

quaderni di assorestauro



YEAR11NR01  
JUNE 2022

# Historic and Restoration site tour in Italy

06 - 10 JUNE 2022

# Restoration week®



06 JUNE  
MILANO



07 JUNE  
TEN YEARS  
FROM 2012  
EARTHQUAKE



08  
09 JUNE  
FERRARA



10 JUNE  
VENEZIA



In collaboration with:



SCUOLA DI SPECIALIZZAZIONE  
IN BENI ARCHITETTONICI E DEL PAESAGGIO





Quaderni di Assorestauro



YEARS 11 | NUMBER 01  
JUNE 2022

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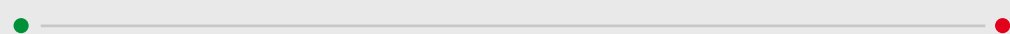
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**ITALIAN TRADE AGENCY**

**ICE - Agenzia per la promozione all'estero e l'internazionalizzazione delle imprese italiane**

ITA - Italian Trade Agency is the Governmental agency that supports the business development of our companies abroad and promotes the attraction of foreign investment in Italy. With a motivated and modern organization and a widespread network of overseas offices, ITA provides information, assistance, consulting, promotion and training to Italian small and medium-sized businesses. Using the most modern multi-channel promotion and communication tools, it acts to assert the excellence of Made in Italy in the world.



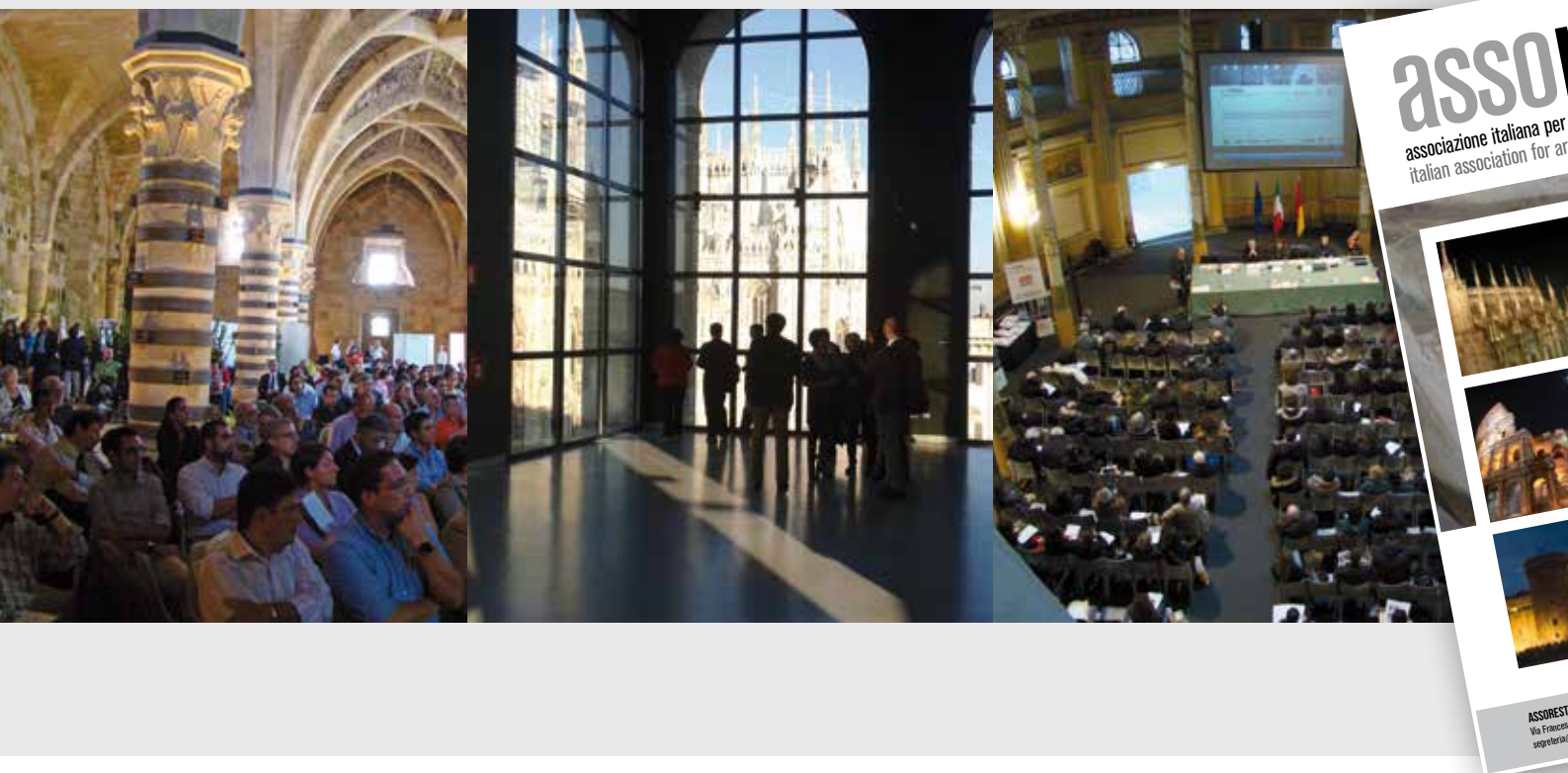
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# assorestauro®

associazione italiana per il restauro architettonico, artistico, urbano  
italian association for architecture, art and urban restoration

Project coordinator:  
Andrea Griletto

## WHO IS ASSORESTAURO ?

Established in 2005 as the first Italian association of manufacturers of materials, equipment and technology, suppliers of services and specialized companies, Assorestauro represents the Italian sector of restoration and conservation of material heritage. To date, it is the sole association and a reference in the national and international market for anyone willing to start working in the conservation sector in Italy. This field is a synthesis of the various disciplines involved, of the professional specialists, of the available technology and of the growing business community. If examined as a whole, the sector accounts for a large market share and has a meaningful impact on tourism, industry and bioconstruction.

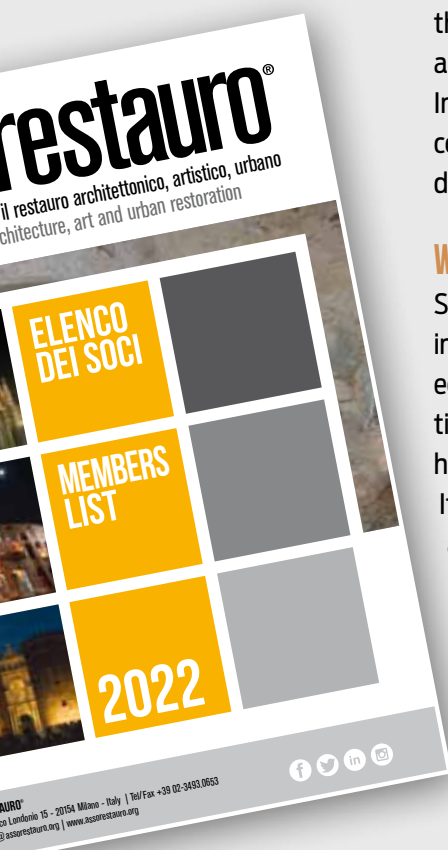
## WHAT ARE ASSORESTAURO'S GOALS ?

Assorestauro is the National Trade Association for the Restoration Sector, representing manufacturers of materials, equipment, technology, specialist companies, designers and suppliers of services for analyses, surveys and diffusion. The Association offers its members information, assistance, advice and training both directly and through its partners, with a view to building a consistent and unitary orientation to the different sectors of the restoration industry at a national and international level.

As a national association, Assorestauro aims at coordinating, protecting and promoting the interests of the restoration sector. Moreover, it represents the outer market, in Italy and abroad, the common positions in technical and economic issues, as well as an image. In fact, it carries out targeted activities such as relevant ads of the sector, information and communication, protection of common interests (economy, image, standards), research, development and promotion.

## WHAT DOES ASSORESTAURO DO ?

Several activities aimed at promoting the professional skills in the restoration sector fall in the scopes of the Association. They include diagnostic analysis, design and on site execution, producing technology and materials, as well as contribute technological Innovation, with the support of Institutions, Universities, Agencies for the protection of cultural heritage and ITA - Italian Trade Agency. This type of activities includes both promotions in Italy (conferences and training seminars, trade exhibitions, courses and similar initiatives) and abroad (foreign missions, training, b2b encounters, restoration sites). In such occasions the member companies are involved and they are offered the chance to study and penetrate foreign markets through projects co-sponsored by national and international bodies.




@assorestauro    



project

# RESTAURO MADE IN ITALY



**“Restauro Made in Italy” is a wide project aimed at promoting the sector of Italian restoration abroad**, launched by ITA - Italian Trade Agency and organized by Fiera Ferrara and Assorestauo by means of technical and promotional initiatives and activities to be held in Italy and abroad in 2020/2022.

The objective of the project is to strengthen – in terms of increased business volume and penetration of third markets – the sector of Italian restoration, the enterprises working in the sector, the training institutions and academies offering skill building, and the local authorities supporting the sector. Considering the high specialization of the sector in Italy and abroad, it is urgent to take the unmissable opportunities now arising from an increased demand in the cultural field worldwide, especially from the most industrialized country, where cultural resources and restoration are rated as a new and growing economic asset.

The first steps of the project are developed as an alternation of actions of technical promotion and spreading of the Italian methods and technology in the reference market. These actions will come as complex application projects and commercial initiatives, including the participation to trade shows and networking events to support the technical actions.

### **INNOVATIVE CONTENTS OF THE PROJECT**

The project owns an innovative strategy, combining different technical and commercial actions aimed at building a model for business promotion and penetration for the Italian SMEs to operate abroad. These coordinated and synergic actions offer concrete opportunities for the Italian enterprises (manufacturers of materials and technology, suppliers of services catering for analysis, survey, engineering and communication, and the sector businesses) to expand their sales network and prospective customers in the reference market, and to improve the commercial penetration of products and services “Made in Italy”, to which Restoration of cultural heritage belongs by all rights.

The technical and operational actions developed in Italy offer the chance to spread the Italian practices, methods and technology in the third markets, and create virtuous examples of “good practice”. Training actions help build a background of functionaries, technicians, professionals and operators that will be capable of appreciating, using and asking for the peculiar methods of the Italian restoration business.

The partnership with the “International Exhibition of Restoration, Museums and Cultural Business” of Ferrara – the reference trade show for Assorestauo – helps build marketing opportunities in Italy and in the target Countries, and enhance the international appeal of the Italian restoration business.

