

E.1027. MAISON EN BORD DE MER: Theoretical Restoration

E.1027. MAISON EN BORD DE MER: Restauración conceptual

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Abstract

E.1027, Maison en bord de mer is a small villa in Roquebrune Cap-Martin, built by architects Eileen Gray and Jean Badovici between 1926 and 1929. It was hailed as a landmark of modern architecture, and then forgotten. Over the years many transformations have been carried out, and these changes have altered the spatial qualities of the original project. Time and neglect have taken their toll, and until 2008 the villa was abandoned, a shadow of its former self.

In order to state an appropriate restoration, a description of the house and its historic evolution has been made, comparing plans of its different transformations. After compiling the most common pathologies and restoration procedures in buildings of the Modern Movement in general, the particular pathologies of *E.1027* are presented, concluding with a restoration proposal for *E.1027* that considers aesthetical as well as technical aspects.

This study involves an attempt to establish guidelines for the theoretical and technical aspects for restoration of architecture of the Modern Movement, using the *Maison en bord de mer* as an example.

Resumen

E.1027, Maison en bord de mer es una pequeña casa de campo construida por los arquitectos Eileen Gray y Jean Badovici entre 1926 y 1929 en Roquebrune Cap-Martin, que fue considerada un hito de la arquitectura moderna y más tarde olvidada. Con el paso de los años, sufrió muchas transformaciones que alteraron las características espaciales del proyecto original. El tiempo y la dejadez afectaron negativamente y permaneció abandonada hasta 2008, cuando ya era una sombra de lo que había sido.

Para definir una restauración adecuada se realizó una descripción de la casa y su evolución histórica, comparando los planos de sus diferentes transformaciones. Tras recopilar las patologías más comunes y los procedimientos de restauración en edificios modernistas en general, se presentaron las patologías concretas de *E.1027* y se concluyó con una propuesta de restauración que tuvo en cuenta tanto los aspectos estéticos como técnicos.

Este estudio supone un intento por servir de guía a los aspectos conceptuales y técnicos para la restauración de la arquitectura modernista, tomando como ejemplo la *Maison en bord de mer*.

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1. E.1027: Maison en bord de mer

(Badovici) “– Ainsi tu préconises un retour aux sentiments, à l’émotivité!

(Gray) – Oui, mais encore une fois, à une émotivité purifiée par la connaissance; enrichie par l’idée, et qui n’exclut point la connaissance et l’appréciation des acquisitions scientifiques. Il ne faut demander aux artistes que d’être de leur temps.

(Badovici) – Tu veux dire de vivre avec leur temps et de l’exprimer.

(Gray) – Oui, sans aucun artifice, d’aucune sorte. L’oeuvre belle est plus vraie que l’artiste.”

EILEEN GRAY and JEAN BADOVICI¹

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This excerpt from the article “De l’eclectisme au doute”, written as a dialogue by Eileen Gray and Jean Badovici in a special issue of *L’Architecture Vivante*, clearly discloses the ideas promoted by Eileen Gray about the artist-architect. Gray does not avoid the journalistic questions put to her by Badovici on the subject of aesthetics and art: she answers like a true architect and speaks about concepts and knowledge.

Between 1926 and 1929, Both Gray and Badovici designed *E.1027*, a small villa in Roquebrune also known as *Maison en bord de mer*, for Badovici’s own use. The name of the house is an alphanumeric code for their intertwined initials: E for Eileen, 10 for J (Jean), 2 for B (Badovici), and 7 for G (Gray), indicating the collaborative and sentimental nature of the mission. Gray was responsible for much of the design and for the supervision of the site. Badovici provide theoretical knowledge and technical matters.

It is located on the French Mediterranean coast between St. Tropez and Menton, on parcels 249 and 250 of the AN n°S section of the cadastral sector in Roquebrune Cap Martin. The property occupies an area of 790 square meters, and the two story house has merely 150 square meters of construction. It was hailed as a landmark of modern architecture, and

¹ Excerpt from the article “De L’éclectisme au doute”, published in the monographical issue of *L’Architecture Vivante*, Fall-Winter 1929, E.1027: Maison en bord de mer, Editions Albert Morancé, Paris. Facsimil London, p. 17.

then forgotten. Time and neglect have taken their toll, and today the villa stands abandoned, a shadow of its former self.²

1.1. 1926. Original project

The initial project of *E.1027* house was drawn in 1926 upon a precise geometry and implied a clear relationship between the whole volume and its individual parts (Figs. 1-3). The complexity of the structure can already be appreciated in sketches of a previous version of the house.³ The preliminary project is represented with great simplicity, in very abstract renderings. The interior design of each room was exhaustively developed. There was a vertical chimney-like element located where the glass hood and spiral staircase were later built.

