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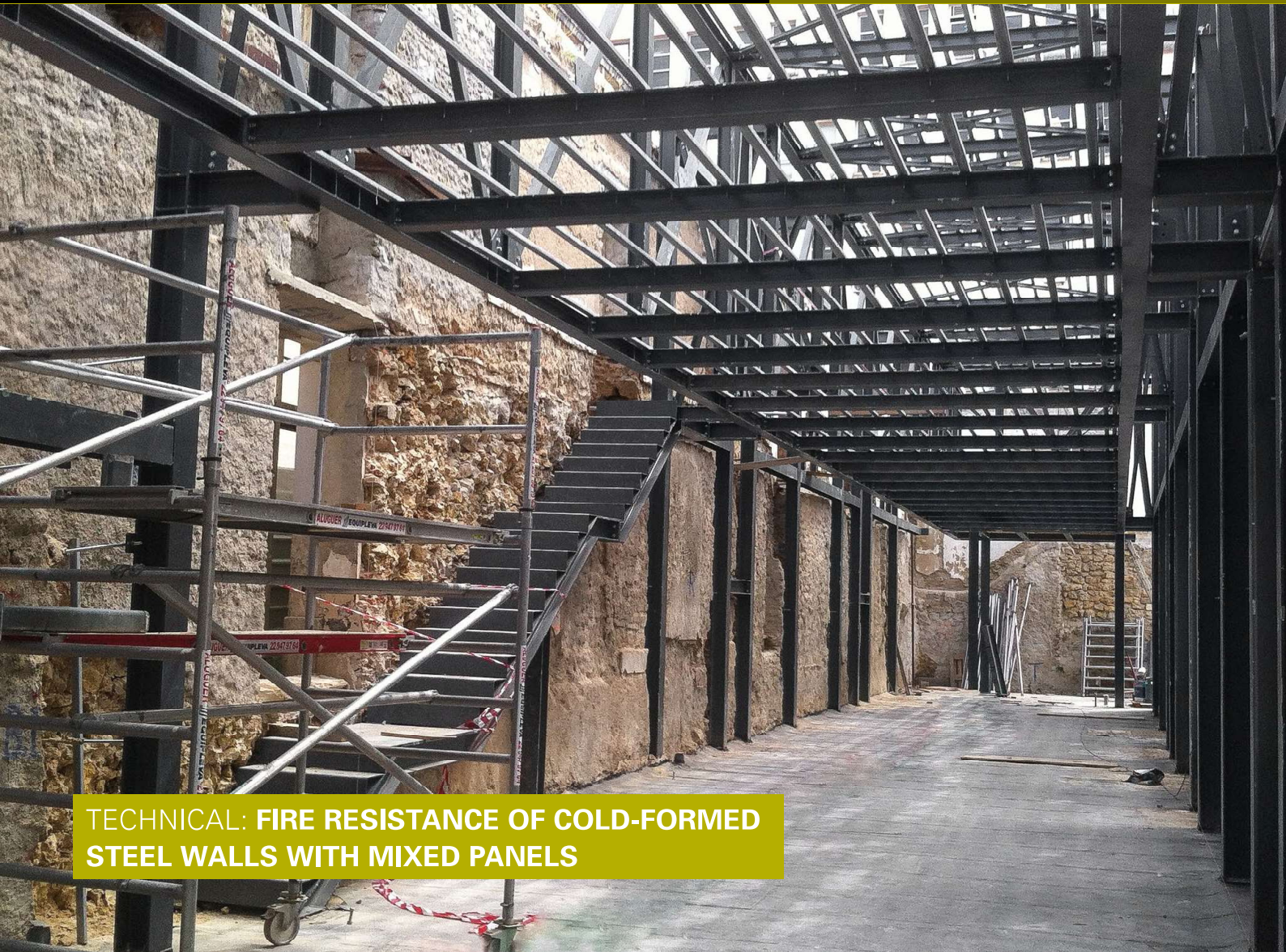


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O N L I N E M A G A Z I N E

**TECHNICAL: FIRE RESISTANCE OF COLD-FORMED
STEEL WALLS WITH MIXED PANELS**





Nuno Lopes
Diretor

This edition of *Metálica* could not begin without highlighting the prestigious title of Doctor Honoris Causa attributed by the University of Liège to Professor Luís Simões da Silva, president of CMM. A distinction that awards the important work he has done in the scientific and technological development of the area of steel and composite structures. Also noteworthy is the news of Professor Paulo Vila Real, vice-president of CMM, chairing the working group for the development of the second generation of Part 1.2 of Eurocode 3.