# Restoration week®

Italian Trade Agency and Assorestauro are glad to present an international event in Italy, the Restoration Week 2022. A week rich of activities and meetings dedicated to the excellence of Italian restoration. The event will be focused on strategic restoration worksites in North Italy along a path from Milan passing through Modena, Ferrara and Venice. During the week, the audience will have the opportunity to take part in virtual tours in restoration sites and attend to live streamed conferences.





## Milan

Monday 6<sup>th</sup> June

9:30 to 12:00 am<sup>GMT+2</sup>

**VISIT TO:** The Shoah Memorial of Milan, Central Station

2.30 to 5:30 pm<sup>GMT+2</sup>

**VISIT TO:** Visit to Abbey of Santa Maria di Rovignano (Chiaravalle Abbey)

## Ten Years from 2012 Earthquake

Tuesday 7<sup>th</sup> June

9:30 to 12:00 am<sup>GMT+2</sup>

**VISIT TO:** Visit to Pio's Palace in Carpi (MO)

2.30 to 5:30 pm<sup>GMT+2</sup>

**VISIT TO:** Polirone Abbey in San Benedetto Po (MN)

## Ferrara

Wednesday 8<sup>th</sup> June

### Salone internazionale del Restauro "International Restoration Exhibition" at the Ferrara Fiere

Workshop for the presentation of Country Projects organized by Italian Trade Agency within the promotional project "Restauro Made in Italy"

2.00 to 6:00 pm<sup>GMT+2</sup>

#### CONFERENCE:

*The LANDSCAPE IN ITALY planning, protection, sustainable development.*

Curated by the Technical and Scientific committee of Assorestauro and Salone del Restauro

5.30 to 7:30 pm<sup>GMT+2</sup>

**VISIT TO:** Ferrara Cathedral, Cathedral of Saint George the Martyr (Duomo di Ferrara)

## Ferrara

Thursday 9<sup>th</sup> June

### Salone internazionale del Restauro "International Restoration Exhibition" at the Ferrara Fiere

Workshop for the presentation of Country Projects organized by Italian Trade Agency within the promotional project "Restauro Made in Italy"

2.00 to 4:00 pm<sup>GMT+2</sup>

#### CONFERENCE:

*Reconstruction and new skills 10 years after the 2012 earthquake.*

Curated by the Emilia-Romagna Region Agency for Reconstruction and Assorestauro

## Venice

Friday 10<sup>th</sup> June

10:00 to 12:30 am<sup>GMT+2</sup>

**VISIT TO:** Diedo Palace, Canareggio

2.30 to 5:30 pm<sup>GMT+2</sup>

**VISIT TO:** Doge's Palace (Palazzo Ducale), San Marco



## MEMORIAL OF THE SHOAH IN MILAN. A PLACE FOR COMMEMORATION AND KNOWLEDGE

Tania Ghensi,  
Assorestauro  
Ing. Antonio Allegrini,  
P.M. DE MARCO S.r.l.

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### THE PLACE: THE CENTRAL STATION OF MILAN

The Shoah Memorial is settled in the area below the platform level of the Milan Central Station: it is in this hidden place that, between the end of 1943 and the beginning of 1945, Jews and political opponents were deported to Nazi concentration camps and annihilation.

The history of the Central Station begins thirty-one years before this tragic event, in 1912, when the first prize was awarded to the project "in motu vita" by the architect Ulisse Stacchini for the construction of a new train station for the city of Milan. The main aspect of this innovative project was the double intended use, deliberately kept separate: in the elevated area a place for passengers only while, at street level, an area for freight transport; it is thanks to this distancing between the parties that it was possible to carry out these atrocities without affecting the daily life of the rest of the population.

### PURPOSE OF THE PROJECT

The main objective of the project, by Morpurgo de Curtis Architetti Associati, is to transform the place, initially disused and then abandoned towards the end of the 90s, into a space for reflection and re-elaboration placed in close dialogue with the city. The Shoah Memorial is conceived as a large "lantern" visible from the outside; walking along Piazza Edmond Jacob Safra (Fig 1) it is possible to look out to observe, through the windows in front of the original open gates, the belly of the building consisting of a reinforced concrete frame left exposed. What was once introverted and hidden today has undergone a turnaround: the spaces reveal themselves for what they have become in such a way as to openly declare what has happened while offering places for research and re-elaboration.



Fig 1. Piazza Edmond Jacob Safra and the entrance to the Shoah Memorial (ph. Andrea Martiradonna)

Fig 2. Entrance hall with the Wall of Indifference, first installation of the Memorial path (ph. Andrea Martiradonna)

In a first phase, therefore, a project was carried out with respect to the internal spatiality and materiality: non-original partitions were demolished and the structure was stripped of a thick layer of plaster that covered all the internal surfaces; over the years, in fact, the spaces had changed in order to satisfy the new uses of the premises. The concept of memory serves to set new foundations for the present, therefore the future, for this reason we cannot speak of a simple museum but this place must be read both from the point of view of memory and narration and as a laboratory of memory: from on one side we have the story of the events, thanks to a path that connects the places of the events, while on the other side a workshop space in which citizens can participate. The place of knowledge is conceptually kept separate from the one aimed at active re-elaboration, but they remain in continuous visual relationship thanks to the demolition project of part of the slab and relative pillars outside the path of the actual memorial, capable of restoring new foundations towards the square; this operation made it possible for the memorial to dialogue with the space of the city. The project is deeply rooted in the place thanks to permanent installations, including the library and the auditorium, capable of communicating with the existing structure. The old is deliberately distanced from the new, with the aim of preserving the original structure of the places and making it eloquent thanks to forms and materials in a continuous relationship between history and those who cross and will cross. All the interventions can be considered as operations capable of making the history of the station legible. What the architects wanted to maintain is a correspondence between form and content, possible only through the clarity of the additional architectural elements. The latter were made with materials contextual to the place but recognizable from the originals thanks to the different treatment methods: the rooms are obtained through the use of iron, concrete, wood and train ballast with, in addition, the glass that highlight the gap from the original materials of the station. These transparent slabs, in addition to acting as a security and delimitation system, also have a strongly symbolic character with the invitation to visitors not to take their eyes off but to carefully observe the places of memory.



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Fig 3. Connection between the two levels of the Central Station: space used for the elevation of the wagons (ph. Tania Ghensi)

Fig 4. Deportation quay and freight wagon (ph. Andrea Martiradonna)

Fig 5. Place of reflection (ph. Lorenzo Taccioli)

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## THE MEMORIAL

The space of the Memorial, intended as a place of shared memory beyond the story and remembrance, is capable of involving people on multiple sensory fronts: the sound plays a fundamental role as the structure was conceived as a large chest capable of emphasizing and propagate the noise of trains departing and arriving at the upper level. It develops between the second and fourth spans of the ground and raised floors, which are connected to each other by a ramp that runs along the Wall of Indifference (Fig 2); from here begins a journey that touches the pivotal points of the complex spatial system in such a way as to make clear the story of the events. To understand the functioning of the machinery that allowed the movement of the wagons, the observatory was designed: this installation allows people to view videos, made by the Istituto Luce, which show the manoeuvres performed by both the moving wagons and the lift. From the raised floor of the Memorial it is possible to see the upper floor of the Central Station through a gap in the attic between platforms 18 and 19 (Fig 3); once raised, all the wagons were hooked together and subsequently connected to a motor vehicle that allowed them to leave for Auschwitz-Birkenau, Mauthausen and other extermination and concentration camps, or to the Italian collection camps such as those of Fossoli and Bolzano. Going along the first of the two platforms (Fig 4), which still has the original pavement, you reach the so-called “track towards an unknown destination”, above which there are original goods wagons restored and donated by the State Railways. At the end of the itinerary, a place for reflection was also created (Fig 5) to give visitors the opportunity to rework what they saw along the way.

Fig 6. Access walkway to the Memorial area - View of the South Prospectus of the Library

Fig 7-8. Library - Internal area, West elevation on three levels (basement, mezzanine floor, ground floor)

## THE LABORATORY OF MEMORY

The “Laboratory of Memory” is a place for study, research, comparison and spaces suitable for hosting meetings and exhibitions. The Works of the Completion Works of the Library, which included the windows, the iron works and the wooden furnishings, were conducted by DE MARCO S.r.l., the Assignee Company of the Contract represented by the Administrator geom. Pasquale de Marco. The large library area, thus completed, is configured as a large shell consisting of the skilful combination of metal structures and large glass slabs (Fig 6) inside which the wooden soul of the birch bookcases that unfold on three levels shows off walkways and illuminated by a sophisticated home automation lighting system (Fig 7-8).





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Given the importance of the commemorative context in which it was going to operate, so steeped in memories and meaning, the company had thought right from the tender stage to propose a shipbuilding system that would not only act as a “semi-opaque” protective screen but also as a means of dissemination and remembrance. Thus, the construction site communication project was born, shared with the Foundation of the Memorial of the Shoah in Milan, intended as a series of transparent windows on the working areas with graphic representations and didactic, that placed the accent not only on memories but also on the shared spirit of solidarity, participation and peace.

Eng. Valerio Arienti as Director of Works, in concert with the Responsabile of the work Arch. Andrea Costa periodically proceeded to check the conformity of what was achieved with respect to what was prepared by the architectural design entrusted to the Morpourogo de Curtis Architetti Associati studio which also assumed the role of Artistic Direction, on the other side the global work of was conducted and coordinated, on the company side, by Eng. Antonio Allegrini as Project Manager.