1.2. 1929. Hypothetic state of the house in its original state

The built house differs from the original project in various ways. Due to difficult accessibility to the site, or to problems encountered when laying foundations, or perhaps to Gray’s inexperience as a builder, the project was deformed and lost its orthogonal character, as well as some of the pristine clean-cut nature of its details: the north wall was not laid out parallel to the southern facade, which is the main axis in relation to which all other walls are perpendicular or parallel.

On the other hand, the layout of the north wall, which swings away from the access platform, emphasizes the idea of creating sort of a funnel to receive visitors.

² This article was written before the actual restoration of the house which has been led in the last four years by Pierre Antoine Gatier, *Architect en Chef et Inspector Général des Monuments Historiques*. The quality of this work recovered the villa to the state of Le Corbusier’s painting not paying enough attention to Eileen Gray’s subtle details as translucent glass, colors and interior atmosphere.

³ Hecker, Stefan and Müller, Christian: *Eileen Gray, Obras y Proyectos*. Ed. Gustavo Gili, Barcelona, 1993. Spanish/English edition.

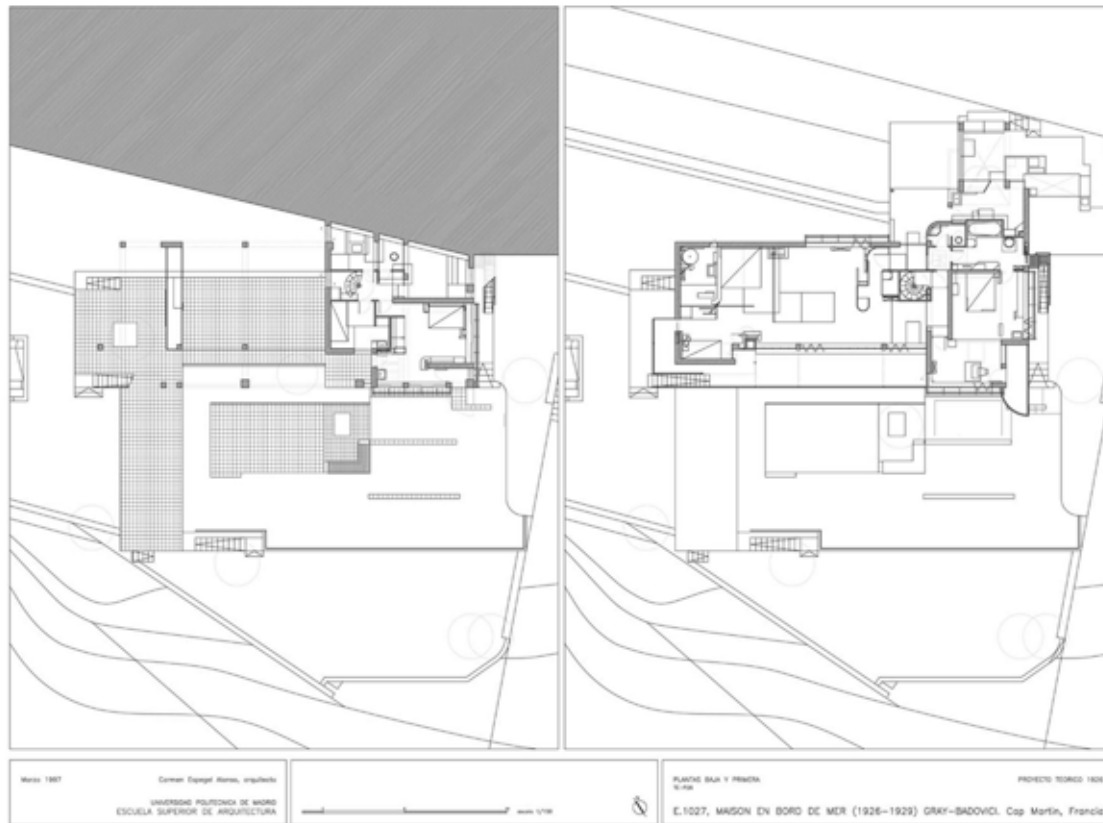


Fig 1. Ground and first floor. Theoretical project, 1926

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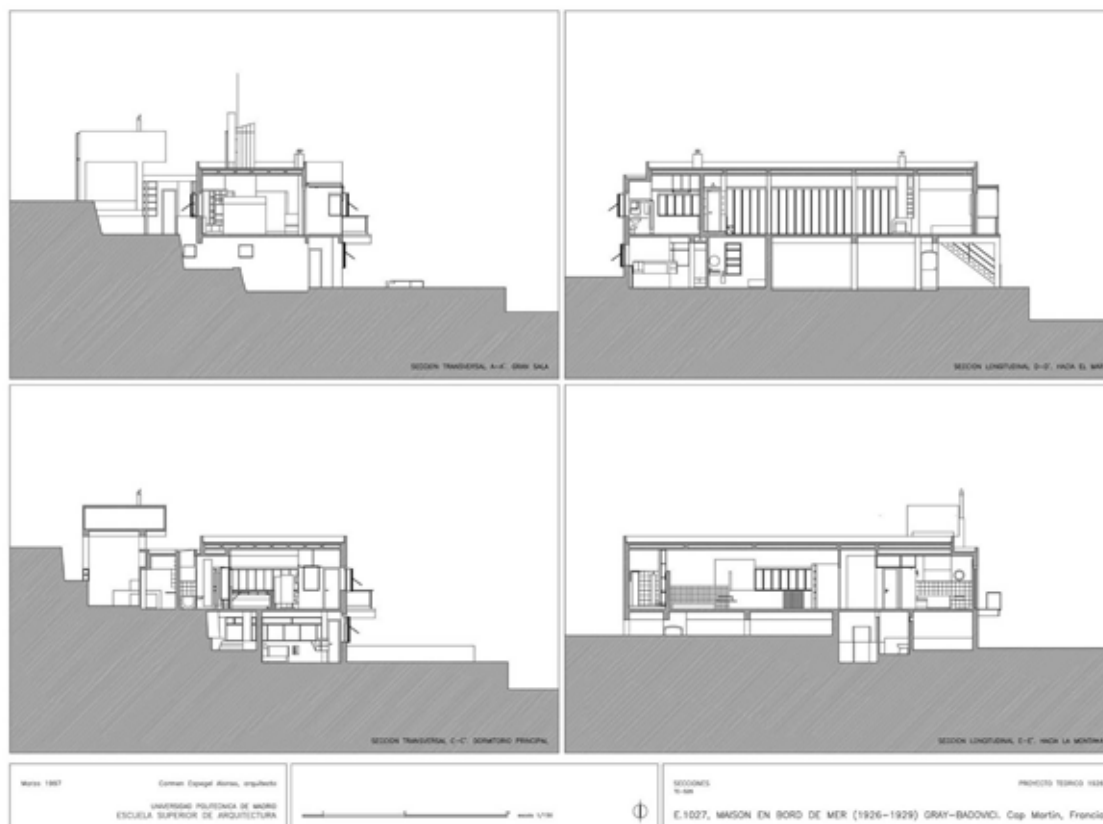