The technical article presents a study on the fire behavior of cold formed steel walls with composite panels made of plaster and cork. The work included experimental tests and numerical simulations focusing on the determination of the thermal insulation and structural resistance provided by the walls.

The articles of opinion of this edition are dedicated to the rehabilitation of a building using a steel structure, the storage and handling of welding consumables and finally a bridge and footbridge, to cross the same passage, built on the island of Vitória, Brazil.



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Prof. Vitor Murtinho
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From Colégio da Trindade to the House of Jurisprudence: the recovery of value

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“The expert of the past is often an adversary of the present. However, the existence of a historical monument should not fossilize its immediate surroundings; the duty of memory should not paralyze creative thinking.”

Roland Recht*

The set of various interventions by Francisco and Manuel Aires Mateus allows us to identify a singular work distinguished by its originality with the definition of an autonomous and proper path. The approach to spaces, by the architects, attributes a very sculptural character to the work, allowing to detect a methodology based on the definition of voids, originating from a subtraction of matter. This course, with national and international recognition among its peers, was very recently confirmed by a distinguished jury that conferred the Pessoa Award in its edition of 2017. It seems evident that in its design process the model has a primordial role, being particularly noteworthy the way plasticity of spaces is explored, leading to the limits where constructivity is relegated to 2nd place. That is, in some aspects, the way in which the solutions are presented is closer to a study of minimalist materialities, which resemble an exploratory work in a model, than of an expressive design in a constructive and detail systematization that has the concern of the resistance of the solution to the hardships of the climate in its different states of time.

Located in the middle of the University of Coimbra, next to the University courtyard, the Trinity College remained during the first decade of this century in a profound state of lethargy. In fact, in the last century and a half of its history there was a number of events, facts and occurrences that strongly conditioned its performance, providing the physical degradation of this space until reaching limit and fracture situations. Therefore, the recent recovery of the Trinity College – a project conceived by the pair of brothers Aires Mateus – for the



Figure 1. View of the facade of the College and the Church of the Holy Trinity after the works of consolidation of facades and before rehabilitation of the building.

purpose of partially installing the Faculty of Law of the University of Coimbra, was an imperative and perhaps the most effective way to preserve the building and honor properly its memory.

With the construction started in 1562, this college had as its objective to house the meritorious Order of the Holy Trinity, enabling, on the one hand, the implementation of more definitive installations to this institution and, on the other, allowing the liberation of the old buildings occupied next to the secular



Figure 2. Aerial view of the Trinity College before the rehabilitation of the building, taken from the roof of the Department of Physics of the University of Coimbra.

* Quote from *Penser le patrimoine, mise en scène et mise en ordre de l'art*, Éditions Hazan, Paris, 1998, p. 15.

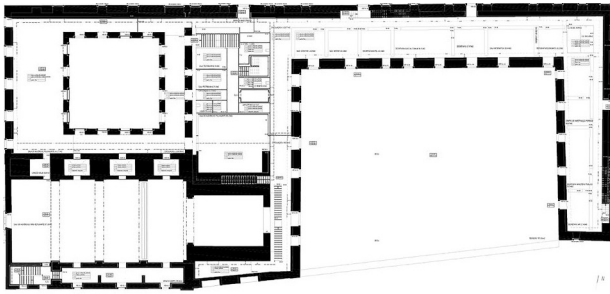


Figure 3. Plant of the intermediate floor of the Trinity College according to the project of Francisco and Manuel Aires Mateus.

Sé Velha of the city.¹ Subject to successive actions of construction, expansion and reorganization, this college has stabilized as an important place for the accommodation of this religious community and for the development of its activities related to education.