Fig 9. Library - Bracketing system made to measure and laser cut to house the customized light fixtures. Wooden masking top containing plant backbones and electrical equipment from which, through prepared slots, the exit of the water mist nozzles relating to the sprinkler fire-fighting system is guaranteed

Due to the criticalities dictated by the particular logistics of the intervention sites as well as by the limited load capacity of the stalls isolated from the pre-existing structures, and characterized by a system of dampers in order to contain the induced vibrations, the need emerged on the part of the Company to design and install a composite system of overhead cranes suitable for the movement of large windows in order to cope with the limited space for manoeuvring as well as pursuing the preservation of the glass elements, while responding to the maximum safety and protection constraints of the workers. Therefore, taking advantage of the existing natural supports, large "L" -shaped structures in welded and subsequently removed metal sections were installed in a completely reversible manner, placed on the reinforced concrete capitals and on the perimeter roof beams of the constituent metal structure the skeleton of the Library. Industrial metal profiles were welded to the aforementioned "L" which acted as imposing bidirectional sliding rails, on which a winch system connected to an electric suction cup handler with very high lifting

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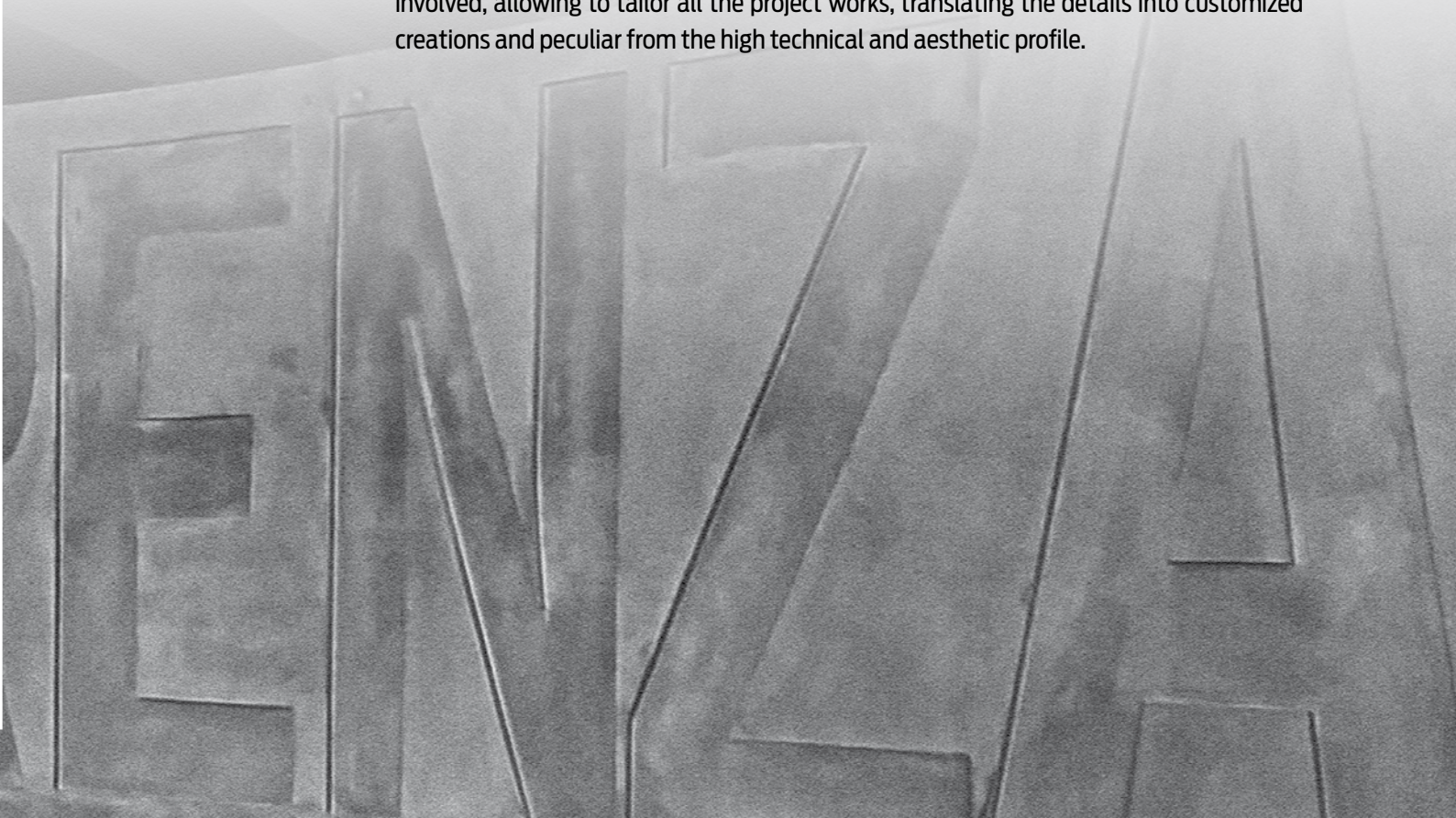
Fig 10. Library - Existing staircase behind the west wall. The large windows housed between the metal pillars, the sheet metal roofing elements with insulating panels as well as the entire electrical and lighting system were created.

Fig 11. Library - The majestic South Door created using a sophisticated structural system where the metal rotation axis is directly connected to the large window through articulated screws (rotules) with a high load capacity. The sheets also underwent an HST treatment - Heat Soak Test - to reduce the likelihood of spontaneous breaking of the glass.

load capacity was installed, in order to guarantee the vertical translation of the glass panes is safe.

The fire-fighting system created for the library area, unlike those present in the other rooms of the Memorial, is made up of a sophisticated water-mist nebulization system with a pressure of 120 bar, designed in order to preserve the integrity of the 45,000 volumes on display and electrical and electronic equipment. In fact, the special water mist nozzles (Fig 9) which constitute the architectural and plant terminals of the mechanical distribution system, allow the evaporation of water by increasing its volume incrementally, thus inducing a rarefaction of the oxygen present in the air, avoiding damaging the protected property compared to other extinguishing agents, ensuring the positive effects of cooling, inertization and separation effect. Furthermore, the work involved the installation in small spaces of an impressive pressurization unit lowered into the external technical compartment, below the road level, with the aid of a crane. The positioning of the technological group was carried out on a horizontal structure in metal profiles and steel grids previously consolidated and enlarged relative to the walkable surface.

The construction drawings translated the needs of the architectural design for the coordination between structures and systems. These drawings were of fundamental importance to create elements that put in synergy the plant and lighting system, the workshop and carpentry works, all necessarily tailor-made. Everything inside the construction site refers to the “macro” staircase linked to the majesty of the dimensions of the iron and glass envelope set inside an even larger “box”, as well as to the imposing staircase (Fig 10) which leads to the colossal South Gate (more than 5 meters high!) (Fig 11). Yet, the work carried out has made it possible to decline the macroscopic scale up to the micrometric scale thanks to the constant technical comparison between all the professional figures involved, allowing to tailor all the project works, translating the details into customized creations and peculiar from the high technical and aesthetic profile.



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## THE CISTERCIAN ABBEY OF CHIARAVALLE. RESTORATION, CONSERVATION AND MAINTENANCE OF THE *CIRIBICIACCOLA*

The present article illustrates the restoration and consolidation intervention applied on the bell tower of the Cistercian Abbey of Chiaravalle, in Milan. Designed by Lorenzo Jurina and Edoardo Radaelli, carried out by the company Cores4n, the project contains innovative solutions in the field of structural conservation of cultural heritage.

### THE ABBEY

The Abbey of Chiaravalle, located at the gates of the so-called Parco Agricolo Sud Milano, is the direct daughter of Citeaux Abbey, and it is one of the first four filia-

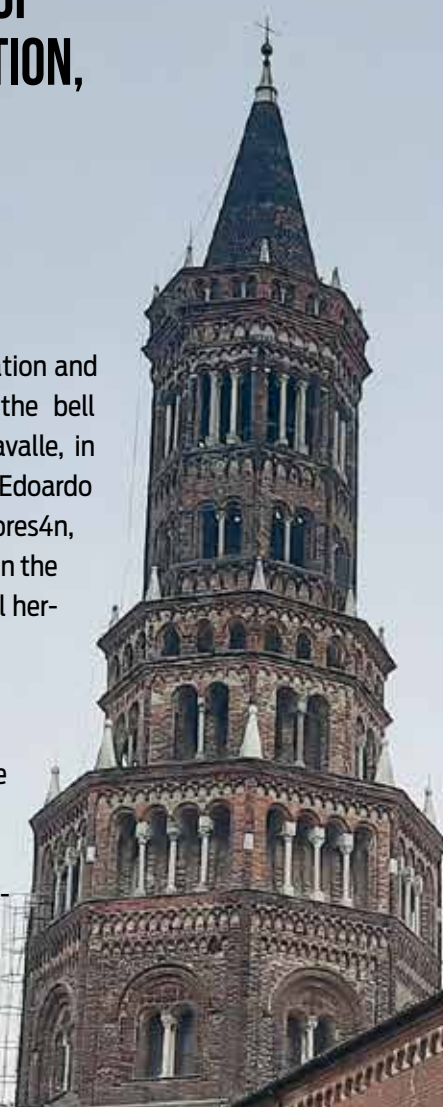


Fig 1. View on Chiaravalle Abbey





Fig 2. The scaffolding of the tower

tions of the Cistercian order. It was founded in 1135 by Saint Bernard on a vast area, originally swampy and uncultivated, located a few kilometers from the Porta Romana area, in Milan. Its construction was financed by the Milanese people through donations and it represents the purely Gothic-Cistercian style, even if, unlike the sisters of Clairvaux (to whom it is inspired and from which it takes its name) and Fontenay, both characterized by massive and square architecture, Chiaravalle Abbey is simple and slender, with its bell tower soaring in the sky. The wise use of proportions, the essentiality of the shapes, and the study of light give to the environments the following result: a combination of beauty and simplicity in a mystical atmosphere. According to the principles of the Rule of St. Benedict of Norcia, the monastic community has played over the centuries a fundamental role in the reclamation and reorganization of the southern territory of Milan. The abbey was the basis for the economic and agricultural flourishing of the Milanese countryside.

### THE BELL TOWER

The bell tower was built two centuries later than the abbey, rising above the tiburium. From the sources, it is assumed the architect Francesco Pecorari as the designer of the tower. The structure is stylistically different from the austere architecture wanted by San Bernardo. In fact, it is made of full masonry and rises to a height of 56.26 meters. The structure transfers the selfweight on the four arches of the tiburium; three of them were reinforced, by changing from circular arches to gothic ones, in order to reduce the horizontal thrusts at the base. Only one of the arches (the frontal one) remains circular, to allow the complete view of the apsis. In addition to the tiburium, which already has a first order of arches, each octagonal area is characterized by arches of various shapes along the entire perimeter, with worked terracotta frames. The two-lights, three lights and four-lights lancet windows on the structure are made of stone elements, originally in Angera stone and Candoglia marble. Some of them were partially replaced over the centuries with other stones such as Beola, Serizzo, Ceppo and decorative cements.

The bell tower is called by the Milanese people *Ciribiciaccola*, a word that in the local dialect describes the characteristic sound that storks emitted when they nested on its summit. A stork, also for more noble reasons, is also present in the coat of arms of the abbey.