Fig 2. Cross and longitudinal sections. Theoretical project, 1926

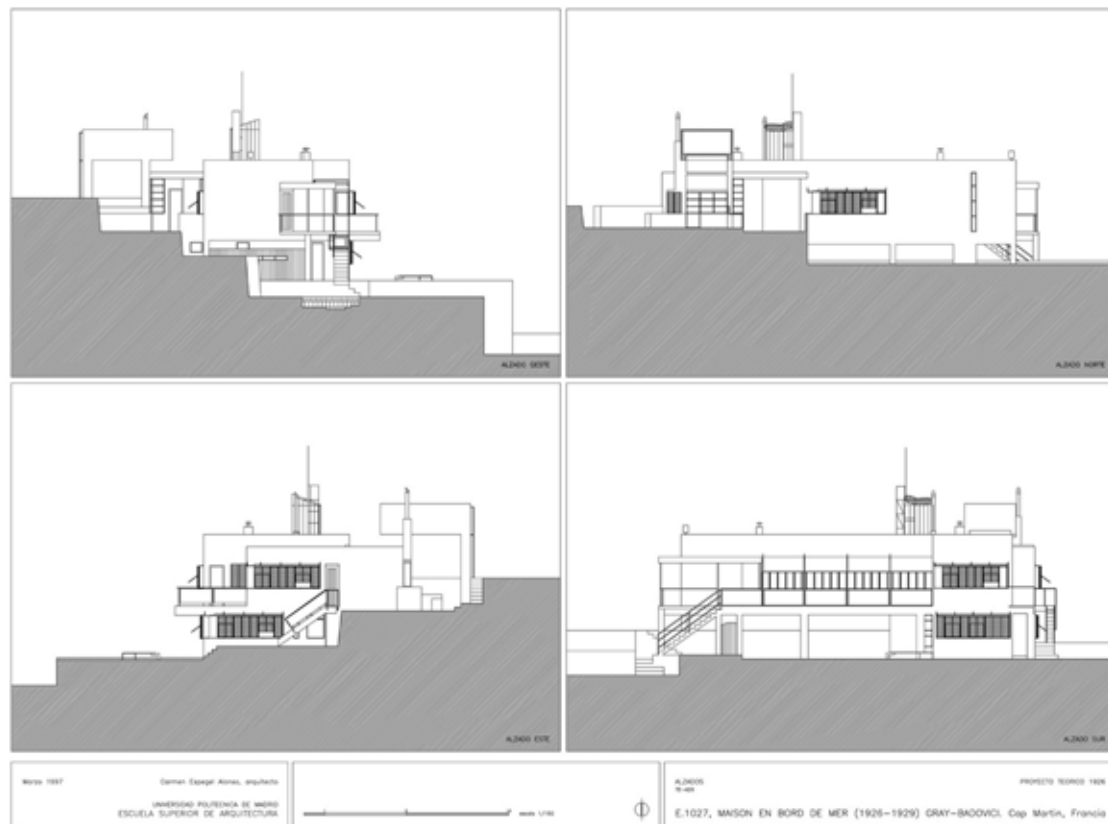


Fig 3. Elevations. Theoretical project, 1926

1.3. 1929-1972.⁴ Transformations

Beginning in 1938, Le Corbusier painted a series of murals that modified the clean pristine quality of Gray's spaces. This is particularly evident in the living room: the original layout was designed with gathering places (divan, music and dining areas) that created tensions from one side of the room to the other. When Le Corbusier's mural was painted on the wall at the far end of the room, it prevented the use of that area as a backdrop for the conversation corner around the divan, and the furniture tended to be arranged in a conventional layout at the center of the room.

A diagonal wall was built in the service entrance, which eliminated the ambiguity of the original elegant

double entry from the atrium under the marquee, changing the complex circulation system that the house had. Besides this, Gray built the main terrace sloping to the inside of the house. As a result, rain water was supposed to drain through the recessed channel under the folding windows, but this apparently did not function well and water would flood the living room. Finally, a step was built between the living room and the terrace, which altered the sense of continuity between both spaces, and caused the folding windows to be shortened.

2. Modern inheritance

The value of great architecture transcends the context in which it was created. Understanding the scientific, social and artistic background of the construction of the *Maison en bord de mer* is mainly necessary to

⁴ Information retrieved mainly from data compiled by Loye, Brigitte: *Eileen Gray, 1879-1976, Architecture. Design*, Analeph/J.P. Viguier, Paris, 1984.

support the new space created by the house rather than the particular relationship of the architect and her time.

In relation to science, modern architects did not transcribe the physical discoveries of their time, but interpreted the ever evolving intuitions of it. Their eagerness to prove their scientific spirit led many of them to adopt scientific terminology without actually knowing what it meant. Thus, the “fourth dimension” in modern architecture represented time as a measure of movement, and since buildings do not move, the “fourth dimension” factor might necessarily be provided by the spectator.

