Le Corbusier, Couvent de La Tourette, Eveux, France, 1953–1960. © FLC/SPA.

The *Couvent de La Tourette* from 1960 to the Present Day. Future Discernibility of Past Interventions

BY ROBERTA GRIGNOLO

The *La Tourette* Convent, built by Le Corbusier in Eveux (1953–1960) was subjected to interventions very soon after its inauguration. The article presents a critical analysis of these interventions: those overseen by Fernand Gardien (until 1964) right after completion; those undertaken before the complex was listed and for which limited documentation is available (1964–1979); the restoration campaign led by the ***Architecte en Chef des Monuments Historiques*** (ACMH) Mortamet, who followed an approach based on the completion of Le Corbusier's work; lastly the most recent campaign, overseen by the ACMH Repellin, who succeeded in devising intelligent alternative compliance measures thanks to the fire safety officials. The complex was returned to its original appearance, following an approach that has yet to come to terms with the aging of modern architectural works, but is nevertheless still widely used today in the conservation of 20th century architecture.

The *Couvent de Sainte-Marie de La Tourette* was designed and built by Le Corbusier as a place of learning for the Dominican order in Eveux-sur-l'Arbresle, not far from Lyon, between 1953 and 1960. Since its completion, it has undergone several interventions and adaptations — notably to accommodate visitors after 1970 — including a recent restoration campaign started in 2006 and completed in 2013, which brought the building to the attention of the *Fondation Le Corbusier* (henceforth FLC). As often happens, not all of the interventions were registered nor comprehensively documented. Thus the complex — like many other 20th century buildings — raises the issue of discernibility of interventions. For instance, some of the *ragréages* (concrete patches) date back to the original site work, but many interventions on the concrete surfaces followed, including recent patching. Will the former be recognisable from the latter in ten or twenty years' time? Similar questions can be asked for the interventions on the renowned *pans ondulatoires* ("undulating" glazing) or on the *canons à lumière* ("light cannons" — splayed conical skylights). Such open issues put forward by the FLC called for a thorough documentation not only of the recent restoration work, but also of previous interventions, which could be traced only by cross-referencing several different archival sources[1]. This article is the outcome of work developed with students from the *Accademia di architettura in Mendrisio*[2] at the request of the FLC. The result, a graphic and critical documentation recording of the changes that have taken place over the years, is a contribution to the, as yet, underexplored history of 20th century heritage conservation.

"Loger cent coeurs et cent corps dans le silence"

The article focuses on restoration interventions, but a few historical notes seem necessary to highlight the building's main features.

Le Corbusier received the commission in 1952 thanks to the Dominican Father Marie-Alain Couturier (1897–1954), an artist by education and a pioneer of the renaissance of sacred art and architecture. The program "*Loger cent coeurs et cent corps dans le silence*" ("Providing silence abode to a hundred bodies and a hundred souls"),[3] which entailed building not only a liturgical space, but also living quarters for the monks, allowed Le Corbusier to further develop his research on dwelling units and on the "interplay of individual and collective life"[4]. The monks' cells — a hundred rooms for teachers and students — became the unit of measure and composition of the entire project.

In the post-war period, the number of ongoing projects at the *Atelier* prompted Le Corbusier to assign the direction of each to a different collaborator. In the case of *La Tourette* it was Iannis Xenakis (1922–2001), a knowledgeable young Greek engineer and *avant-garde* musician who had arrived in Paris as a refugee, who was asked to lead the project. This collaboration was marked by such highly prolific exchanges that it is difficult to recognise with confidence the paternity of some of the adopted solutions.

The complex was built on sloping terrain and was designed, as Le Corbusier stated, "*[en prenant] l'assiette en haut, à l'horizontale du bâtiment au sommet*",[5] (i.e. from the top down): the U-shaped living and study building has a reinforced concrete frame, it is raised on piers of various

01 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953–1960. Aereal view from the North shortly after completion. © FLC/SPA.

02 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953–1960. The cracks on the *acrotères* (parapets) are already visible before the completion of the worksite. © FLC/SPA, ACT, late 1950s.

forms and thus leaves the slope intact. The church closes the composition: it is an isolated box-shaped volume in *béton banché* (off-form poured concrete), which rests directly on the ground. The rectangular space between the buildings is left in its natural sloping condition, so there is no habitable courtyard, but a "garden-court" instead. Yet all the buildings are connected at the lower level by walkways called *conduits*, which form a cross-like plan. An assemblage of prismatic forms punctuates the flat-topped ensemble: the oratory with its pyramidal roof, the cylinder of the spiral staircase, the ear-shaped crypt with its *canons à lumière* and the triangular section atrium (Figure 01).

As for the façades, the living and study building is crowned by two levels of cells with deep loggias, which mark the residential quarters. Towards the inside of the court, the corridors which lead to the cells are clad in concrete blocks — except for a continuous horizontal eye-level opening — and covered in a rough, white-painted plaster. Below are located the communal activities, such as the classrooms, the library and the refectory, which are recognisable for their glazed envelopes, articulated according to interior light requirements. The façades along the perimeter of the court consist of story-high squarish concrete panels, prefabricated in-situ. Slender posts and horizontal elements subdivide each panel in quadrangular compartments, which are alternately glazed or clad in concrete. Such elements — which can be read as a mineral transcription of the timber *pan de verre aménagé* of the Maisons Jaoul — are called *pans en Z et en H*, according to the position of the opaque parts.