Fig 3. Final configuration of the structural reinforcement



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Sezione A-A'



Pianta 1 (+163,34m)

5



Fig 4. Section of the Tower divided into levels to identify the intervention areas

Fig 5. The scaffolding around the Tower

## BRIEF PAST TRANSFORMATIONS AND RESTORATIONS

The bell tower of Chiaravalle has been remodeled several times over time. Between the end of the 15th and the beginning of the 16th century a consolidation intervention was carried out on the arches of the transept, probably due to the inadequacy of the supports which had not been designed and sized in view of the load of such a high tower. The 17th century saw not only the implementation of additions or reforms but also replacements. From the end of the 19th century to the present days, we can mention the restoration and consolidation of the tower in 1905 by Gaetano Moretti together with Raineri Arcaini. The sphere and the terminal cross placed on the upper end of the tower were also removed, repaired, and gilded with bite. This intervention had an aspect of considerable historical-methodological interest, which concerns the theme of the proposed removal of the additions from the 17th century.

The most recent intervention in the 1990s included:

- \_ applications of cement plaster on the upper levels of the bell tower;
- \_ the replacement of a pillar and part of its mullioned window by stone instead of terracotta;
- \_ waterproofing on all overhangs with a bituminous membrane;
- \_ the insertion of bird nets and the replacement of the wooden staircase with a metal one in order to allow an easier access to the different levels of the belfry.

## THE RESTORATION PROJECT

The first phase, carried out in 2018, allowed to deepen the knowledge on the abbey, concerning geometry (a laser scanner survey was done), materials (through a diagnostic and investigation campaign, such as flat jack tests, sonic test) and loads (dynamic recording was performed); a second phase concerned with the static and seismic vulnerability analysis to horizontal loads and the design of the structural and restoration interventions; a final phase, in progress, has to do with the realization of the project.

The structural restoration and consolidation project, conceived and coordinated by Prof. Ing. Lorenzo Jurina and Ing. Edoardo Radaelli, has as primary objective the reduction of the seismic vulnerability of the bell tower.

The tower's restoration and consolidation project is being carried out by the Italian company Cores4n s.r.l., which has been operating in this field for years carrying out restoration and conservation interventions.

## THE SITUATION BEFORE THE RESTORATION

The inspection analysis carried out on the surfaces revealed several problems of the conservation of all materials and the degradation, due to the stratification of black crusts, salt efflorescences and bird droppings, all of considerable thickness, on the architectural surfaces, in addition to the localized decohesion of terracotta and stone decorations.

Inside all the openings it was possible to detect a deposit of atmospheric dirt well attached

Fig 6. Detail of the vegetation growth

Fig 7. Detail of the color change due to atmospheric pollution



Fig 8. Restoration details

to the surfaces. On the original or reconstructed stone elements there were problems of detachment. The stone surfaces were largely broken, with a serious corrosion phenomenon, to the point of not perceiving in some parts the original shape. From a structural point of view was related to the large quantity of openings and the slender of the tower.

## THE RESTORATION PROGRAM

The intervention to secure the surface of the bell tower is of the utmost urgency. The challenge is to cope with the risks caused by the cracking and detachment of substantial pieces of both the stone and terracotta elements of the projecting parapets: they suffer the most from the action of degradation due to atmospheric agents.

The intervention involves works of plastering with mortars and pins, as well as fixing with hoops or metal supports, which concern the Candoglia marble pinnacles, the capitals and stone columns of the parapet and the terracotta arches. The restoration intervention intends to preserve the traces of past restorations and the significant stratifications that have resulted from them, renouncing the integration of missing or incomplete parts, even decorative ones, especially if not necessary from a functional, safety and durability point of view.

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Fig 9. View on the Abbey  
 from the tower



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In the specific material field of the stone elements, the conservation intervention differs according to the type of stones present on the monument. In general, the project provides for all brick, stone and iron material surfaces:

- \_ a pre-consolidation of detached surfaces, followed by a wet cleaning by spraying all surfaces in order to dissolve black crusts;
- \_ a punctual cleaning with compress, application of biocide with a wide spectrum of action by spray and brush;
- \_ a final treatment of metal elements with ferromicaceous products and rust converters.

For the plaster surfaces in correspondence with the overhanging balconies and the broken holes in the terracotta arches, the demolition of the grouting and cement mortar restorations is foreseen. Their consolidation in depth of the original layers, dating back to the restoration phases, has been carried out by injections of consolidating mixtures based on natural hydraulic lime free from salts while the grouting and sealing have been made with natural hydraulic lime mortars, cocciopesto powder and sands, like the originals.

## PROJECT SHEET

Chiesa di Santa Maria di Chiaravalle – Comunità monastica dell'Abbazia di Chiaravalle – abate padre Stefano

### *Designers*

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Edoardo Oliviero Radaelli.

*Consultant for the restoration project*  
Paola Bassani

*Company*  
Cores4n

*Restoration project financed by*  
MIC – Ministero delle Cultura

*Soprintendenza per la Città Metropolitana di Milano:*  
arch. Antonella Ranaldi  
arch. Paolo Savio

## STRUCTURAL INTERVENTION

Thanks to a structural numerical modeling, it was possible to recognize the weaknesses and the main fragilities of the monument under normal conditions and, in case of seismic actions, to design the structural intervention. The walls of the Tower appear uneven, due to the many alterations that the structure has undergone over the centuries, as demonstrated by the results obtained from the sonic investigations. The bell tower suffers from structural deficiencies from a seismic point of view, due to its high slenderness and rather empty geometry, which make it vulnerable to horizontal loads. Locally, at different levels, the presence of masonry elements near to detachment has been identified, together with significantly eroded stone columns, with very low residual strength, and oxidized iron elements that do not guarantee the necessary structural security. To reconcile the structural needs with the criteria of non-invasiveness, lightness, and reversibility of the intervention, (essential to preserve the historical-architectural authenticity of such an important monument) it was decided to insert, inside the tower, a light structure in steel cables. This system offers a confinement action and it works as a three-dimensional bracing structure, collaborating with the masonry of the tower. It is a parabolic hyperboloid post tense structure, a sort of "hourglass", composed of inclined cables. In case of seismic event the structure will get a compression of the masonry, on one side, and a tensile action in the cables, on the opposite side. The choice of cables was made because of their resistance, effectiveness, and their ability to guarantee an adequate ductility to the structure, but also for the reduced perceptual impact for the visitor.

## CONCLUSION

The project, of extreme innovative character, faces some conservative and structural criticalities adapting new technologies and studies to in-depth analysis and preliminary investigations. With this intervention, the company Cores4n s.r.l. has acted specifically on every material of the bell tower respecting its historicity and following the principle of non-invasiveness and developing the action of consolidation and restoration in compliance with the criterion of reversibility.

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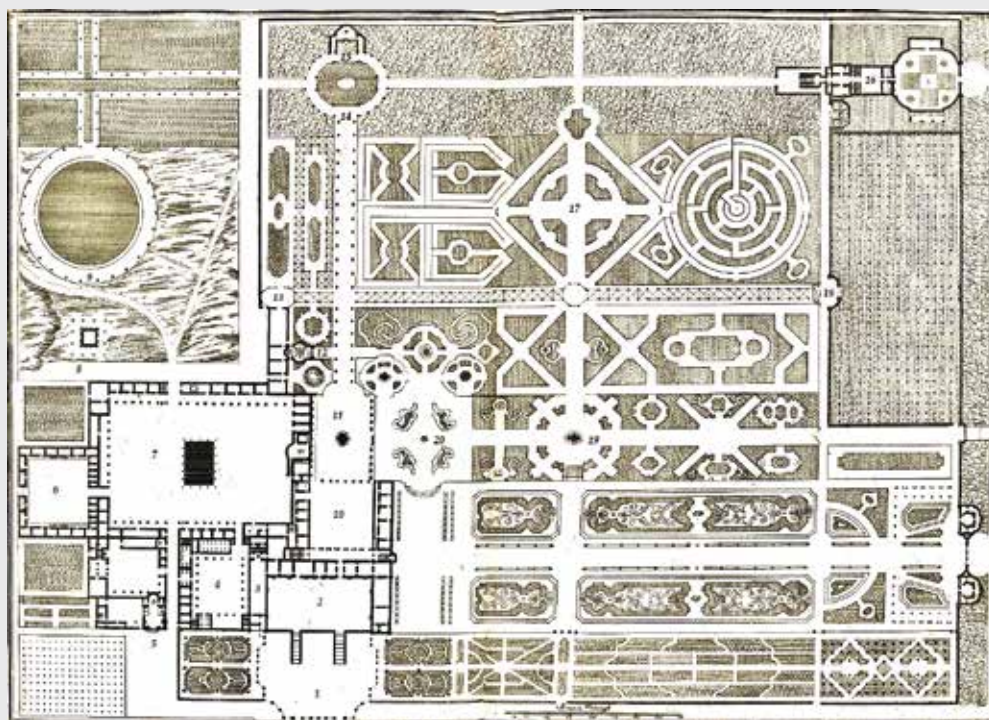
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Fig 10. View of the tower from  
the internal courtyard



1



Sonia Vallese  
Technical Director  
Assorestauro

## BETWEEN PAST AND FUTURE OF AN ITALIAN LEISURE VILLA. THE RESTORATION OF VILLA ARCONATI GARDENS

### WHERE ART MEETS NATURE

Starting from the sixteenth century, the Lombard nobility, thanks to a favourable economic development and political calm, began to design le ville di delizia, holiday resorts in locations outside the cities, along rivers or in hilly areas, that offered a healthy environment far from human presence. The countryside around Milan is rich in a heritage of architecture and gardens that tell us about a sumptuous lifestyle but in search of contact with nature. Villa Arconati is one of the historic villas of the Groane Park, located in Bollate, on the outskirts of Milan. Originally born as an agricultural centre for the management of the surrounding countryside, after the purchase of the property by the Arconati family, great art lovers, the area is transformed. In 1621 the owner Galeazzo Arconati, after returning home from Rome, organized the integrated planning between villa, landscape and garden, based on examples of Roman and Florentine villas, introducing theatres and water games inspired by the studies of Leonardo da Vinci. The villa becomes a so-called delizie used as a residence in the summer and for the hunting season, to welcome illustrious guests and spend these moments of leisure.

The garden of Villa Arconati was conceived since its construction as a monumental Italian garden (Fig 1). Here we find sculptures showing the classic myths, a geometric subdivision of spaces through rows of trees and hedges, gushing water fountains, berceaux, theatres



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Fig 1. The complex of Villa Arconati from an engraving by Marcantonio Dal Re 1743

Fig 2. Gioco Maestro - The Water Tower behind the orangery which allows the fountains in the garden to function

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*The spectacle of the fountains in the garden was provided by the “noria”, a water wheel that took water from the aquifer below the ground, operated by a winch moved in turn by a horse, according to a system also used for mills. The water was thus raised inside the so-called “Gioco Maestro” a tower still present today at the end of the courtyard, placed in the most favourable position to serve the functioning of all the other fountains through pipes (Fig 2).*

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and dining areas. However, the most important element of the park remains the water: used to irrigate the park’s vegetation and for the pleasure of the nobles; there are numerous water features inside the park with the task of refreshing and enlivening the walks.