Of the architectural ensemble, the Church of the Holy Trinity stood out, located at the south / west corner of the block, with a west / east axis, according to the normal canonical orientation (west: entrance: nascente: main altar), with main body barrel vault – without transept – and three lateral chapels on each side. Its façade had an austere portal framed by two pairs of Doric columns and surmounted by entablature, to which was raised a trinitarian cross – symbol of the order of the Holy Trinity –, flanked by two Ionic pilasters and topped off by round pediment interrupted at the vertex. The southern façade, bordering Lisbon's Couraça, was marked by a classical design balcony and supported by the lateral cornice of the church. The balcony resembled an Italian *loggia* facing south, which allowed the enjoyment of a unique view of the Mondego River. In the square-shaped cloister, each of the four galleries was vaulted on a brick edge and composed of four simple arches. The rooms of the friars, classrooms and library were located adjacent to the church and near the referred balcony.²

However, in the context of the extinction of the religious orders – carried out by the Conimbrican minister Joaquim António de Aguiar, whose anti-ecclesiastical spirit earned him the nickname of *Mata-Frades* – the normal cycle of the building's history would be disturbed and its luck changed substantially. To aggravate this course of events, in the radical context of the measure, what also contributed to this was the inevitable cessation of religious functions by the temple.

As a result of this process, the sale of the Trinity College to private individuals took place in 1849. As

a property of the National Treasury, the church and the cloister were maintained, which, in the context of the transfer to the Municipal Chamber, functioned as a judicial court until 1870. Later, the church would also be sold to the owner of the remaining part of the whole, starting a troubled process of occupation, reorganization, transformation and later, of constant obsolescence.

The intense and transformative occupation of that block lasted more than a century and enabled this space to be quartered by a large number of dwellings. In addition, at the end of the twenties of the twentieth century, the building served to house the Queen Saint Elizabeth College, remaining in its space until its definitive change to new facilities in the early forties of the twentieth century.³ Subsequently, a collapse allowed the church and the cloister to be, for a long time in the twentieth century, a woodwork and a warehouse with furniture trade.⁴ In an abbreviated way, this is the story of a building with a long life, but which in recent times saw its function distorted with the implementation of profound changes that put in question its existence and that were direct cause for its irremediable demise⁵.

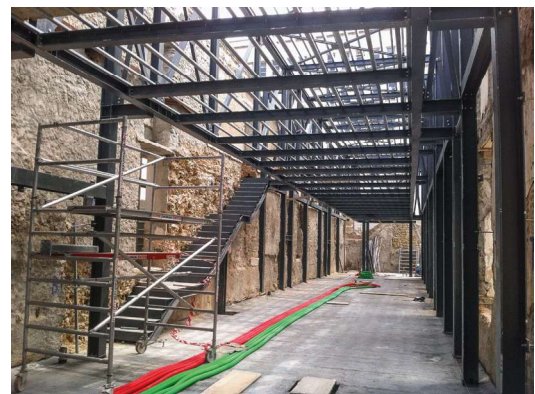


Figure 4. Photo of the work corresponding to the intermediate floor, north wing, July 2015.

But if the worst could have occurred, as a result of carelessness or pure abandonment of his fortune, in February 1988, a great part of the southern façade of the Trinity Church would be overthrown, bringing down the balcony / *loggia* and most of the temple's barrel vault. This fateful event, if on the one hand constituted an irreparable loss of part of the construction, on the other, developed the renewal of an interest from the University of Coimbra, which was impelled to assume some responsibilities there. Consequently, the

¹ For a brief history of the Trinity College we suggest reading Dias, Pedro e, Gonçalves, António Nogueira, *O Património Artístico da Universidade de Coimbra*, 2nd edition of the magazine and augmented, Gráfica de Coimbra, Coimbra, 2004, pp. 144-146.

² See Correia, Vergílio e Gonçalves, António Nogueira, *Inventário Artístico de Portugal, Cidade de Coimbra*, volume II, National Academy of Arts, Lisbon, 1947, pp. 144-147.

³ Vasconcelos, António de, *Escritos Vários Relativos à Universidade Dionisiana*, reedition prepared by Manuel Augusto Rodrigues, volume I, Archive of University of Coimbra, Coimbra, 1987, pp. 242-243.

⁴ Vasconcelos, António de, *Escritos Vários Relativos à Universidade Dionisiana*, volume I, p. 243.

⁵ Brito e Silva, Gastão, *Portugal em ruínas*, Foundation Francisco Manuel dos Santos, Lisbon, 2014, p. 11.