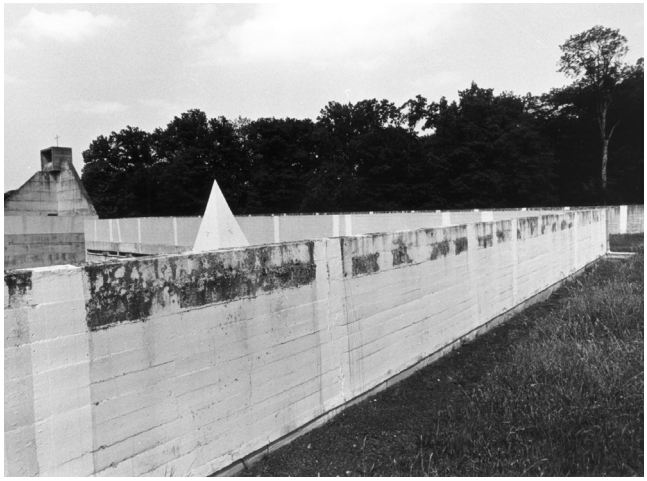
Conversely, the system developed for the external façades would seem to be derived from a solution seen on the Indian worksites, which was described by Le Corbusier and developed by Xenakis[6]. It consists of the juxtaposition of narrow story-high reinforced concrete mullions, with grooves along the sides to house the sheets of glass. The latter are simply secured with mastic, without any fixtures. The distance between the reinforced concrete mullions is determined by the Modulor measurements. For their positioning along the perimeter of the building Xenakis adopted "*quelques gammes de distances répétées sous forme d'ondes*"[7], hence the suggested name of *pans ondulatoires* (undulating glazing)[8]. The system is based on a functional differentiation: lighting is provided by fixed glass panes, ventilation through *aréateurs* (aerators) — vertical slits equipped with a pivoting metal shutter, which controls the incoming air.

Le Corbusier attached particular importance to the above system, which he went on to use in several later projects[9], to the extent that, in 1955, documentation was prepared to file a patent[10], that was never however submitted, despite Le Corbusier's insistence[11]. Nonetheless, such documentation proves how important this cladding system, which allows complete independence from the position of the pillars of the load-bearing structure, was to the architect. The Convent's *pans de verre ondulatoires*, the first ever built[12], are a milestone in the evolution of the *façade libre* (free façade), one of the *cinq points d'une architecture nouvelle* (five points of a new architecture) drafted in 1927.

The Le Corbusier *Atelier* Undertakes the First Repairs: Roof-Terraces and *Acrotères*

The church was consecrated in October 1960, and shortly after — before September 1961 — the roof-terraces had to be repaired for the first time. According to archival documents[13], the original roof was built with a layer of pozzolana, applied so as to create a slope to discharge water, covered by a waterproofing membrane. A 15cm thick layer of soil was added directly above the latter, with the exception of a peripheral walkway, which Le Corbusier had left to allow the monks to walk on the roof, which he had conceived as a grass-covered terrace for prayer and meditation. After the first water seepage[14], Le Corbusier assigned Fernand Gardien, his faithful collaborator who managed his late work sites in France, to personally oversee the repair work. The early failure of the waterproofing was probably due to the fact the contractor, Sud-Est Travaux

03 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953–1960. Aereal view from the North shortly after completion. © FLC/SPA.



04 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953–1960. The view of the roof-terrace after the second treatment of the fair-faced concrete in the 1970s. Note the white bands on the parapets.© FLC/SPA, ACT.

& Constructions, had not foreseen the need for expansion joints in the *acrotères* (i.e. the high parapets surrounding the roof-terrace)[15]. Consequently, as early as 1960, as proved by period archive sources and photographs, noticeable vertical or oblique cracks — also called "natural joints" — appeared along the *acrotères* (Figure 02)[16]. In September 1963, to eliminate roof leaks, the cracks were filled with *Polyjoint* special coating and the most exposed surfaces were subsequently treated with waterproof, *Polyfilm* plaster in a cement grey colour[17]. This product was used on the parapets, but probably also on the inclined organ surface, on the pyramid-like oratory roof and on the sloping wall of the crypt[18]. The use of such opaque waterproofing materials, which are clearly visible in the subsequent photographs (Figure 03), worried the monks who informed Gardien that the repair work covered and eliminated the grain and natural colour of the fair-faced concrete[19]. Gardien's response left no doubts: Le Corbusier had examined and accepted the selected material, which was thus to be applied.[20] However, the repair work did not stop the leaks, since in March 1964 the contractor informed Gardien that the Polystrat Company would check the waterproofing work once again[21].

Treatment of the Fair-Faced Concrete Surfaces in the Seventies

From then until 1979, when the Convent was listed (*classé*), no written documents have been found to indicate any work on the building. In France it is only once protection becomes official that interventions must be overseen by an *Architecte en Chef des Monuments Historiques* (ACMH), and that the latter is charged with filing information on any work performed on the listed building. However, a few datable sources and photographs show that new repair work was performed on parapet cracks (Figure 04); additionally[22], layers of Paxalumin, a waterproofing membrane protected by an aluminum sheet, were applied on the roof-terraces.

In 1970 the owners of the Convent, which had seen a decline in the number of resident friars, decided to open the complex to the public for visits and overnight stays, using the revenue to pay for overheads. This new *hôtellerie* use (hostel use) gradually introduced more stringent compliance issues.