As regards society, the question of the role of woman was established as a consequence of the industrial revolution. The First World War put an end to nineteenth century society and its traditional bourgeois morale, and brought about the swinging twenties. Meanwhile, the bolsheviks in the Soviet Union were inventing a future of their own. Emancipated and liberated women entered the scene in those years. They flew airplanes, and made architecture. By 1933 the revolution was over. The parallel development of the arts, and particularly of architecture, was such that the Modern Movement would be unthinkable without the contributions of the Russian and Soviet avant-garde: the Constructivist (Tatlin), Productivist (Ginzburg), Suprematist (Malévich) and Formalist (Ladovski) movements.⁵

In accordance to this, as happened within other artistic expressions, painting sought to articulate a new language, and the permanent formal dichotomy presented in other arts was also found in painting: cubism and constructivism on the one hand, and expressionism and surrealism on the other. Picasso, whom we could define as eclectic, surpassed both. His eclecticism, like Gray's, was a protest against the cult of originality.

Finally, the necessary techniques and modern machines were mastered and produced in an extraordinarily short period of time. As a result, a new idea of architecture developed before and after the First World War.

Studying the work of Eileen Gray and preserving the history and memory of *E.1027* constitutes an at-

tempt to establish guidelines for the theoretical and technical aspects for restorations of architecture of the Modern Movement, using the study of the *Maison en bord de mer* as an example. The restoration of a modern building requires thoughtful analysis. On the one hand, it seeks to restore those parts of the building that are damaged, or whose construction techniques led to rapidly deteriorating structures. On the other hand, restoration implies a re-evaluation of the architectural ideas that inspired those buildings.

3. Most common pathologies and solutions related to buildings of the Modern Movement

Providing a general view of pathologies and possible repair and restoration treatments for them found in buildings of the Modern Movement seems appropriate, mainly the deterioration of reinforced concrete and steel carpentry. Expert analysis and laboratory results are necessary, though, to establish a precise diagnosis of the problems and define specific solutions for each particular case.

3.1. Reinforced concrete

Insufficient embedding of reinforcing bars was the main mistake made in concrete structures in buildings of the Modern Movement: they corrode and gradually lose their structural strength, and at the same time damage the concrete around them. Likewise, the most harmful processes for concrete are mainly related to the carbonation process in reinforced concrete, the exposure to weather and harmful substances, the high volume of pores, the cement proportion, steel corrosion in reinforced concrete and project and execution mistakes.

A correct approach should consider a static and constructive analysis of the structure, to verify its stability and plan long term repairs so the underlying causes of damage may be corrected. The structure must be recalculated and reinforced to comply with current building codes when necessary. A thorough survey of cracks, their shape and position, must be conducted to determine if they are active or not and find out their causes.

The different stages involved in repair and protection involve cleaning the damaged areas of loose

⁵ Cohen, J-L.; Cooke, C.; Strigalev, A.A.; Tafuri, M. *Constructivismo ruso: Sobre la arquitectura de las vanguardias ruso-soviéticas hacia 1917*, Barcelona, Ed. del Serbal, 1994.

concrete and corrosion by-products, protecting the steel from further corrosion, priming the concrete to avoid penetration of harmful substances, and repairing the damaged areas by reconstructing or increasing the sections of structural elements when necessary. A final coating may be added to protect the concrete surface.

3.2. Steel carpentry

Time, weather exposure and lack of maintenance are the main causes for the deterioration of steel window frames and steel railings used in most buildings of the Modern Movement. Steel carpentry and railings gradually lose their protective paint coating. They rust, and corrosion by-products increase their volume and eventually deformations become noticeable: window panes break, and steel carpentry projects from the walls. Deformations can be exacerbated when steel is exposed to extreme temperature changes and thermal dilatation.

306 When the original windows are damaged beyond repair they should be replaced by windows that meet both visual and structural requirements, and that comply with today's building and comfort standards. Their most important feature should be that the sections are as slim as possible, to emulate the sections used in the original project. In the case of damaged steel carpentry such as railings and posts, they should be cleaned of rust, paint, and corrosion matter and protected with anti-oxidant paint before being painted anew in the appropriate color. If they are damaged beyond repair or have been twisted out of shape, they should be altogether replaced by new galvanized steel elements with a paint coating.

3.3. Wooden carpentry

Damage to wooden carpentry by rot, weather exposure and humidity can only be avoided through regular maintenance. Damaged or rotten wooden elements can be sanded, primed, painted (when reproducing original color) and protected with marine varnish.