Figure 5. Photo of the steel structure with Courtyard of the University of Coimbra in the background, October 2015.

university would carry out a systematized survey in the year 1999⁶ and, in the following century, would promote the launch of a competition with a view to its recovery, of what could still be redeemed. It was in this context that emerged the pair of architects Aires Mateus.

The works began after intense years of design, archaeological actions and consolidation of the building (2009/2010), aiming to occupy the building as a Jurisprudence House, to house research values of the Faculty of Law of the University of Coimbra. The consolidation work already included the implementation of foundations, for a later phase of the work; this had served as a pretext for partial and selective demolitions, in order to allow the fitting, in the existing, of what the brothers Aires Mateus project had as a proposition.

When affairs are troubled and the paths of things are contrary to the predictable, events turn into complex situations, with imponderability, eventually leading to feelings of commiseration and, with that, arouse curiosity and interest.

Before the construction began (late 2014), citizens were used to seeing the block of Trinity College entirely flanked by a steel sheet siding barrier that could apparently indicate the existence of a work, eventually helped to hide – and add mystery – a situation of degradation of the little that remained of the Trinity College. If the interior was kept out of sight, the memories accumulated in the older university community sparked a desire for safeguarding, seeking to counteract the ruin and rapid physical devastation of what remained of the old splendor of the building. With a recent troublesome past, it was a moral and ethical imperative to restore that ruin, aware that, since it was impossible to build the previous splendor, exhausted by the time and the negligence of men, it became mandatory to assume contemporaneity, proceeding with the creative valorization with the artifacts of this age and bear witness to a vision for the future.

In general, the brothers Aires Mateus show a very evident concern with the place. Not that they understand that the project is on the site, but simply because they understand that through their projects they can transform the place.

In this sense, since the place was the starting point in their projects, their design methodology showed that it was a determined will to build or rebuild. In other words, as Gonçalo Byrne mentioned in an interview about the work of these architects, “when a project is constructed, it somehow alters the *genius locci*, also because this *genius locci* is a dynamic thing, built over time”.⁷ Thus, the dynamics of time would be something always present in any architecture, permanently subsisting the presumption that each intervention should be a testimony of its own time.

In addition, Byrne clarified that – referring in the abstract to the question of rehabilitation as if a potential freezing of spaces was involved, and could even be an accelerator for ruin – the best, in the context of each project, would be to perceive the possible dynamics of the time and try to perceive the space and the place well and, accordingly, respond to them.⁸ This informed response was a reading and understanding of the building, as well as the absorption of the program and its uses; later, in a confident, intelligent and, above all, condescending manner, Byrne explained how all these different and important components were articulated. In this sense, the reading of the place and the appreciation of the site as a factor of value and of perennality were surely decisive.

As a design methodology, a prominent interest of the architects stood out for drawing questions, however, its distinctive mark was assumed in the way the model was present in multiple phases of the process. The model, besides the possibilities of visualization and experimentation, functioned as an ideal support of extreme abstraction and as a selective tool for the evaluation of the space, namely, the interior. The use of neutral materials, in the model, defined spatiality as the center of reflection and the respective qualities of perception, from which emerged the play of light and shadow.⁹ Thus, faced with the moral and patrimonial imperative of rehabilitation of what was generally considered the “last ruin of the University Center of Coimbra”, a large project had been developed that aimed to regenerate the block of the Trinity College.

⁷ Byrne, Gonçalo, *Entrevista*, Magazine arqa – Arquitetura e Arte, nº 126, 2017, p. 36.

⁸ Byrne, Gonçalo, *Entrevista*, p. 36.

⁹ Cacciatore, Francesco, “L’animale e la conchiglia. L’architettura di Manuel e Francisco Aires Mateus come dimora del vuoto” in *L’Architettura di Aires Mateus* a cura di Carlotta Tonon, Mondari Electa, Milano, 2011, p. 15.

⁶ See Lobo, Rui, *O Colégio da Trindade. Estudo do edifício e levantamento da situação actual*, Department of Architecture of FCTUC, Coimbra.



Figure 6. General view of the building from the top of the Joanina Library.