The First Restoration and the Temptation to Complete the Architectural Work

During the early Eighties, owing to the continuing roof-terrace leaks, the *Association des Amis d'Eveux* (The Association of the Friends of Eveux — owner of the by then listed building), consulted Jean-Gabriel Mortamet, one of the ACMHS appointed to oversee the Rhône *département*. It is he who undertook the first important restoration campaign. After temporarily removing the soil from the roof-terraces, Mortamet insulated the horizontal surfaces and laid a new waterproofing membrane, all of this without removing the existing roof layers. He then repositioned the soil and added yet more to cover the entire terraces. The addition of this "package" over the existing layers raised the floor level by over 40cm around the perimeter, where walkways had originally existed, and required a vertical extension of the waterproofing layer by approximately 15cm, with the consequent creation of new lead flashings anchored in the parapets.

Concurrently, the cracks that had formed in the parapets were treated again. The *Polyjoint* and *Polyfilm* products were removed using a methylene chloride pickling process. New vertical joints were formed at regular intervals using a circular saw. All the joints — natural and artificial ones — were then sealed with plastic polyurethane foam and a coat of epoxy resin-based synthetic mastic was applied; lastly, a two-component elastomer sealer was used to create a smooth surface. All fair-faced concrete surfaces were then treated, especially where the concrete cover had spalled. The technique consisted in chemical cleaning, passivation of the steel bars, concrete patching, and lastly, application of a silicon-based waterproofing material. During the first stage (1982–1984) the parapets and terraces above the

cells, the chimney, and roof walkway were treated; during the second stage (1985–86) the *conduits* (walkways) and atrium; during the third and last stage (1986–87) the church parapets and terraces, the skylights of the crypt and the sacresty, the roof of the oratory, the organ surfaces and the loggia panels.

At the initiative of the *Association des Amis d'Eveux*, Mortamet also eliminated two existing church doors, which had not been built to Le Corbusier's designs, and replaced them with two pivot doors produced following the Master's original and never executed drawings. In 1989 the main South door was installed (Figure 05), followed by the North side door in 1993. This approach, based on completing the architect's work, clearly positions these interventions in an, as yet, embryonic stage of 20th century architecture conservation. Mortamet was indeed one of the first ACMHs in France to restore modern buildings. He belonged to a generation of professionals who had trained in a culture which had been "nourished" by the figure of Le Corbusier, and considered the master's works as design models — eventually needing to be finished off with a mimetic approach when they were incomplete — rather than as monuments to be preserved in the conditions in which they have reached us[23].

The Most Recent Intervention Campaign: Insightful Compliance Measures Thanks to the *Chargé de Mission Sécurité Incendie*

The 1990s witnessed a sequence of *Commission de Sécurité* injunctions for non-compliance with updated regulations for buildings open to the public. The warnings culminated with the departmental prefect threatening to close down the living quarters. Restoration and compliance thus became imperative and had to be implemented under very tight deadlines.

In the year 2000, after Mortamet reached the age of retirement, a new ACMH was urgently summoned, Didier Repellin. In 2002 he presented his preliminary study (*Etude Préalable*) and in 2006 he began the second restoration campaign that was completed in 2013. In view of the imminent risk of closure, the first issue to be considered was that of complying with the updated standards, notably fire safety regulations. The relevant commission required that a smoke detection system be installed, that the building be divided into fire resistant compartments (with the addition of new fire doors along the corridors, as well as the enclosure and fire protection of the stairs), and that interior fixtures provide up to 30 minutes fire resistance. The latter requirement would have entailed replacing all interior doors with fire doors: both the ones in the communal spaces and those of the cells, including their *volets d'aération* (ventilation louvers). In view of the impact such requirements would have had on the spatial and material features of the building, the ACMH appealed to a special official of the French heritage system: the *chargé de mission sécurité incendie* (fire safety attaché) attached to the *Ministère de la Culture*. In cases of thorny compliance issues and at the request of an ACMH, this Ministry consultant and former fireman is able to suggest alternative compliance measures that respect

05 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953-1960. South church pivot door built by Mortamet in 1989 following the unbuilt 1959 design of Le Corbusier. © FLC/SPA, ACT, Roberta Grignolo.

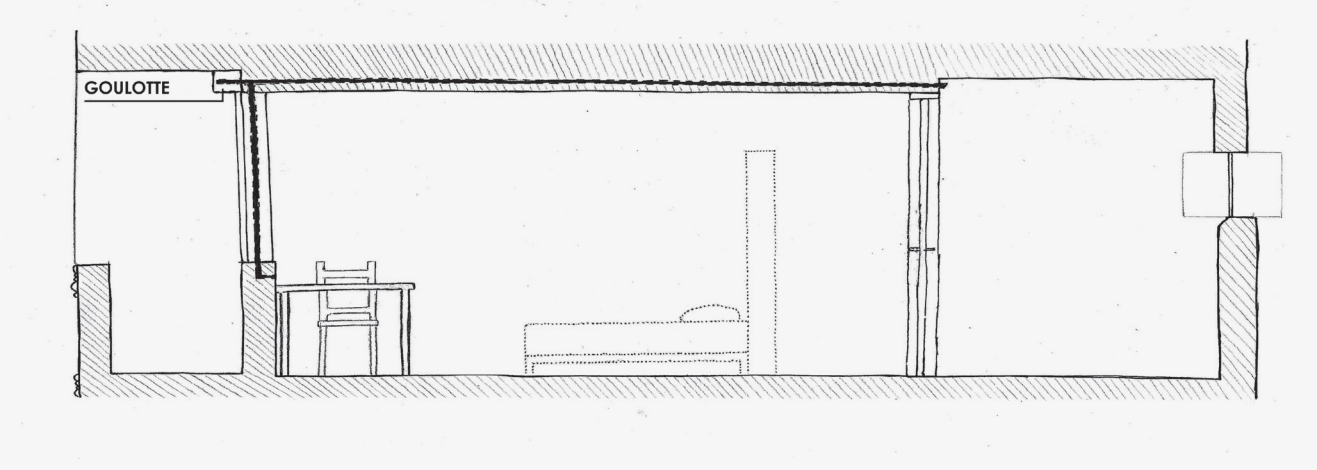
the specific features of a monument. The *chargé de mission*'s inspection of *La Tourette*[24] was decisive: the reinforced concrete load-bearing structure was considered intrinsically fire resistant. The *chargé de mission* judged it necessary to generalize an early warning smoke detection system, and considered that to be a sufficient solution, thus no longer requiring the previously prescribed measures. Hence, dealing with regulatory requirements at the earliest stages of the project provided a solution that was compatible with the architectural quality of the convent.