Elements that are damaged beyond repair should be replaced with new carpentry that is treated to resist weathering and comply with present building and comfort standards. On the downturn, the main design

consideration is to maintain original sections as much as possible, so as not to disturb the appearance of the building.

3.4. Flat roofs

The waterproofing systems used in flat roofs of buildings of the Modern Movement often failed to withstand heavy traffic and needed frequent repairs. In addition the drainpipes provided seemed to have been insufficient. In abandoned and neglected buildings drainpipes are often blocked; water infiltration occurs and eventually damages the concrete slabs beneath.

In buildings of the Modern Movement flat roofs were often used as garden-terraces. The necessary technology to build a real flat roof, however, was not available at the time, and certain problems were underestimated. To restore the roofs in their original spirit, with a flat waterproof surface, today we can resort to inverted roof systems where the thermal filtering insulation panels are placed on the exterior layer: They insulate and protect the waterproofing which is laid under the insulation. With some systems this insulation layer can function as a terrace floor; in other cases it can be covered with tiles or a double layer roof that allows water to filtrate to the insulation layer from where it drains on the waterproofing to the drain pipes.

4. Case study: materials and pathologies in *E.1027*

It was not possible to conduct any probes nor retrieve any samples of materials from *E.1027*. The information presented in this text is based on visits to the villa, on photographs, and on descriptions by Gray and other authors. Any restoration work would have to reevaluate this study according to preliminary probes and samples of materials taken from the house.

4.1. Reinforced concrete structure

Most of the house, with the exception of a few brick walls, is built of reinforced concrete. The visible damage to the structure consists mainly of cracks and crumbling of the concrete surface. In some areas cor-

roded steel reinforcement is exposed, and there are also humidity stains.

As usually happened in other buildings of the Modern Movement, the concrete covering the steel reinforcing bars was not thick enough to protect the steel from corrosion, which was accelerated both by weather exposure and the marine humid environment of *E.1027*: in these cases the carbonation front has reached the steel reinforcing bars. One can also suspect the porousness of the concrete as a cause of accelerated decay in some areas.

Exterior concrete surfaces were either rendered and painted, or directly painted. Renders exposed to the rain and weather have become detached from their support. Likewise, some elements have lost a considerable thickness of their section. The corners of the building present some cracks due to foundation settlement because the ground is more vulnerable to being washed away by frequent torrential rains, characteristic of this Mediterranean climate.

4.2. Steel carpentry

All steel carpentry in the house is rusted to some degree, depending on location and weather exposure. The protective layer of paint that once covered these elements is gone in most places, or in bad condition. However, none of the steel frames are twisted or deformed.

Some railings have decreased in section where they are embedded in concrete slabs. Several window frames have been replaced by new profiles of different section and subdivisions. Finally, some exterior railings were at one time replaced with galvanized steel railings, which have also lost their protective paint coating.

4.3. Wooden shutters and doors

Practically all shutters are rotten, and many have broken slats. The mechanism that allowed them to slide along the steel profiles is rusted and they do not move easily; in some instances these mechanisms appear to have been replaced by metal profiles screwed to the bottom and top of the shutter. Some of the shutters have been replaced by sheets of metal.

The terrace folding windows were cut shorter and fitted with an intermediary horizontal transom that

has subdivided the tall windows into two panes. Exterior doors are rotten on the bottom, and the two outer doors fitted with pivoting slats (in the alcove and the main bathroom) are now missing.

4.4. Roofs, drainpipes and waterproofing

The system used for roof construction appears to have withstood the passing of time in remarkably good condition, although this should be closely examined. The roof's main problem was that it lacked enough drainpipes; others were added later, and they were placed on the exterior against the facades.

An important project mistake made by Gray was to drain the terrace through the recess or channel built under the folding windows. It proved insufficient and led to the construction of a 20 cm step that runs under the folding windows, which had to be shortened.

4.5. Interior finishings and furniture

Other many pathologies have been detected in relation with the entrances, different livable areas or staircases, specially related to humidity, cracks and rendered and painted walls or ceilings.

Damages to the frescos are particularly relevant in this case. On the wall of the entrance hall, a fresco by Le Corbusier was painted over Gray's inscriptions and fresco; rendered surfaces painted white and black. Other Le Corbusier's frescos were rendered and painted white.