Figure 7. Cloister and gallery of the Trinity College



Figure 8. Interior of the Church of the Holy Trinity after restoration work

This work, recently inaugurated, will allow us to resume experiences in that patrimonial space, facilitating the perpetuation of memories and giving meaning and function to that place. Conscious that the proposal corresponds to an interpretation of that place, this project, in its singularity, brought an optimistic expectation of permanence that is expected to continue in the future.¹⁰

In the last phase of the work, it was found that the church – intervened in the context of its previous collapse –, the cloister and the exterior walls, which defined the entire perimeter of the old school space, were the spaces and elements that best resisted to the power of time. The Aires Mateus proposal was based on a basic principle of distinction between preexistence and transformation. The project methodology would remove its authors from the classic idea of restoration, trying to start from the existing legacy only, in order to valorize the space, adjusting it to the teaching and

¹⁰ Tuñón, Emilio, "Uma conversación com Manuel y Francisco Aires Mateus", El Croquis, nº 186, Madrid, 2016, p. 10.

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Figure 9. Interior patio and its lawn space with Department of Physics and University Archive in background.

research functions, without minimizing the preexisting structures.

Conceptually, in order to distinguish these two moments, which refer to the past and present, the existing mass was worked as something eternalized because subject to compression, and the new was regarded as ephemeral architecture and therefore subject to traction.¹¹ This argument, of a simple nature, actually made it possible to make a full distinction between what was methodologically the older construction and the most recent part. What was defined as compression structure was constituted, globally, by stone masonry walls and by brick vaults. In the traction structures, the steel solutions were the most preferred due to the properties of this material.

In order to absorb infrastructural elements and to help solve some of the vertical communications, the thickness of the outer walls were substantially widened, defining the continuous inner contour and accentuating the mass effect of the preexisting facings. This solution with a strong image impact and strongly conditioning the useful area of the building made it possible to easily meet the infrastructure requirements that, in this type of buildings in general, constituted a great embarrassment and a situation of difficult resolution.

We know that the subject of transformation is a burning issue that is permanently on the table, and in the recent history of the Trinity College this problem is also almost always latent.

Regarding the Aires Mateus Architects project it should also be mentioned that the study had initially been developed to house the European College of the University of Coimbra (2001), and in 2004 it was adapted to the European Judicial University Court and, in 2013, converted to Civil Court. After lack of

agreement with the Ministry of Justice, the study was finally carried out to house the Jurisprudence House of the University of Coimbra. To all these programs, the building was responding with projects without major differences, demonstrating that the readaptation of this space to new functions was something easily implementable. In this way, it is proved that, even if new transformations take place in the future, at present, this House of Jurisprudence corresponds to a moment chained in a succession of states.¹²

The Trinity College building is built on three distinct floors, a low floor, at the level of the church and at the base of the cloister, partially buried and two floors above the ground. On the buried floor the functional valences are very little, being circumscribed much to the renewed function of the church – of conference room –, some rooms of support / meetings and spaces of circulation or toilets. In the upper floors the office spaces and complementary rooms of classes or meetings are developed. In these last floors there are spaces of collective use, very limited around the cloister and, also, spaces of offices in the form of “L”, next to Rua José Falcão (adjacent to the Schools Ward) and Rua de São Pedro (in front of the Department of Physics), with a north-south orientation. In the case of the office area, the organizational model is established by corridors along the streets referred to and with work spaces facing the garden. Such design corresponds to the transposition of the existing solution in the building while as the College of the Order of the Holy Trinity, denoting, from the design team, a very clear understanding of the compositional and functional system of this space of accommodation and teaching.

In order to valorize the dichotomous action between new and old, in the area next to the exterior walls, a kind of hall was created that goes through the entire space and defines a structural void throughout the building. This void separates, architecturally, the existing construction of the new proposal, since, gravitically, it would be impossible to materialize this concept. In this way, the connections between the existing construction and the new body are carried out in the area of the spans at the level of the upper floor, thus minimizing the contact points. This solution was only possible to implement thanks to the proposal of continuous steel structure that runs through the floors and ceilings, allowing the existence of a fluidity of space and, simultaneously, giving the impression that the inner shell floats in the space, contradicting the gravitational action of weights and masses. This circumstance induces a sense of apparent contradiction between the thickness of exterior wall masses, the density of interior

¹¹ Recently, on March 3, 2018, in the context of a conference held at the Trinity College, Manuel Aires Mateus referred and illustrated this conceptual relationship between the preexistence of walls and vaults, such as compression structures and therefore “eternal” and its proposal, as something admittedly “ephemeral”, which can at any moment in the life of the building be transformed or even withdrawn.