## **THE RESTORATION OF THE GARDENS**

After centuries of lustre, the villa at the end of the 1900s experienced a moment of decline, but from the early 90s a new course began: the Villa and the Garden, acquired by the Palladium Group company together with other partners, in 2011 became the headquarters of Augusto Rancilio Foundation. Today the foundation is engaged in an important project of recovery and cultural reconversion of the structure. The huge 12-hectare garden that houses 40 statues needs constant protection and maintenance work, so the Foundation has entrusted the management of the gardens with a five-year contract to the Magistri srl company, led by the Restorer Eros Zanotti. The recovery interventions followed the principles of conservation and revaluation of the original. The restoration of materials and artifacts whose deterioration made conservation impracticable, followed the line of formal reconstructions to recover a critical reading of the particularly valuable decorative elements, intervening only where a structural improvement was necessary.

Focus on restoration: The scenic backdrop of the Diana theatre with the Tritons fountain  
Diana’s theatre represents the scenic backdrop at the end of the main path inside the park of Villa Arconati. Together with the water features of the Tritons fountain, they create a unique space in the garden (Fig 3). Although belonging to two designs distant in time, the fountain was in fact one of the first works built in the garden (1610), these two structures have been in dialogue for centuries and have come back to light together thanks to the restorations of recent years.

The theatre consists of a hemicycle with three niches with a tympanum embellished with inscription and terracotta vases and festoons. The main figure is Diana, who dominates

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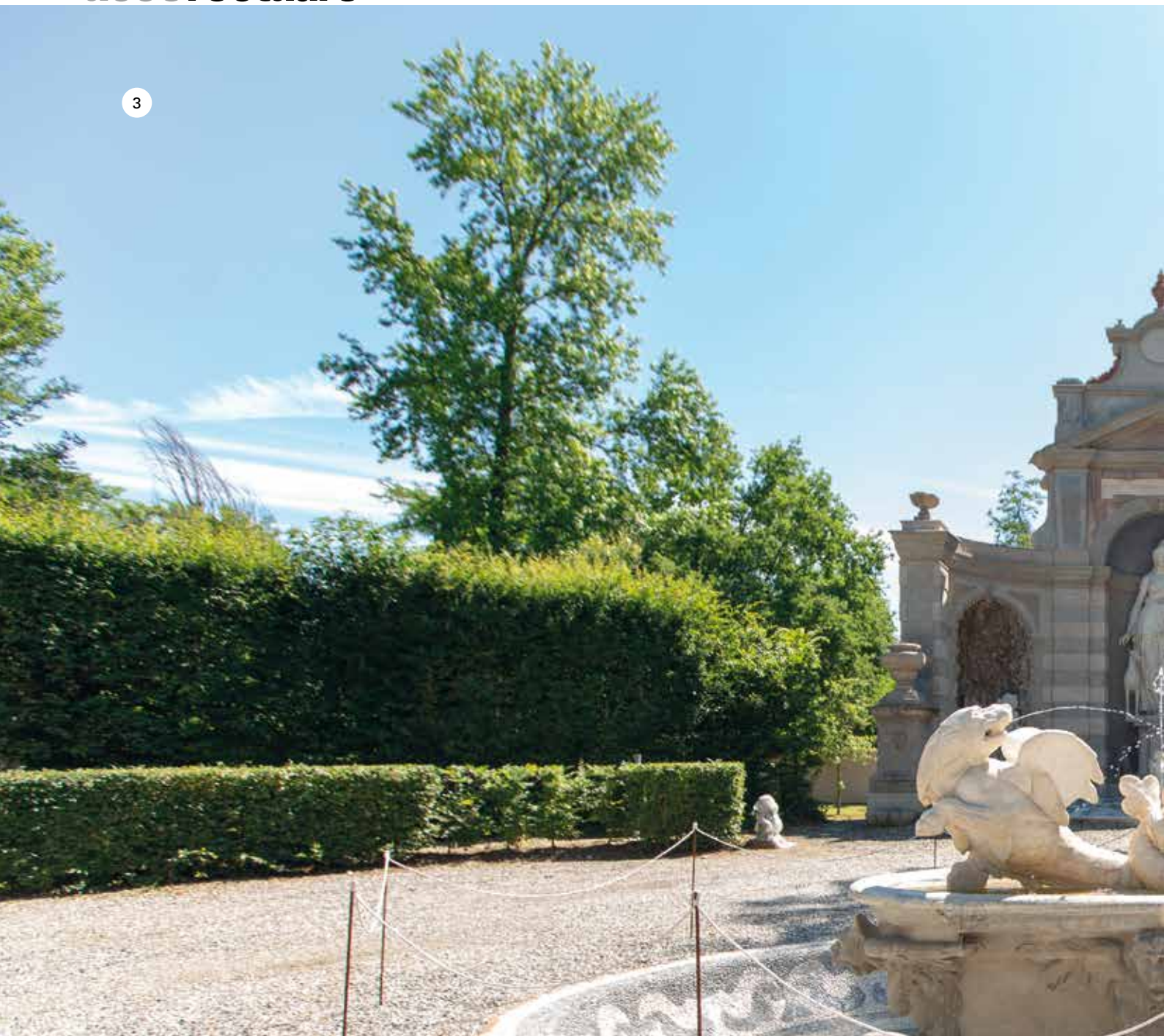


Fig 3. The scenic backdrops of Diana Theatre with the Tritons fountain

the theatre with her imposing height. On either side of her are her maids, lying in tuff caves, flanked by dogs, to remind us of her nature as a hunter. On the two-tone cobblestone floor in the centre there is a shell that houses the figure of a putto. The theatre embraces the square with the fountain surmounted by two Tritons whose upper basin is supported by four Erinyes, evil demons dating back to the Greek tradition (Fig 4).

The conservation required a philological approach that restored the integrity of the reading to the monument that had been lost for some time (Fig 5).

The heterogeneity of materials including marble, terracotta, Lombard ceppo stone, bricks, river pebbles, and plaster has required the use of multiple methods for cleaning surfaces, which have been exposed to the weathering for centuries. The cleaning phase was tackled



by carrying out tests on the various lithoid types with different products, such as surfactants and neutral detergents and precision mechanical instruments (Fig 6). The restorers finally opted for a combined approach with biocide and highly selective and delicate enzymatic product (Fig 7). This has been shown to effectively remove biological patinas, thanks to its property of discriminating between the material constituting the support and deposits extraneous to the work. The cleaning was then finished with a localized microaeroabrasion on the most coherent deposits placed in the areas most protected from washout. It was also necessary to reactivate the water system of the water features, in fact the Tritons fountain never actually worked since the upper tank had a predisposition for the nozzles but without the drilling. Over the years, many details have been lost, especially



Fig 4. Overview of the Diana Theatre

Fig 5. The Diana Theatre. Detail of the Dog sculpture before and after the restoration

Fig 6. The Diana Theatre. Detail of the Diana's head sculpture during the diagnostic phase

Fig 7. The Triton fountain. Application of the enzymatic product Nasier Gel

Fig 8. The Triton fountain. Excavation phase below the main tub

on most of the bottom of the pool, where the decorative motif made of black and white cobblestone was extremely fragmentary. It was necessary to act both at a structural level, consolidating the fragile elements, and at a technological level by inserting new hydraulic pipes and reconstructing the surface of the tank above it with the two-tone cobblestone design (Fig. 8). The entire statuary was then micro-grouted and reintegrated with hydraulic lime-based mortars, composed of aggregates of colour and grain size similar to the original and where necessary with the use of stainless-steel pins and chemical anchor. Nowadays in addition to the restoration project, the Augusto Rancilio Foundation promotes cultural activities in the Villa, such as the Festival of Villa Arconati-FAR and guided tours, once again giving it the status of Regia Villa, guardian of history and knowledge, meeting place, of celebration and culture.

Villa Arconati is a multifaceted place far from the main tourist circuits, therefore absolutely to be discovered. ([www.villaarconati-far.it/eng/](http://www.villaarconati-far.it/eng/))

To learn more about the project, an interactive portal is online where you can follow the restorations of the Villa Arconati step by step and discover curiosities about the sculptural works of the park. ([www.villaarconatimagistri.com/](http://www.villaarconatimagistri.com/))

And a new website and newsletter to follow all the activities of the Magistri srl restoration company. The website has an important value both from a documentary point of view and as a fruition of the artistic heritage and restoration interventions also for the “non-experts”. ([www.en.ilgiornaledelavori.com/](http://www.en.ilgiornaledelavori.com/))





07 JUNE  
TEN YEARS  
FROM 2012  
EARTHQUAKE



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## A SET OF LINKED EXTRAORDINARY BUILDINGS. THE PIO'S PALACE AND ITS RESTORATION

### INTRODUCTION

The Pio's Palace, or castle, in Carpi (Fig 1) has a particular configuration due to an incredible construction stratification of different periods -between XI and XIII centuries-. It is located between the main Renaissance longitudinal square Piazza dei Martiri, on the west side, and the gothic one, medieval heart of Piazzale Re Astolfo, on the east side, in the city historical centre.

Fig 1. Pio's Palace facade  
on Piazza dei Martiri.  
Source: Wikipedia



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Apparently uniform thanks to the Renaissance facade, the East side is articulated in the addition of the sixteenth century to the north and by the so-called “Stanze del Vescovo” to the south, that connects the central part to the “Torrione degli Spagnoli”. Specifically, it is composed of a set of buildings of medieval style (the crenellated tower of Passerino Bonaccolsi), Renaissance one (the cylindrical Uccelliera, the long facade, the tower of Galasso Pio at the left end) and seventeenth-century ones (from this period it is the Clock Tower). The building consists in over 160 meters along the front of the building on the Piazza dei Martiri and over 14,000 square meters of surface area of the building, which include courtyards, arcades, terraces, frescoed rooms, a chapel, but also offices, conference rooms, exhibition rooms, all concentrated in three museums, an archive, a library and the Children’s Castle, a structure equipped for the activities of the youngest.