Chasing Wiring Ducts inside Interior Walls

The addition of an aspirating smoke detection system and new electric cabling — the whole electrical system was replaced by a new one — followed the original design criteria. On the communal activity levels, all the wiring ducts run in full view on a horizontal grid along the upper part of the corridors. At the cell level the situation is more complex: originally the electric cabling in this area was chased through metal ducts, which were now unusable. New ducts (for smoke detection and electricity) were therefore chased into the walls by cutting into the concrete blocks. The visible parts of the smoke detectors are now limited to 1cm diameter pipes that protrude from the cell and corridor walls and are barely visible because of the rough finish of the plaster, which was reproduced to preserve the original indoor appearance.

Externally, Exposed Horizontal Ducts Convey Pipework to the Smoke Aspiration Units

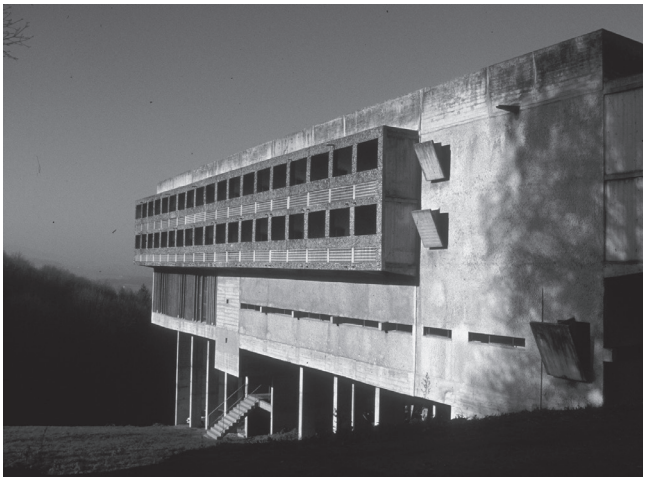
On the outside of the building the solution adopted for the pipework is more visible. The aspiration units of the smoke detection system are placed at the center of each wing, in the loggias corresponding to the staircases. To avoid cutting costly and invasive chases in the reinforced concrete, the wiring of the smoke detection system and the new electric cabling were positioned outside the building, and run through the loggias to reach the aspiration unit. All pipework was placed in an exposed *goulotte* — a rectangular 8 × 15cm plastic duct



06 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953-1960. Drawing showing the position of the wiring ducts added during the recent restoration. © Drawing by Aminah Costantini, Alice Piazzoli (AAM students) and Alessandra Castelbarco Albani (assistant).

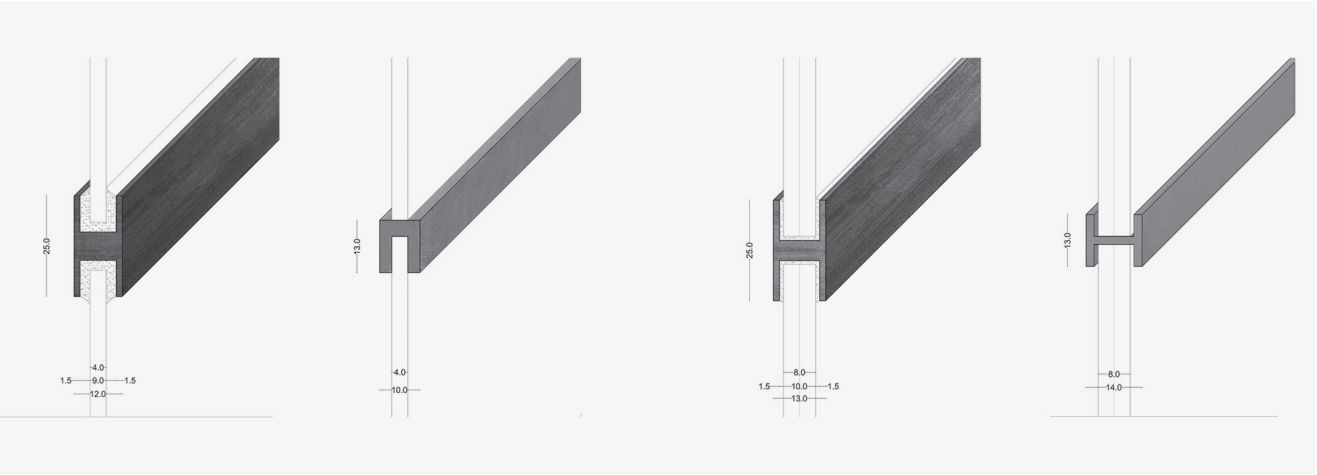
07 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953-1960. View of the loggias with the wiring ducts running in the *goulotte* above the window fixtures. © FLC/SPA, Roberta Grignolo.