¹² Posocco, Pisana e Raitano, Manuela, *La seconda vita degli edifici. Riflessioni e progetti*, Quodlibet Editore, Macerata, 2016, p. 25.



Figure 10. View from the balcony / loggia located on the south wall of the Church of the Holy Trinity and adjacent to the Street Rua da Couraça de Lisboa.

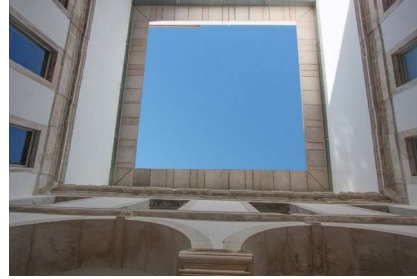


Figure 11. Interior of the Cloister with finishes of lioz stone roofs



Figure 12. Roof in lioz stone, zone next to the cloister, being visible the continuous traces of zenital illumination

surfaces and the interstitial voids, overvalued by zenithal illumination that runs evenly across the perimeter areas.

This intervention, guided by a qualitative modernization of the different spaces, both opened up new and desirable constructive intrusions, in relation to the preexisting philosophy, but also allowed, in some way, the affirmation of some discontinuities and materializations that, for some, correspond to irremediable scars. In this aspect, the use of a lioz stone cover, as an alternative to the traditional red clay tile roof, for some, was a dissonant and disturbing element. Probably, for these people, the safeguard lies in maintaining an “aesthetic primacy that has to prevail”¹³, with images functioning as conservative situations and mimicable through certain common places. However, the option for the lioz stone at the level of the roofs, which is roughly the same as the University’s Patio, visually allows a continuity with the texture that effectively covers this peculiar space. The lioz stone, in general terms of white color, is one of the textures that most imposes in the overall context of the building, being recurrently used as coating material of the interior pavement, throughout the construction.

As a color note, the architects chose to introduce a greenish gray tone to the interior walls of the old church, a solution that was later enlarged by the coloring of the doors at ground level. This economy of color and materials is a trend of the Aires Mateus brothers, being a constant of their work. This feature is so evident that in many of their works, the solutions created are even more minimalist. This methodology corresponds to an *aesthetic purpose and results from a necessary intentionality*.¹⁴ A chromatic minimization and matter is usually contrasted with an emphasis on the volumetric exploration of forms, embodied in peculiar models of space organization and composition. A predominance of the study in section is also characteristic, as opposed to the planimetry, constituting

itself as a corollary of a projective methodology that, in an operative way of communication, privileges the thoughts with three-dimensional matrices.¹⁵ Architecture develops, essentially, in space and with space. Full and empty, they facilitate the confrontation between the existing reality and the possible reality, materialized in spaces with sculptural nature, creating excavated and subtracted environments, and defining full and empty inherent to each construction, but defining an authorial identity mark.¹⁶

The College of the Holy Trinity, now also Jurisprudence House of the University of Coimbra, intends to assume itself as an exemplary work that aims to permanently stabilize its memory, appease itself with time and offer the city a deserved object stability. Commonly, the fluidity of time and the volatility of memory are contrasted with an enormous solidity of objects.¹⁷ Unfortunately, in the context of this building, everything happened differently, and it was precisely past memory and value that allowed a renewed interest in its heritage, rescuing and refocusing that place to the forefront of the need for revitalization. After this arduous task, we hope that the new uses will allow the creation of new memories, giving meaning to this work that will certainly help to revitalize all that space with a university vocation. ■

¹³ Brito e Silva, Gastão, *Portugal em ruínas*, p. 32.

¹⁴ Vita, Francesca, *Aires Mateus*, Portuguese Architects Collection, Vila do Conde, 2013, p. 15.

¹⁵ Cacciatore, Francesco, “L’animale e la conchiglia. L’architettura di Manuel e Francisco Aires Mateus come dimora del vuoto”, p. 12.

¹⁶ Tuñon, Emilio, “Sem Coelhos na Cartola”, in *Aires Mateus*, Alameda / Centro Cultural de Belém, s/l, 2005.

¹⁷ Ballart, Josep, *El patrimonio histórico y arqueológico: valor y uso*, Editorial Ariel, Barcelona, 2010, p. 36.