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## RESTORATION WORKS

Currently two important operations are taking place in the palace. Both of them are financed by the Municipality of Carpi and by Regione Emilia-Romagna. They follow a cycle of interventions started after the earthquake of 2012 with the aim to consolidate and give a new and longer life to the ensemble of buildings. Relevant has been in the past years the structural reinforcement interventions of the roofs, while at this time the focus is on surfaces, frescoes and paintings. Two important Italian leaders in the restoration and material diagnostic sectors are working towards this goal: Cooperativa Archeologia and CMR (Center Material Research).

The first operation has been conducted by CMR in order to provide to Cooperativa Archeologia the informations necessary to elaborate the most correct and appropriate intervention, according to the existing materials and their conservation state. Using very high precision instruments, CMR proceeded to take numerous samples and analyze their state of consistency and conservation in the laboratory. Samples have been taken from the Pio's Chapel, from the "Stanze del Vescovo", from the "Sala Cervi" and "Sala Mori", such as in the "Torrione degli Spagnoli", where also structural analysis have been done.

In particular, the analyzes carried out were the petrographic study on a polished section in reflected light and/or on a thin section to identify the nature and composition of the plasters; study under a polarizing microscope in reflected light with a shiny cross section, to identify the succession of the layers present; study under the scanning electron micro-

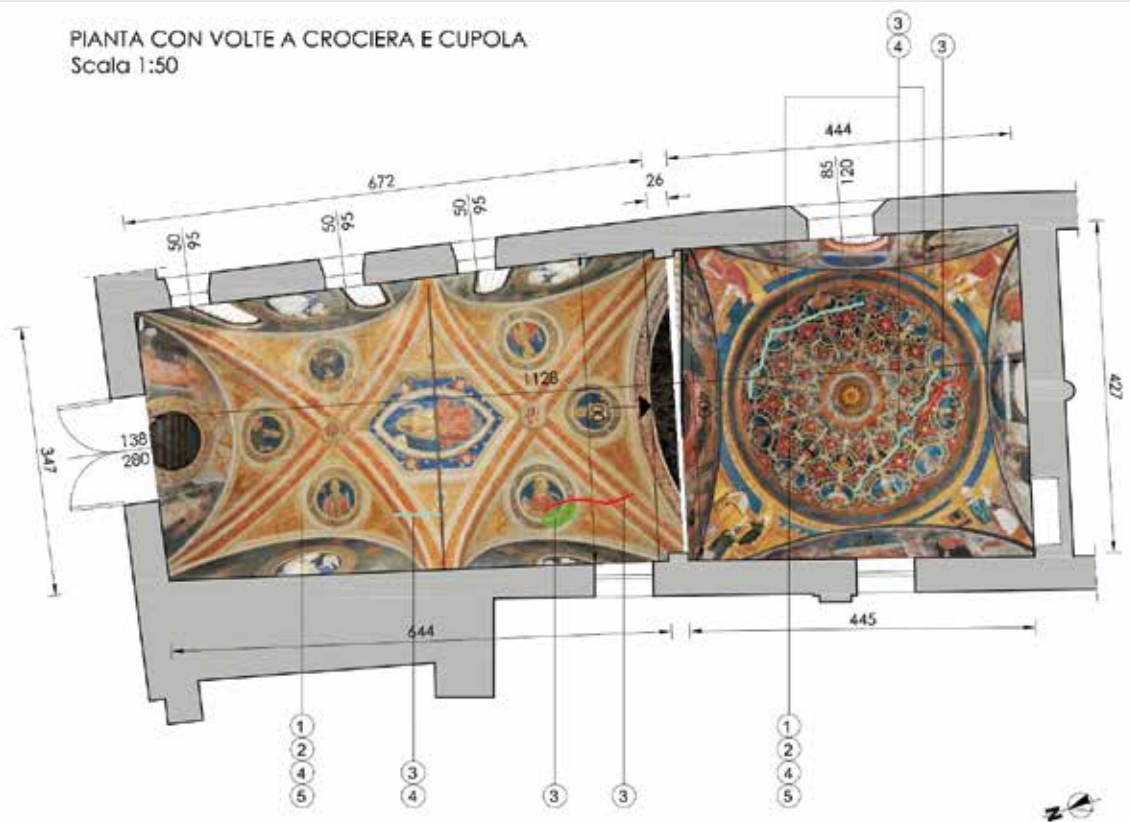


Fig 2. Observation of the shiny sections obtained after incorporation of the samples with the SEM EDS EM-30AX scanning electron microscope by Coxem by GMR

Fig 3. Plan of the Pio's Chapel. Source: Cooperativa Archeologia

scope (SEM) accompanied by elementary chemical microanalysis of the electron microprobe in energy dispersion (EDS) on a shiny section to identify the type of inorganic elements present in the stratigraphic package (Fig 2); infrared spectrophotometric analysis (Fourier transform) in FT-IR: in order to identify and determine the nature of any organic substances and finally the soluble salts analysis.

Following the preliminary analysis conducted by CMR, a second step has been started: the restoration and consolidation of the frescoed walls of the "Sala della Dama", "Cappella del Pio" and of the Passerino tower led by Cooperativa Archeologia who won the contract for those fundamental works.

The Pio's Chapel is characterized by small room with a typically Renaissance decoration. It consists in a rectangular nave with a cross vault and a square room with a dome that has the presbytery role (Fig 3). The frescoes cover all the walls and vaults and show episodes from the life of Christ and Mary, to whom the room is dedicated. They are made by Bernardino Loschi in 1511, with stylistic modules that are they refer to the late fifteenth-century Lombard and Po Valley pictorial tradition of Mantegnesque ancestry. These frescos presents some plaster cracks or detachments that will be first of all pre-consolidated (Fig 4), then cleaned (Fig 5), the fragments will be re-attached and the missing parts reintegrated following the principles not to make unrecognizable antiquated imitations.

The "Sala della Dama" located in the "Torre del Passerino" on the cour d'honneur, has frescoed decorations on the walls and on the cross vault made by an Emilian artist dating



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Fig 4. Plaster consolidation of the Pio's Chapel by Cooperativa Archeologia's team of experts

Fig 5. Surface cleaning of the Pio's Chapel by Cooperativa Archeologia's team of experts

Fig 6. Surface cleaning of the "Sala della Dama" by Cooperativa Archeologia's team of experts

Fig 7. Plaster consolidation of the "Sala della Dama" by Cooperativa Archeologia's team of experts

Fig 8. Plaster consolidation of the "Stanze del Vescovo" by Cooperativa Archeologia's team of experts

back to the fifteenth century. Here the figures of a lady riding an horse and another under a canopy stand out: they are interesting for the references to courteous themes widespread between the fourteenth century and fifteenth century. From ancient documents it appears that the room was the cubicular room (the bedroom) of the noble apartment. In fact it seems that two characters represented in the vault, a woman with a head veiled in white and a man with all the characteristics of the lord, are Lionello Pio and Caterina Pico, parents of Alberto III Pio. In this small, but astonishing, room part of the frescoes are missing and have been plastered with a neutral tone. The ongoing restoration works are focusing on the fresco areas with extreme accuracy. They are proceeding with a pre-consolidation of the support, with the removal of incoherent deposits, surface cleaning (Fig 6), reestablishment of detachments and fragments on the wall support (Fig 7), grouting of cracks and edges and at the end reintegration of lacks of paintings with the "velatura" and "rigatino" techniques. These operations will bring back to shine and to a fulfill appreciation the beauty of this room of the noble apartment.

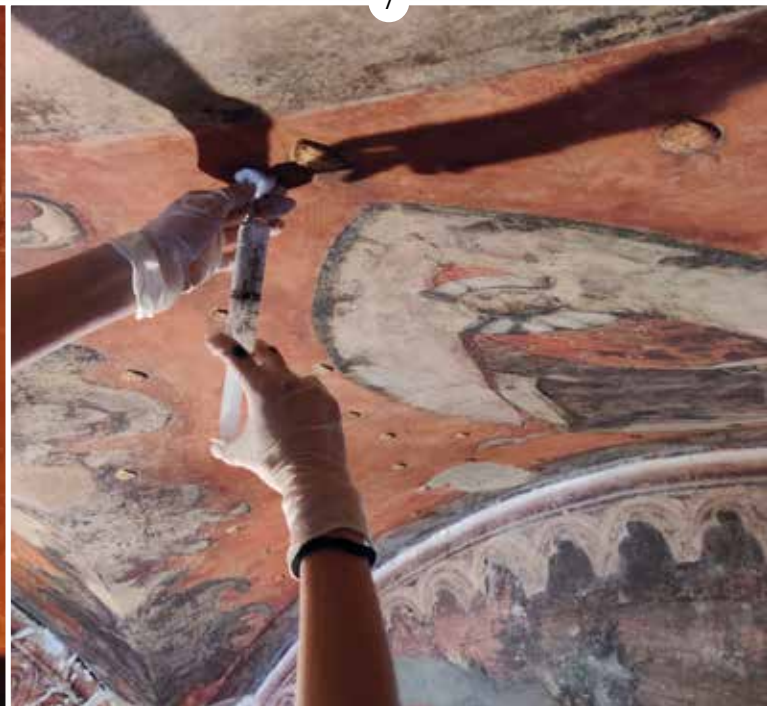
But Cooperativa Archeologia also worked on the surfaces restoration of the "Stanze del Vescovo", a work already terminated, where they brought to light the mainly neoclassical covered frescos that have not been visible and appreciable for years (Fig 8). In these rooms, indeed, the stratigraphic tests conducted, have discovered the ancient frescoes and paintings that have been restored by removing the different more recent polychrome white-washing, bringing these rooms back to their maximum splendor.

The richness of the Pio's Palace proved by the elaborate sequence of rooms, arcades, towers, courtyards and by the wide range of finishing techniques. Cooperativa Archeologia and CMR separately approached the building for more informed works, but they were joint together by the same purpose. The perfect conservation of these irreplaceable palace (or castle) will definitely help to rediscover the building by future visitors and previous ones who will re-visit and use the spaces.

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## SAN BENEDETTO IN POLIRONE ABBEY. POST-EARTHQUAKE REHABILITATION DESIGN WITH BIM MANAGEMENT SYSTEM

### ABSTRACT

The abbey of San Benedetto in Polirone (Fig 1), founded in the 11th century, has been undergoing restoration work since 2006. In 2012 an earthquake happened, and it hit the worksite of the complex's last wings. It caused extensive damage that made it necessary to plan a further seismic and large-scale recovery campaign. Since then, there have been several phases of work, and to date, the seismic repair and improvement phase of the cloister Dei Secolari, the heart of the former monastery, is about to be completed.