08 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953-1960. The fire detection system doesn't change the original appearance of the cell corridors. © FLC/SPA, Roberta Grignolo.



09 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953–1960. © FLC/SPA, ACT.

10 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953–1960. © FLC/SPA, Roberta Grignolo.



11 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953-1960. The ***barlotières*** (glazing bars) of the ***pans de verre ondulatoires***: on the left the original solution (respectively the brass and the polyurethane from profiles), on the right the one adopted after several attempts (respectively the new brass and the new grey silicone profiles). © Drawings by Riccardo Cola, Davide Etter, Francesco Tadini (AAM students) and Alessandra Castelbarco Albani (assistant).

that contains the wiring — located along the upper corner of the loggias, running in full view above the window fixtures. The vertical path of the pipework was instead dealt with by inserting the *goulotte* inside the exterior *volet d'aération* (ventilation louver) of each room (the exterior *volet* — louver — provides ventilation to the cell and is located on the same plane as the window fixtures). Hidden inside the *volet*, the duct is thus visible only on close inspection.

Here additions are clearly discernible. There remains the further question of whether an alternative solution could have been found to avoid the fact that the *goulottes* alter the clarity of the external volume of the loggias "cut" into the concrete, possibly making them less visible from the outside, especially from the entrance to the convent (Figure 06–08).

Recovering the Original Level of the Roof-Terraces and their Meditational Dimension

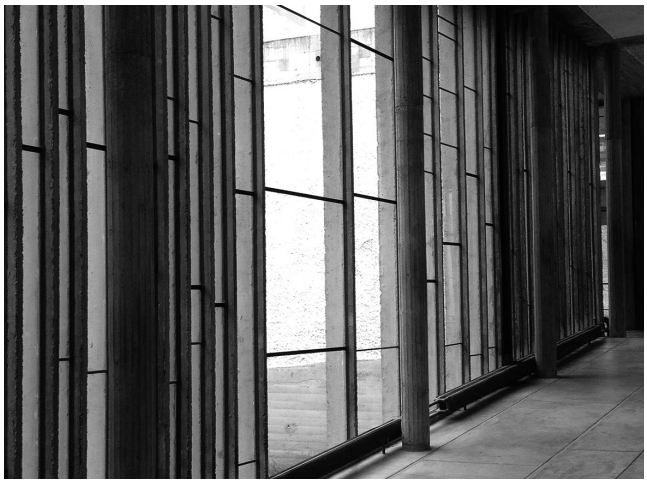
The other urgent issue that had to be dealt with was the waterproofing of the roof-terrace. Le Corbusier had conceived it as a place for meditation: the tall parapets were meant to allow the strolling monks to see no more than the distant horizon, eliminating all possible distractions due to the view of the immediate vicinity. With the numerous subsequent waterproofing interventions, several layers had been added on top of the original ones, leading to a considerable increase in the overall weight and height of the roof level. The ACMH decided to restore the original roof level. Consequently he removed all the added layers, and applied a new insulation and waterproofing membrane, retaining the original level. A raised floor of concrete tiles was placed where the perimeter walkway had been, and the existing soil was repositioned in the central area of each roof-terrace. Thanks to this intervention, the meditational dimension of the roof area was re-established.

Restoration of the Alleged Contrast between Fair-Faced Concrete and White Rough Plaster

Another key issue concerned the façades, whether opaque or transparent. The opaque façades are partly fair-faced concrete (exposed beams, blind facades), and partly concrete blocks covered in roughly textured plaster. The main problems in the concrete surfaces had occurred at roof level, where water had collected and caused the concrete of the parapets to deteriorate at the level of the highest slabs. In some cases, the corrosion of the steel bars caused concrete cracking and spalling. Other fair-faced concrete surfaces, especially sloping ones such as those of the oratory, the organ and the crypt, bore traces of dirt and microorganisms, and their surfaces appeared definitely darker. Concrete surfaces were cleaned using different techniques according to the extent of the deterioration (high pressure water, microgommage or cryogenic systems, the latter inside the church), the steel bars were passivated, and concrete patches were executed where necessary. Everything was then made uniform with limewash. Lastly, all the surfaces were treated with a water-repellent solution. The rough plaster surfaces were repaired wherever required and were all repainted with white mineral based slurry.

On visiting the convent one is inevitably led to reflect upon the issue of the aging of modern architecture surfaces, for which it is still problematic to apply the general principles of restoration, including the preservation of patina over time. In this case the aim of the ACMH was to restore the alleged original contrast between the grey, fair-faced concrete surfaces, and the lighter, white plastered parts. However it is difficult to grasp from original black and white photographs, how strong the contrast actually was. What is nonetheless certain, is that the colour photographs taken before the last intervention, show softer tones: the surfaces of the different materials all tend to take on the same warm, beige colour (Figure 09–10). If the linguistic and formal values of the facades might have seemed a little faded, the aged elevations undeniably bore significant documentary value and material culture. This is especially true when considering that the convent's fair-faced concrete surfaces were the outcome — in the second half of the 1950s — of a transfer of know-how from the civil engineering sector to the building sector. The workers of the Eveux site were

12 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953-1960. Le Corbusier in the ***grand conduite*** (main walkway) during the Convent inauguration ceremony. Note the single bar guard rail running along the ***pan ondulatoire***. © FLC/SPA, ACT.



