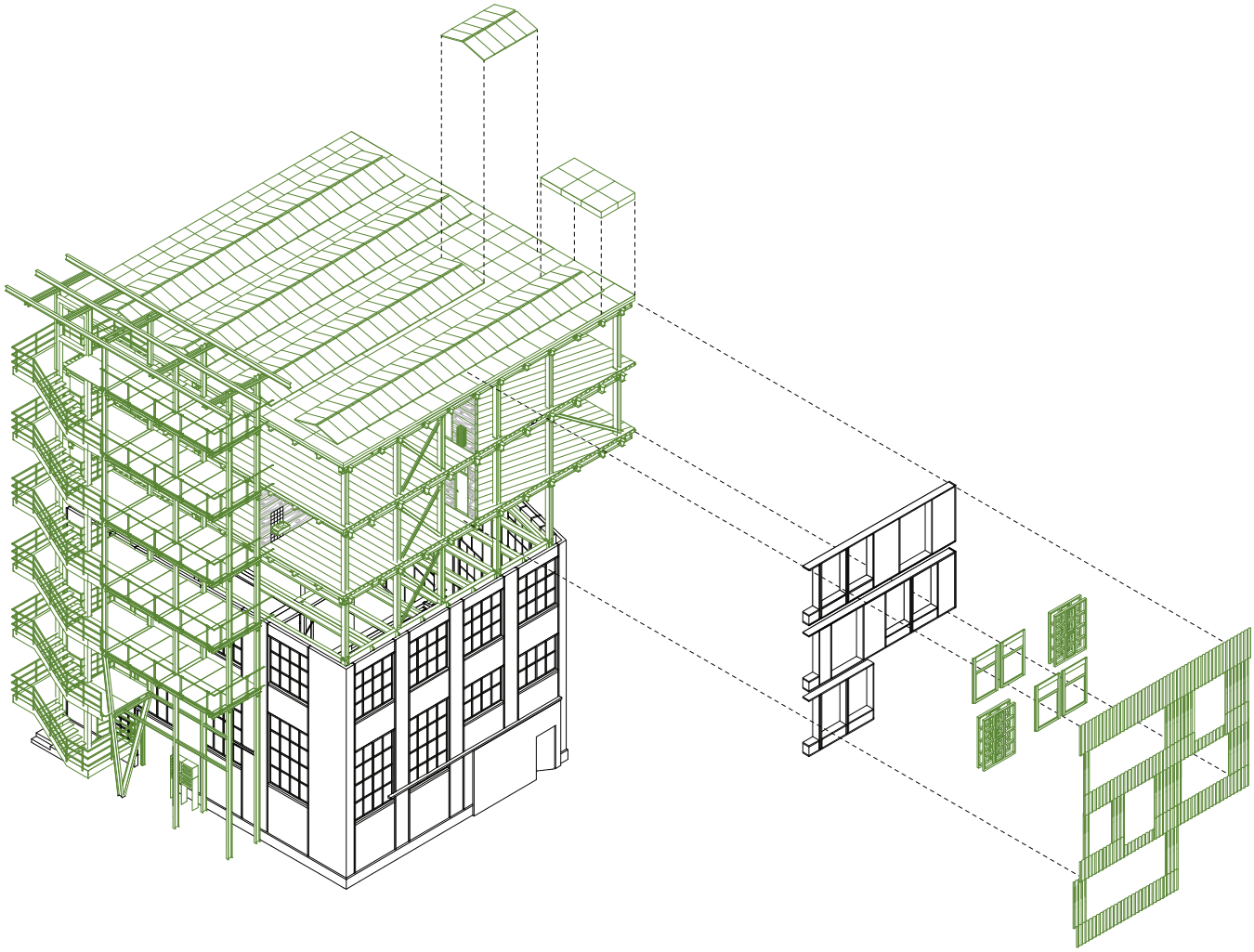
fig.6 Section F–F.

0 1 10 m






fig.7 Axonometry.