On this occasion, innovative operating methods are tested, such as the laser scanner survey and the BIM technology, utilized to represent the condition of things and the recovery and restoration project of the monastery.

This operating model can be applied to similar cases where the intervention on large portions of cultural heritage.

#### *Design Process*

Architecture and  
Engineering design:  
Studio Berlucchi

MEP design:  
Caratti Engineering

#### *Building Process*

Marmioli S.r.l.  
S.I.E.L. Impianti S.r.l.

### HISTORICAL FRAMEWORK

Tedaldo di Canossa, Count of Mantua, founded the abbey in 1007 by donating land between the Po' and the Lirone rivers to the Benedictine monks. Later, his niece, Matilda di Canossa, donated the monastery to the pope, who was decisive in making the monks adhere to the reform of Cluny, and the place thus acquired an architecture inspired by the



customs of the French monastery. The abbey hosted Matilda's tomb from 1115 to 1632, at which time the burial was sold to the Vatican. Today it is St. Peter's in Rome that lodges her tomb. During the medieval period, it became an important center for the transcription of ancient manuscripts.

After a period of decline, the monastery became part of the congregation of Santa Giustina da Padova which relaunched its centrality in the cultural and humanistic life of the time. The monastery saw periods of great crisis between the seventeenth and eighteenth centuries caused by continuous floods and looting until the arrival of Napoleon in Italy, who suppressed it. So, the abbey lands were split and sold to private businesses, interrupting the almost millennial continuity of the monastery.

The cloister of the Secolari (Fig 2), the object of the restoration works described, dates back to the second half of the fifteenth century and underwent baroque renovations in the late sixteenth and seventeenth centuries. In contrast, the access loggia overlooking the square is an eighteenth-century addition.

Today the cloister spaces are utilized for various functions: service areas by the adjacent Polirone museum, a post office, and some spaces used by municipal associations. The recovery of these spaces and their complete return to the community is a crucial aspect since it is a central place in the distribution of the visits to the complex and, at the same time, hosts offices and places available to the city community.

Fig 1. The abbey of San Benedetto in Polirone seen from above

Fig 2. The cloister of Secolari



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## POST-EARTHQUAKE REHABILITATION DESIGN PROCESS: THE CLOISTER OF THE SECOLARI

The earthquake of 2012 mainly damaged the buildings that are part of the south and east wings of the cloister of the Secolari, which the previous restoration works did not involve. Immediately after, provisional interventions were carried out to make the dangerous structures safer in order to prevent further possible collapses, and a campaign to survey the cracks and monitoring helped understand the kinematics in place (Fig 3).

Subsequently, the project of the structural consolidation works of the east wing of the cloister began: the design proceeded to stiff the floor diaphragms and reinforce with concrete floors in correspondence with the vaulted elements. They decided to demolish the partitions built on the first floor that did not correspond to the partitions below. They built new masonry-infilled walls clamped to the perimeter walls and aligned with the wall partitions of the ground floor.

The latest phase of works currently nearing completion involves the previously excluded areas of the cloister itself, and it is in continuity with the interventions previously carried out on the east wing.

From a structural point of view, it aims to solve the local failure mechanisms by providing the building with better box-like behavior. The intervention methods are similar to the previous ones utilized in the other parts of the cloister (Fig 4), and provided for the partial reconstruction of the roof (Fig 5).

Fig 3. Reconstruction of part of the cloister roof

Fig 4. Graphic representation of the post-earthquake cracks survey

Fig 5. Consolidation work on the vaults of the north wing of the cloister

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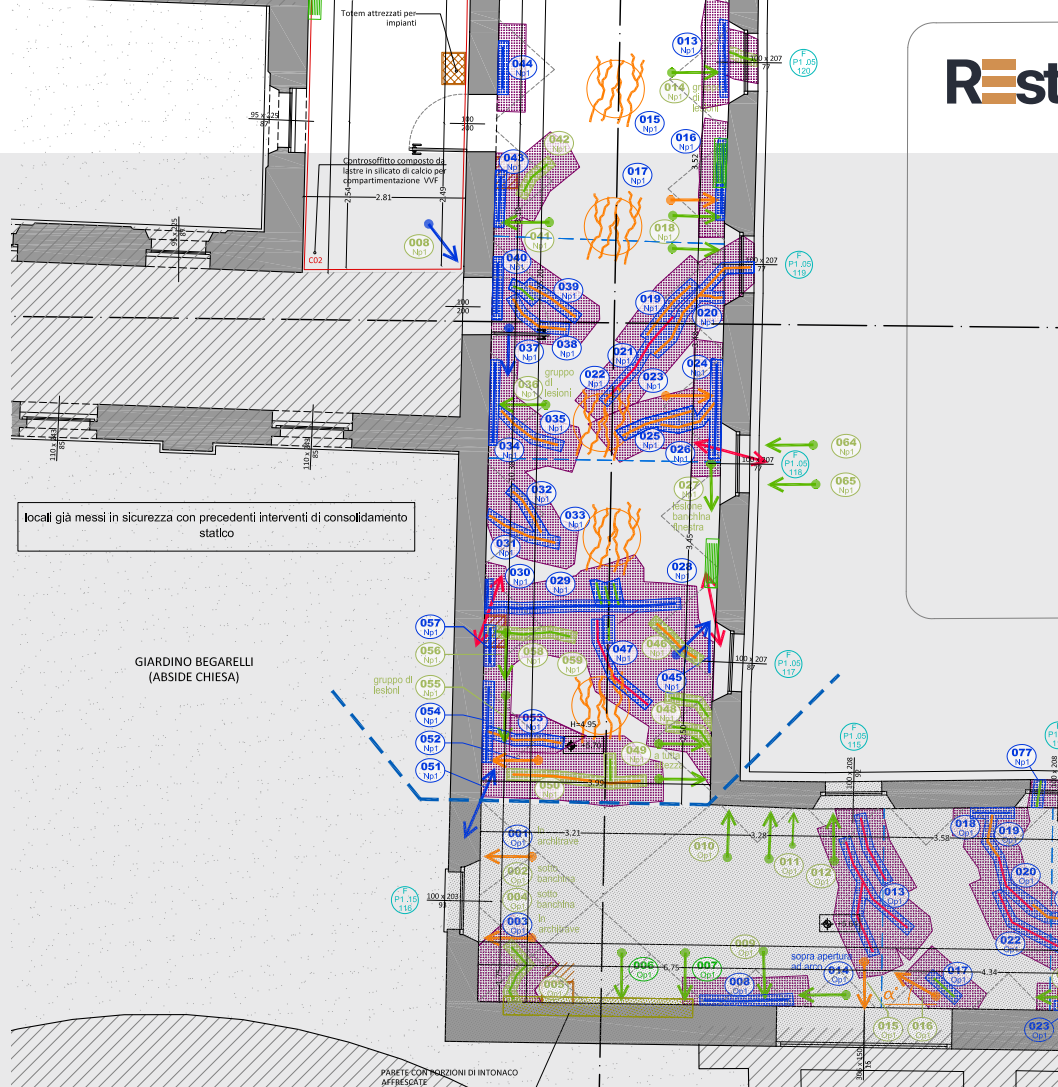




Fig 06. Detail of the procedure for closing a crack on a vault of the cloister

Fig 07. Post-earthquake condition of the vaults

Fig 8. The cloister before, during and after the restoration

Fig 9. BIM model showing design intervention area

Fig 10. BIM model showing surfaces and materials

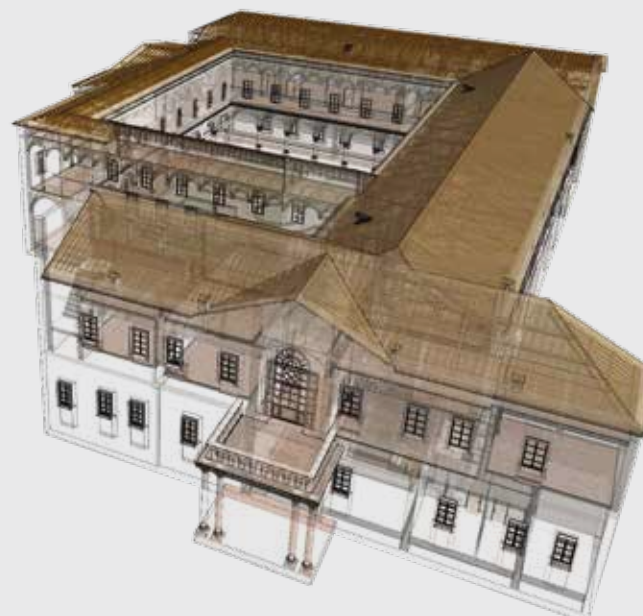
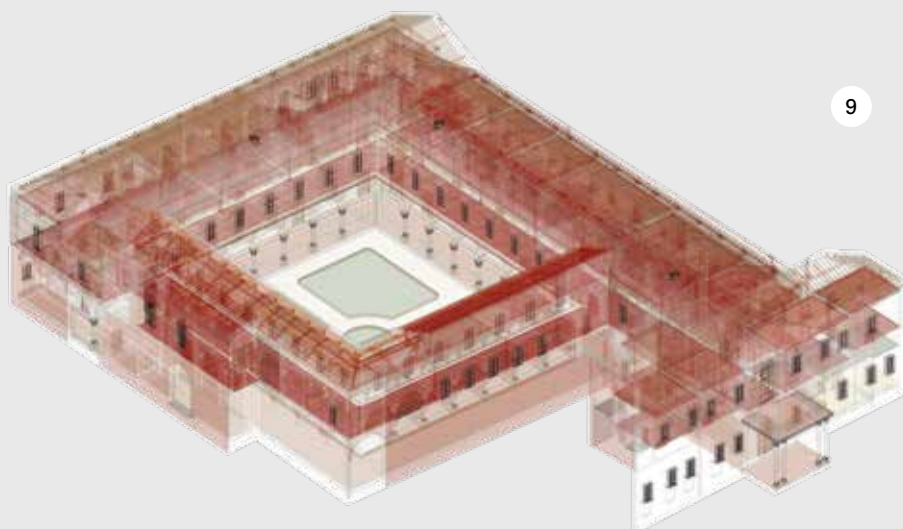


Fig 11. BIM model implemented with the earthquake damage survey

Fig 12. Roof stiffening: comparison of the project BIM model and reality

They consolidated the masonry vaults through the injection of the cracks (Fig 6-7) and the construction of low thickness floors in lightweight structural concrete. A double-crossed wooden planking help stiffen the floors, while the steel angles guarantee a better connection to the walls through the grouting with threaded rods.