5. Restoration proposals for *E.1027*

Aesthetic and technique are closely linked and dependent on each other. The restoration process demands a close collaboration of architects and technical experts alike. In ancient stone, masonry or wooden buildings, the damaged sections of the structure can be altogether replaced without modifying the aspect of the building. Monolithic concrete structures demand a different approach and are more complicated to restore, since the structure is visible. It is important to try to achieve an appearance as similar as possible to the original, since later additions that bear witness to transformations are generally not considered as worth maintaining in this type of architecture.

One must analyze the various options for restoration: whether to return the building to its original state, or maintain the building with its current transformations, or deny all architectural value and adapt the building to new functional requirements. In practice an intermediate solution is often adopted, since one can rarely embrace such a pure or radical solution.

In the case of the restoration of *E.1027*, it is proposed to return the house to its original state. Its value resides in the spirit and ideas it embodies, as well as in the formal and technical solutions that convey those ideas. It is such a complex and complete work of architecture, interior and furniture design, implanted on the site with such sensibility, that any transformation detracts from its purity and spirit.

The main aspects of this restoration aim to recover the total original spatial conception, remove later additions and reconstruct missing elements, and preserve the typologies of materials and construction techniques. The project itself would recover the original 1929 state of the house and remove later additions, particularly those which transformed the multiple and complex circulation scheme of the house and those that invalidated spatial continuity between the interior, the covered exterior (terrace) and the outdoor grounds (Fig. 4).

It is planned to restore the built-in furniture that remains in the house: Spine-screen, staircase cupboards, partition and cupboard of the dressing and shower area, main bedroom headboard, slanted cupboard and other pieces in the main bathroom, guest room wardrobe, and servant's room cupboard. The missing built-in and mobile furniture would be reconstructed, since all pertinent information is available to do so, or would be replaced with originals when possible, since many of them belong to museums or private collections.

A special consideration must be given to Le Corbusier's mural paintings, however. They transformed the perception of space as conceived by Eileen Gray, and in all rigor should be eliminated. Yet they deserve to be preserved for their intrinsic value. That is why a solution has been devised to allow, to a certain extent, for perception of Gray's original space while preserving the murals: concealing Le Corbusier's fresco with a canvas shade sliding on stainless steel tensors.

For some time now the office of the *Services Techniques de Roquebrune* has thought about creating a

protected area encompassing *E.1027* and the *Cabanon* of Le Corbusier. The proposal is organizing a circuit for visitors to walk through both buildings, and then perhaps to proceed to the graves of Le Corbusier and his wife above Roquebrune. The visit could extend to *Tempe à Pailla*, which is close by in the mountains of Menton. The objective is to create a Museum for the works of Eileen Gray, Jean Badovici, and Le Corbusier. The lives and works of these three architects were closely related to the coastal area of Cap Martin, and people there are not really aware of the value of *E.1027*, or *Maison Blanche*, as it is locally known.

6. Final considerations

Over the years many transformations of *E.1027* have been carried out. Some sought to correct design mistakes of the original project, others were meant to further embellish the house or modify its disposition. All the original furniture that conformed and specialized interior spaces has been removed; the last pieces were auctioned by Sotheby's in Monte-Carlo in 1991 and are now scattered in various collections. These changes have altered the spatial qualities of the original project. As a result of it, a thorough documentation of a building turns essential to undertake its restoration. In the case of *E.1027*, all the compiled information sheds light on the design process as undertaken by Eileen Gray and Jean Badovici, and on the house itself.

The important role of documentation reveals a description that make it almost possible to reconstruct the villa through the written and graphic materials studied. In spite of all this data, many incoherences appeared during the study and remain as uncertain assertions in some issues of the research, since they reflect an own particular interpretation.

The most urgent task was to document the *Maison en bord de mer*, to promote its conservation and restoration. This led to specify the restoration project as much as possible, to include building materials and technical details, and not just define general intervention guidelines that may be interpreted in a variety of ways. The analysis presented in this study is based on the previous research published by several authors. In the same way, future studies on *E.1027* will improve upon this thesis and add new contributions.