13 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953-1960. The main walkway after the last intervention: the railing has been removed, according t o the alleged intentions of Le Corbusier. © FLC/SPA, Roberta Grignolo.

experts in fair-faced concrete surfaces and had acquired their experience and reputation building dams and mountain road bridges.

Pans de Verre Ondulatoires Restored à l'Identique

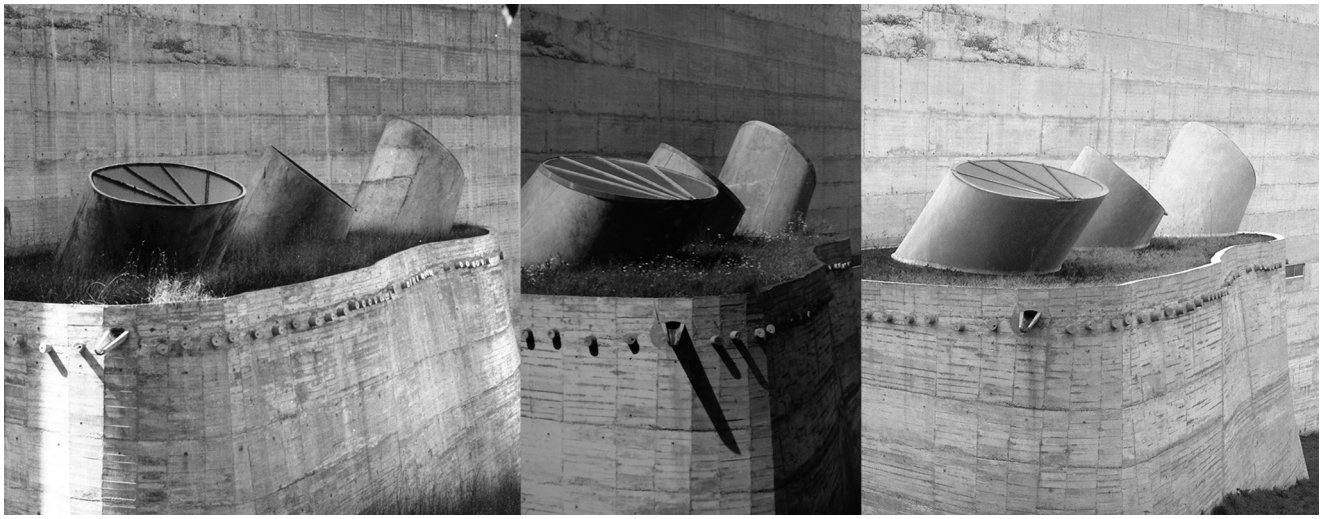
As to the transparent facades, the ACMH found the glazing in an advanced state of disrepair. The mastic which secured the glazing in the vertical grooves of the concrete mullions was dried out or missing, while the horizontal elements — *barlotières* according to the ACMH's denomination — which were placed between one glass pane and another were deteriorated. At *La Tourette*, Le Corbusier had used two types of horizontal profiles: the thicker ones (h=25mm) were brass H sections, which appeared to be bent and partly corroded; the more slender ones (h=13mm) were inverted U sections in a grey polyurethane foam, which had hardened, darkened and, for the most part, cracked. Moreover, the installation of the glazing directly in the concrete grooves, with no more that an interposed strip of mastic, tended to cause cracks in the glass plates owing to the different expansion properties of glass and concrete. There was, therefore, the risk that the glass sheets might break and fall from a considerable height.

Such a risk was heightened by the fact the ACMH wished to eliminate the *garde-corps* (guard rails), which in his view altered Le Corbusier's intentions. However several photographs — some of which are included in the *Oeuvre Complète*[25] — show that the guard rails along the *pans ondulatoires* of the study rooms, the refectory and the conduits, already existed at the time of the inauguration. There even are some shots of Le Corbusier seen from behind during the inauguration, in the company of "high ranking prelates", at the end of the ramp leading to the church, in which one can clearly see the parapets. Le Corbusier had thus seen and accepted them. Hence the ACMH's decision to remove them remains questionable (Figure 12–13). It contributed to dismantling the entire, original glazed system, with its simple 4 mm thick glazing, and to replacing it with 8 mm thick Stadip safety glass.

Initially, only the lower parts of the glazing were to be replaced, because of the substantial risk that the glazing might fall outwards if impacted from inside the building. However, during the construction stage, two types of issues developed, technical and aesthetic ones. From a technical standpoint, to achieve the air and water tightness of the envelope, the perimeter mastic joints had to be redone and the broken window panes and foam *barlotières* needed to be replaced. Such interventions, that would have required the removal of all the upper panes followed by their repositioning after the lower ones had been installed, would have been too expensive and in any event there was the risk that the original glass panes might break. From an aesthetic standpoint, the different thickness between the original glazing (4 mm) and the new (8 mm) would have produced a difference in hue and transparency: the prototypes of the new glazing custom-made by Saint Gobain had a slightly different colour; in addition, the new glazing would have been more transparent than the original glass that had become a little cloudy. Such considerations led, in 2007, to the decision to replace the full story-high, original panes of glass.