Biographies

Catarina Ribeiro
Catarina Ribeiro (1985, Guimarães) is an architect graduated from the Faculty of Architecture of the University of Porto (FAUP). In 2014, she founded merooficina, an architecture studio, with Vitório Leite, that aims to combine participatory and circumstantial design processes with the strategic pragmatism of research. In 2024, she completed a PhD in Building Physics at the Faculty of Engineering of the University of Porto (FEUP), with the thesis "The balcony as an archetype of well-being. Impacts on the indoor environment and inhabitants' perception", and worked as an Invited Assistant Professor at the Department of Architecture of the University of Coimbra (DARQ).
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Eduardo Prieto
Eduardo Prieto is an International Doctor of Architecture and has received an Extraordinary Doctorate Award from the Polytechnic University of Madrid. He is also a Graduate in Philosophy and DEA in Aesthetics and Theory of the Arts, and in Moral and Political Philosophy. He is appointed at the Escuela Técnica Superior de Arquitectura de Madrid, where he teaches History of Architecture; he is the director of the international course 'Architecture and Environment', and he has been a *visiting scholar* at GSD–Harvard University. He is the author of more than sixty articles and chapters of indexed books, and several reference books, including *Historia medioambiental de la arquitectura* (Environmental History of Architecture) (Cátedra, 2019, 2022, 2023). He currently works as an architecture critic for *Arquitectura Viva, El Mundo,* and *Revista de Libros,* among other publications. As a practicing architect, he has been awarded, among others, the ICCL European Award for Sustainable Architecture, the COAM Distinction and the Madrid City Council Architecture and Urbanism Award.
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Architect-urbanist (UFPE, 1989) and a historian (UNICAP, 1991), with a PhD in architecture from the University of Pennsylvania (2004). Currently a postdoctoral fellow at Brown University (2023). Professor in the Department of Architecture and Urbanism at the Federal University of Pernambuco (DAU–UFPE). Researcher at CNPq, and an *ad hoc* consultant for Capes, CNPq, FAPESP, the Getty Center (USA), and the Arts & Humanities Research Council (UK). He was a visiting professor at Fu Jen Catholic University, Taiwan (2019), Technical University of Lisbon (2011), and the University of Pennsylvania (2003–2004), ICCROM Fellow (2008), and Samuel H. Kress Foundation scholar (2003–2004). Member of the International Specialists Committee (ISC)/Education+Training of Docomomo International.
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Inês Flores-Colen
Inês Flores-Colen is a Full Professor in the Construction Scientific Area at the Department of Civil Engineering, Architecture and Environment, Instituto Superior Técnico, University of Lisbon. She holds degrees in Civil Engineering (1996), an MSc (2002), and a PhD (2009). She is a researcher at CERIS and actively participates in CIB W70 and W86 (secretary since 2019). She contributes to standardization through WG9 (CEN/TC348), WG7 (ISO TC267), and WG11 (CEN/TC318), and is a member of CT94 and CT192. Her research focuses on innovative and sustainable construction, building pathology, inspection, maintenance, and thermal rehabilitation.
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Jaume Mayol
Jaume Mayol (Mallorca, 1976) graduated from the ETSA Vallés. Together with Irene Pérez, they run the studio TEd'A arquitectes, based in Mallorca, focusing on local resources, local materials and local typologies. Their work has received different awards, among which stand the Spanish Biennial BEAU award in 2021, and 2018, the international FAD award 2018, the interior FAD award 2018, or the Brick award 2020. They have been twice selected as finalist for the Swiss Award, in 2020 and 2022. They combine their professional practice with teaching. Now they are professors at the Accademia di Architettura di Mendrisio. They also taught at the Kunstakademie Düsseldorf, at the University of Stuttgart, at the TU Graz, at the TU Munich, among others.

Javier García-Germán
Javier García-Germán (1974) is associate professor of architectural design at the ETSAM (since 2007). He is module director both in the Master's Degree in Collective Housing (MCH, ETH Zürich–UPM) and in the Master in Advanced Ecological Buildings (MAEB, IAAC, Barcelona). He studied architecture at the ETSAM (Honors), the Oxford School of Architecture, and at the Harvard Graduate School of Design (MDes'04), where he was Fulbright scholar. He received his PhD in architecture in ETSAM (2014). In 2004 he founded TAAS — totem arquitectos asociados — an award-winning practice based in Madrid which explores the connections between the geosphere, architecture and users. In addition, García-Germán has authored several articles in international periodicals (Bauwelt, 2G, Quaderns, etc) and authored and edited several books on energy and architecture, among others *Thermodynamic Interactions* (2016 ACTAR), *De lo Mecánico a lo Termodinámico* (2010 Gustavo Gili) and *Contextos 2008. Hacia un Nuevo Entorno Energético* (2008 UCJC).
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Mark Jarzombek
Professor of the history and theory of architecture at MIT, received his architecture diploma from the ETH in1980 and his PhD from MIT in 1986. He works on a wide range of topics—both historical and theoretical. His most recent book is Architecture Constructed: Notes on a Discipline (Bloomsbury, 2023). In 2020, Jarzombek and Vikramaditya Prakash founded the Office of (Un)certainty Research [O(U)R] as an independent, "post-tenure" collaboration dedicated to challenging architecture's epistemological and design capacities. Projects from O(U)R

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Nuno Ramos
Full Professor at FEUP, PhD in Civil Engineering, has supervised or co-supervised 10 PhD theses, and has been globally and/or at FEUP responsible for 7 research projects. He is the author of more than 60 journal articles indexed in the SCIE. His scientific activity is focused on Civil Engineering, in the field of Building Construction, applying Building Physics and Construction Technology to the development of sustainable buildings. His work can be grouped into three main themes: heat and moisture transfer in buildings; low-carbon construction materials and components; energy efficiency and occupant well-being.
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Vikramaditya Prakash
Vikramaditya Prakash is professor of the history and theory of architecture at the University of Washington (Seattle). Among his recent books is Rethinking Global Modernism: Architectural Historiography and the Postcolonial, co-edited with Maristella Casciato and Daniel Coslett (2021). In 2020, Prakash and Mark Jarzombek founded the Office of (Un)certainty Research [O(U)R] as an independent, "post-tenure" collaboration dedicated to challenging architecture's epistemological and design capacities. Projects from O(U)R have been exhibited at the Venice Biennale (2022) and at other international venues.
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Viriato Soromenho-Marques
Viriato Soromenho-Marques (1957) is full professor of philosophy at the University of Lisbon. He is member of the Lisbon Academy of Sciences, (2008) and member of the Marine Academy (2012). Since 1978 he has been engaged in the civic environmental movement and as member of different advisory bodies for public policies in Portugal, Europe, and the global sphere. He writes and speaks intensely on political philosophy and ethics, environmental issues, federalism, and international relations, and US and EU politics.
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