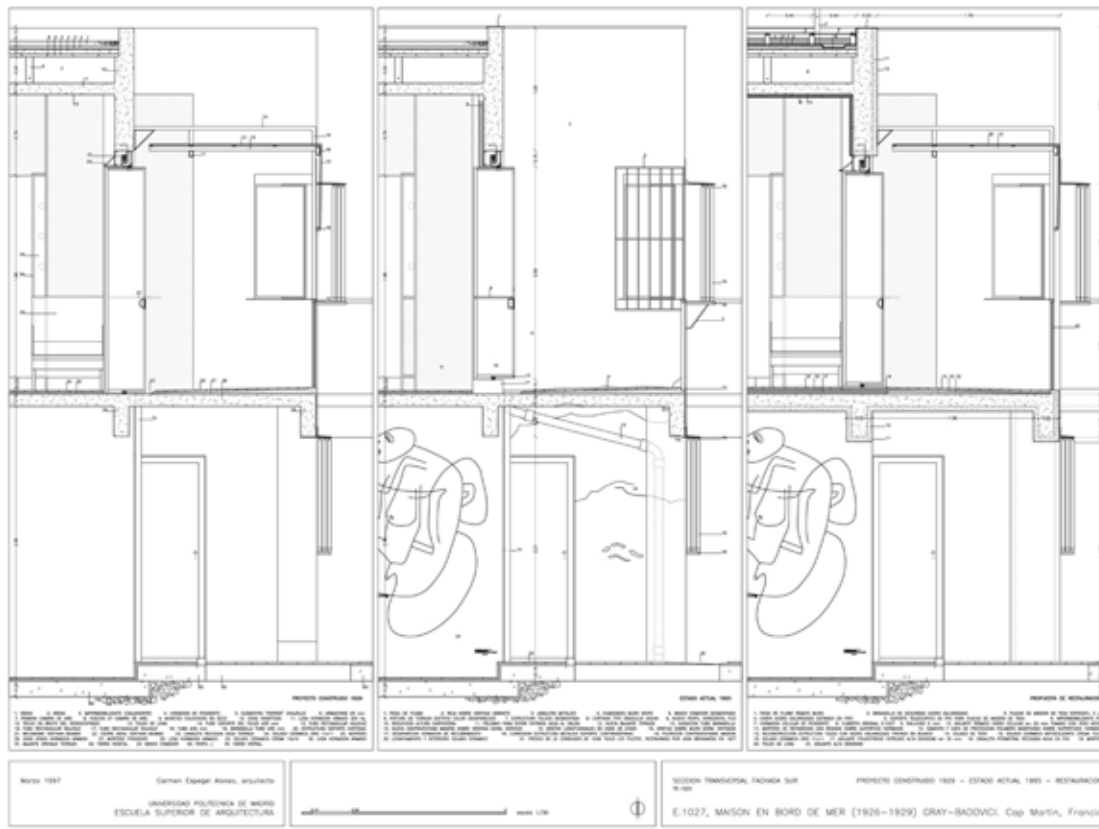


Fig 4. Cross section, Southern façade. Built project, 1929 / Current state, 1995 / Theoretical restoration

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the teaching tasks of the Department of Architectural Project Design at the ETSAM with Professor Carmen Espegel.

Biographies

Carmen Espegel Alonso is Doctor of Architecture and Professor of Architectural Project Design at the ETSAM. She is also director of the Research Group in Housing, GIVCO, and member of the Academic Committee of the international Master in Collective Housing. Her professional trajectory started in 1985, as an independent architect and in 2003 constitutes the firm **espegel-fisac** architects, in association with Concha Fisac. Her work has been showed in diverse books and specialized journals as *Arquitectura Viva*, *Pasajes*, *Future*, *Arquitectura* and *Oris*.

In the academic scope, she has given conferences through United States, Belgium, The Netherlands, Argentine and Mexico, and taken part in many Congress, Exhibitions and Conferences where it can be mentioned the Exhibition of her work at the Royal Institute of British Architects (London) and the Gallery AEDES am Pfefferberg (Berlín). She has written several books and numerous articles; in among we may emphasize *Heroines of the Space: Women architects in the Modern Movement* published in 2006 by Ediciones Generales de la Construcción, that won the Milka Bliznakov Prize at Virginia Polytechnic Institute (USA), *Aires Modernos. E.1027: Maison en bord de mer, Eileen Gray y Jean Badovici, 1926-1929* published in 2010 by Mairera Libros, Madrid.

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