Thus, on the west facade of the west wing, which was treated during the first restoration phase, the brass *barlotières* were replaced with natural anodised aluminium sections — with a shiny, reflecting, grey appearance — in a direct reference to the solutions that had recently been implemented during the restoration of Le Corbusier's Firminy buildings, while the foam *barlotières* were replaced by translucent plastic sections. This solution found little favour with visitors and experts, some of whom complained directly to the FLC, which had only recently been informed that a restoration campaign was underway.

The well-known architectural historian William J.R. Curtis wrote several letters to the FLC, following his visits to the convent during the restoration. He noted that the reflecting aluminium *barlotières* had done away with the backlit "Mondrian effect", while the translucent silicone ones had rounded corners, which in no way matched the precision of the original solution. Curtis thus argued Le Corbusier's and



14 Le Corbusier, *Couvent de La Tourette*, Eveux, France, 1953–1960. The *canons à lumière* (skylights) of the crypt: on the left the original solution; in the center the fixtures added by the ACMH Mortamet during the first restoration, on the right the fixtures after the last intervention. © FLC/ADAGP; left: FLC, centre: Carolina Di Biase; Right: Roberta Grignolo.

Xenakis' precision and visual music had been totally lost, especially when considering the statement attributed to Le Corbusier that "*l'architecture est une question de millimètres*" ("architecture is a question of millimeters").

Hence, during the second stage of the restoration work, an attempt was made to improve the translucent west facade joints, by painting them anthracite. Furthermore, a new solution was developed for the *barlotières* of the south and east facades: the metal ones were manufactured in brass coloured anodised aluminium and the foam ones were custom-made in light grey opaque silicone, allegedly the same colour as the original joints. They were designed with an H section to improve the stability of the glass panes, but with the external dimensions of the originals.

Another modification was devised following a visit by one of the FLC representatives, according to whom the facsimile aluminium solution betrayed the designer's intentions with respect to the use of materials. In the final solution the metal *barlotières* were made to match the original in brass, using a custom-designed manufacturing process (Figure 11). Initially this possibility had been rejected because of its high cost, but it was subsequently authorised following criticism from the scientific community.

The brass *barlotières,* produced with a section identical to the original ones, were positioned in the *conduits* (walkways), but in other areas one still finds the solutions that had been devised during the restoration site work and then improved upon. Thus today diverse restoration solutions for the *pans de verre* co-exist. It consequently becomes essential that interventions be recorded, to avoid that in the future it be mistakingly believed that today's differences are indeed original ones.

The identical restoration of the *pans de verre* has re-established the crucial play of light and shadow in the walkways. One might, however, lament that no part of the original facade was preserved. In this case, such diligence would have allowed us to appreciate the characteristics of the original glass panes, which were totally different to the ones available today in terms of colour, thickness, smoothness, reflectance, aging, etc. This loss means that today's observers no longer have any way to make comparisons, an essential element in furthering advances in this discipline.

Canons à Lumière Fixtures: the Repeated Correction of a Flawed Detail

Lastly, the conical skylight fixtures were modified, since they had been a source of leaks ever since the inauguration of the complex. Originally, water drainage only occurred through five small cannulas (tubes) placed at the base of the sloping windows, causing leak marks and stains on the interior plaster. In a similar manner to the *pans ondulatoires*, Le Corbusier's intention was to achieve direct contact between different materials, without any window fixture: glass panes were positioned on the upper concrete edges of the skylights, with no more that a strip of mastic in between — an experimental detail that proved to be flawed. Over time, several interventions attempted to solve the problem: initially an edged metal sheet was created to collect and drain water from the lower part of each skylight; then, during Mortamet's restoration campaign, continuous vertical flashing, almost 10 cm high, was installed all around the perimeter of the skylights, totally distorting the original detail. Finally, during the most recent intervention, the ACMH positioned the perimeter flashing on the same plane as the glazing. Thanks to the material that was chosen — grey, brushed steel — the flashing merges with the upper concrete edge of the *canons*. From a distance the new detail appears thus similar to the original one (Figure 14).

Interior Polychromy: from a Visual Approach to Stratigraphic Tests

Another issue that should be mentioned is interior polychromy as related to the skylights and to the church, and so crucial to the Master's project. The FLC's involvement, while

work was in progress on the project, led to stratigraphic tests being performed on the colours of the church interiors in 2011. The tests revealed how they had originally been applied using a single colored layer on a layer of white paint to achieve greater brightness. In addition, while some of the surfaces still bore traces of the original paint, in other areas it had been covered and changed. The ACMH thus restored the original colours according to the findings of the stratigraphic tests; in some cases the surfaces were simply cleaned, in others a new layer of paint was applied.

Towards Cooperation between the *Fondation Le Corbusier* and Conservation Architects?

The resumption of contact related to the above issues with the FLC and the positive outcome of the collaborative work developed together, inspires hope for the future. It remains desirable that a cooperation protocol be drafted between the Ministry of Culture (which holds legal responsibility for the protection of architectural works) and the FLC (as heir to the architect's moral rights) that will ensure these stakeholders work in synergy and leverage their respective fields of competence. The FLC can capitalize on the ACMHs' experience on the ground; the latter should be encouraged to dialogue with the FLC and especially with the *comité d'experts,* which comprises experts in the fields of the history and conservation of 20th century architecture. If constructive dialogue develops while a project is in progress — instead of once it has been completed — such a collective tool, with its yet unrealised potential, will at last fully achieve its purpose. ∎

Notes

1 *Fondation Le Corbusier*, Paris (FLC); *Direction Régionale des Affaires Culturelles*, Lyon (DRAC); *Archives Départementales du Rhône*, Lyon (ADR); *Archives du Couvent de La Tourette, Eveux-sur-l'Arbresle* (ACT); *Médiathèque du Patrimoine*, Paris (MP).

2 "Reuse and restoration of 20th Century Heritage" course, a.a. 2013–2014. During a full semester students compared documents from several archival sources, they surveyed parts of the building, mapped interventions, debated with the architects in charge, and lastly produced a wealth of documentation related to the transformations of the Convent from the date of its inauguration in 1960, to the present day. I would like to thank the students of the course and especially those whose "theoretical papers" pursued further research into archival material: Veronica Ghislanzoni, Elena Guerra, Lucrezia Rapillo and Alessandra Aponi. I also wish to thank the *Architecte en Chef des Monuments Historiques* Didier Repellin and his team who generously provided students with drawings, documentation and field expertise.

3 Sergio Ferro, Chérif Kebbal, Philippe Potié, Cyrille Simonnet, *Le Corbusier, Le Couvent de La Tourette*, Marseille, Editions Parenthèses, 1987, p. 12.

4 Le Corbusier on the Charterhouse of Ema, in Galluzzo (Tuscany), in William J.R. Curtis, *Le Corbusier: Ideas and Forms*, Oxford, Phaidon, 1986, p. 181.

5 Conversation of Le Corbusier with the Dominican community, October 1960, in "Le Couvent Sainte-Marie de La Tourette construit par Le Corbusier", *L'Art Sacré*, n. 7–8, mars-avril 1960.

6 Nouritza Matossian, *Iannis Xenakis*, Paris, Fayard-Fondation Sacem, 1981, p. 78–79.

7 Iannis Xenakis, *Note Relative aux Pans de Verre Dénommés* "Ondulatoires", 12 July 1955 [FLC T2–7–253].

8 The vertical concrete mullions are set at varying distances along the facade suggesting the frequency waves on an oscilloscope screen so they do not literally "undulate" but suggest the movement of electronic waves (editor's note).

9 E.g. the *Maison du Brésil at the Cité Universitaire* in Paris (1953–59), the *Maison de la Culture* in Firminy (1961–65) and the Carpenter Center in Cambridge (1961–63).

10 Le Corbusier, *Brevet ou Modèle déposé pour les Pans de Verre Fénommés* "Ondulatoires", 12 July 1955 [FLC T2–7–251]; Iannis Xenakis, *Note Relative aux Pans de Verre Dénommés* "Ondulatoires", 12 July 1955 [FLC T2–7–253].

11 *Note pour Wogensky dictée par L–C*, 8 juin 1955 [FLC T2–7–250]; *Note pour Xénakis dictée par L–C*, 6 octobre 1955 [FLC K3–7–781].

12 Willy Boesiger, *Le Corbusier et Son Atelier Rue de Sèvres 35, Oeuvre Complète 1957–1965*, Zurich, Girsberger, 1965, p. 32.

13 Letter from Fernand Gardien (for André Wogenscky) to M. Quignon (Etanchéité sols, murs), 18 January 1957 [FLC K3–2–183–002].

14 The terraces started to leak even before the Convent was inaugurated in October 1958. Letter from Fernand Gardien and Georges Marc Présenté to the Etablissements Quignon, 14 October 1958 [FLC K3–2–212].

15 Letter from M. Plaisantin (Sud-Est Travaux & Constructions) to Fernand Gardien, 22 August 1963 [FLC K3–12–53].

16 As early as February 1960, the construction company Sud-Est Travaux & Constructions, was contracted for initial repairs to the cracks in the parapets, applying Seelastik or a similar product. Letter from M. Quignon to the Atelier Le Corbusier, 25 February 1960 [FLC K3–2–227].

17 Letter from J. Liling (Polystrat Company) to M. Plaisantin (Sud-Est Travaux), 14 December 1962 [FLC K3–12–129]. *Polyjoint* and *Polyfilm* were produced by the Polystrat Firm (today disappeared), whose production was located in Joinville-le-Pont.

18 Letter from Father Genuyt to Fernand Gardien, 4 October 1963 [FLC K3–15–502].

19 *Idem.*

20 Letter from Fernand Gardien to Father Genuyt, 9 October 1963 [FLC K3–15–504].

21 Letter from M. Plaisantin (Sud-Est Travaux) to Fernand Gardien, 20 October 1964 [FLC K3–12–76].

22 According to the ACMH Mortamet, repairs on the parapet cracks with *bandes plastiques* were carried out in 1974–75 (*Archives Départementales du Rhône, Archives de J.-G. Mortamet*, Rhône hors Lyon, Eveux, 103 J 66).

23 See the paper by François Goven, *"Le Corbusier et le Monument Moderne: la Patrimonialisation de l'Architecture du XXe siècle en France (d') après Le Corbusier",* at the recent conference *Le Corbusier: l'Oeuvre à l'Épreuve de sa Restauration, XIXe Rencontre de la Fondation Le Corbusier, Fondation Le Corbusier-Institut National d'Histoire de l'Art*, Paris, 16–18 April 2015.

24 At the time, the position was held by Lieutenant-Colonel Jean-Paul Spiess.

25 Willy Boesiger, *op. cit.*, p. 40 and p. 44.

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