New masonry partitions made of solid brick and lime mortar define a different distribution and restore the continuity of the earthquake-resistant walls. Finally, they worked on the wooden roofs by consolidating the existing trusses with resin injections in the most cracked points.

From the architectural point of view, the project is the occasion for a new functional distribution of spaces: the west wing facing the square becomes the seat of municipal offices, while the south and east wings will be part of the Polironiano museum as warehouse and workshop spaces (Fig 8).

## THE USE OF THE BIM PROCESS FOR CULTURAL HERITAGE DESIGN

The use of the BIM technology in the design and the management of a worksite concerning cultural heritage is an innovative methodological approach that, in this specific case, they used from the very beginning till the construction supervision.

First, they made a geometric model starting from the laser-scanner survey campaign that went on to define, thanks to the data from the diagnostic investigations.

Parametric modeling assigned different materials to the different elements (Fig 9-10). In this way, it was possible to quantify and manage the detected crack patterns through automatic schedules, reporting the specific characteristics of each rupture (Fig 11).

The architectural, structural, and engineering parts referred to the same multidisciplinary model in the design phase.

In this way, it was possible to manage in a better way the interactions between the different disciplines, visualizing in a unique model the overall dimensions of each element, from the new walls to the electrical installation, operating eventually on the interferences and overlaps in a preliminary phase instead of the construction one (Fig 12).

Using a model made up of parametric elements has also made it possible to optimize the calculation procedures, providing the required dimensional data in real-time and creating unique and facilitated correlations between quantities, times, and costs.

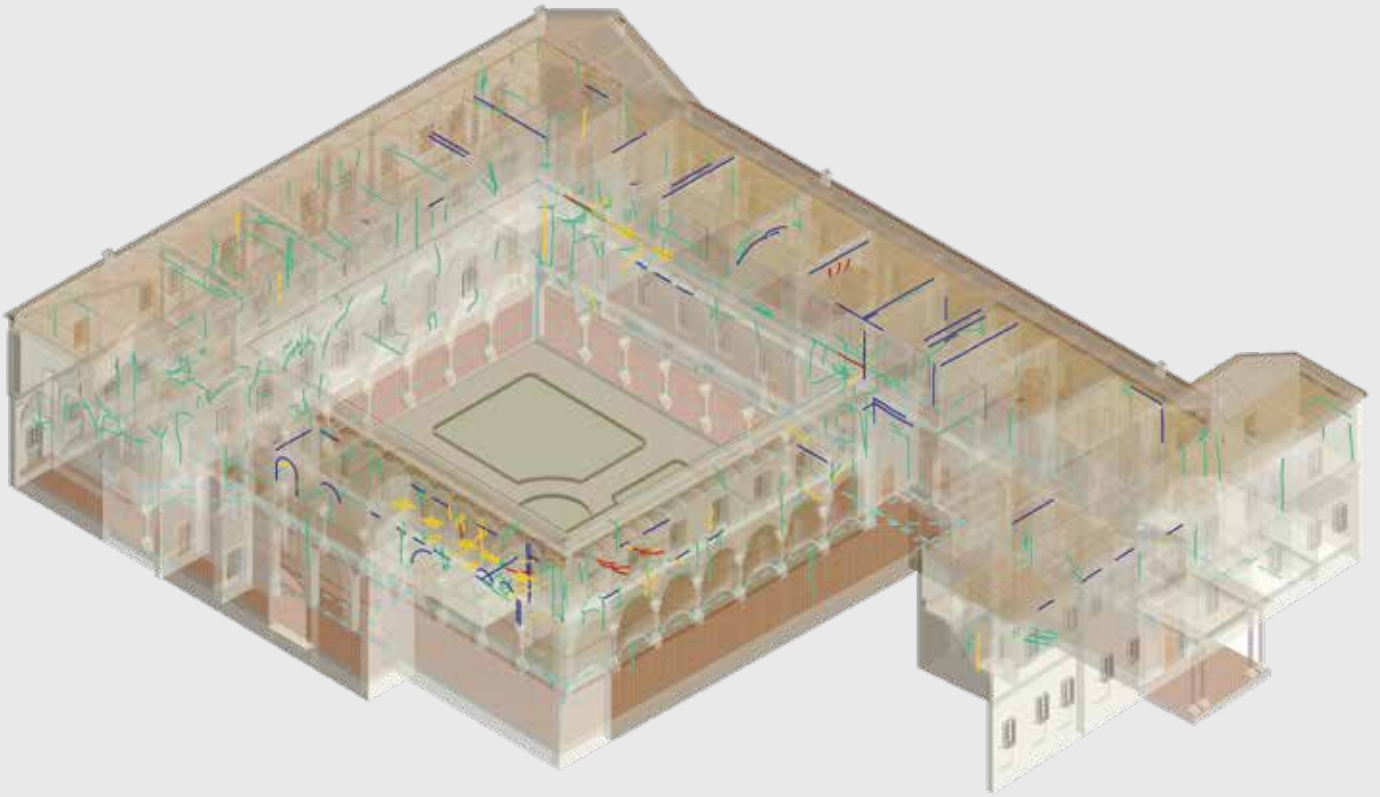
The automation in numerical and graphical data processing has also made it possible to efficiently manage the progress variations, facilitating the documents' updating.

Finally, the BIM model also proves helpful once the construction phase is over because it helps manage the maintenance plan. At the same time, it is a dynamic database containing all the elements constituting the building that can be constantly interrogated and updated, thus facilitating the transfer of information to future operators and designers.

The case of the abbey of San Benedetto in Polirone revealed how this type of database was advantageous, having to manage different phases of the project and supervision works carried out years later on different parts of the same complex.

The construction techniques and the methods of intervention, repeated at different points of the site, have thus been optimized, allowing the management of a large-scale project able to hold the many interdisciplinary aspects required.

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## **CONSOLIDATION OF THE MAIN PILLARS OF FERRARA CATHEDRAL. FROM A FAILED DISASTER TO ARCHAEOLOGICAL SUGGESTIONS**

### **CONTEXT OF INTERVENTION: PURPOSE AND CHALLENGES**

The cathedral has an ancient history, intimately connected with the urban and cultural development of Ferrara. Since its construction began in 1135, thanks to an act of the antipope Anacleto II, changes have been continuously made to its decorative apparatus as well as to its structural parts; in fact, important personalities for the history of architecture like Leon Battista Alberti and Biagio Rossetti had the opportunity to leave their mark on the church. A very important landmark is 1712, when Cardinal Taddeo Luigi dal Verme entrusted Francesco Mazzarelli to upsetting the spatial configuration of the cathedral marking the main nave with three transepts and as many domes. As will be seen, it is precisely this intervention that has caused structural problems quickly manifested by the presence of cracks due to its construction methods.

The 2012 earthquake that hit the Emilia region caused the aggravation of the complex crack pattern of the nave pillars, an alarm for the safety of all those citizens and tourists who visit the Cathedral as well as for the safeguard of the remarkable Cultural Heritage constituted by the building itself.

Thanks to the regional funds of the Piano di Ricostruzione Post-Sisma 2012 it was possible to design and begin the safety and structural consolidation of the eight major pillars, those which support the eighteenth-century domes. This intervention, not already finished, is characterized by a high level of complexity since the pillars are richly stratified.

In fact, during the eighteenth-century rearrangement of the basilica, the work of Mazzarelli exploited the presence of the medieval masonry pillars.

This very important data was derived both from historical sources and from the diagnostic investigations. From these it emerged that all the pillars investigated consist of a portion of a polylobed medieval pillar, off-centered from the final configuration of the pillar built in the eighteenth century.

This decentralization, which is due to the differences in plan of the original three-nave basilica with Mazzarelli's design, led builders to shear the oldest pillars when they were placed in the perimeter of the new shape (Fig 1-2). However, no interventions were made to clamp the old and new masonry, forming a discontinuous interface sometimes recognizable by the presence of medieval plaster.

The absence of clamping determined a low static response of the pillars, aggravated by the earthquake that affected the cathedral over the last three centuries

Therefore, phenomena link to instability pressure occurred, aggravated by seismic horizontal force, but not immediately understandable by reading the cracking patterns of the plaster.



Fig 1. Plan of the cathedral with the overlapping of the modern relief (beige), of the plan made by Leon Battista Aleotti in the XVI century and the XVIII century one made by Francesco Mazzealli (blue). Thanks to the medieval pillars emerging during the intervention it is possible to compare critically the previous relief

From this information, it is possible to understand the complexity of the intervention to ensure safety, restoration and improvement of the static and dynamic response of the pillars. A technical challenge that required synergistic work between various professionals like architects, archaeologists, engineers and restorers; each one for their own expertise but in a context of high interdependence.

## INTERVENTION: BETWEEN TRADITIONAL AND INNOVATIVE SOLUTIONS

The consolidation interventions were carried out in pilot phases to guide the subsequent phases, through tests and interventions on portions of the apparently more damaged pillar and of the one that seemed best preserved.

Since the operations directly affect the load-bearing elements, a multidirectional scaffolding was created during the most delicate and invasive phases, able to discharge the weight of the domes pushing on the pillars directly to the ground. For the same reasons, the entire factory is monitored by a vibration control system and a network of crackmeters.

To complete the process of knowledge of the structures, the Leonardo analysis department dealt with the dating of the mortars to recognize the construction phases and made also resistance tests on masonry using single and double flat jacks. The strength values obtained were fundamental for the engineers to carry out the structural calculations for project. Furthermore, the specificity of each pillar (Fig 3) suggested to carry out the resistance test on each of them.

The frescoes and gilded decorations (Fig 4-5) were a problem for works, so it was necessary to carry out an invasive and delicate intervention of detachment the original eighteenth-century wall paintings with the traditional use of gauze and animal glue. The restorers were able to recognize the painting phases through non-destructive investigations (stylistic evaluation, pictorial quality and composition of the plaster), allowing the definition of protection priorities.



Fig 2. Overlapping of the modern cathedral and the inner prospect drawn by Leon Battista Aleotti (XVI century)

Fig 3. Relief of two different pillars: the different relative position of the original polylobate (orange) is one of the most crucial elements to be considered for intervention

The removed frescoes are stored in shelves inside the cathedral itself, closed to the public, avoiding a risky transport. They will be re-adhered to the pillars once the reinforcement works have been completed and after the plaster has been restored.

Once the masonry pillar was made bare, in addition to the studies on the walls already described it was possible to carry out the most delicate interventions on these load-bearing elements. In primis the use of Bossong technology of controlled injection anchors with sock for the confinement of the pillars.

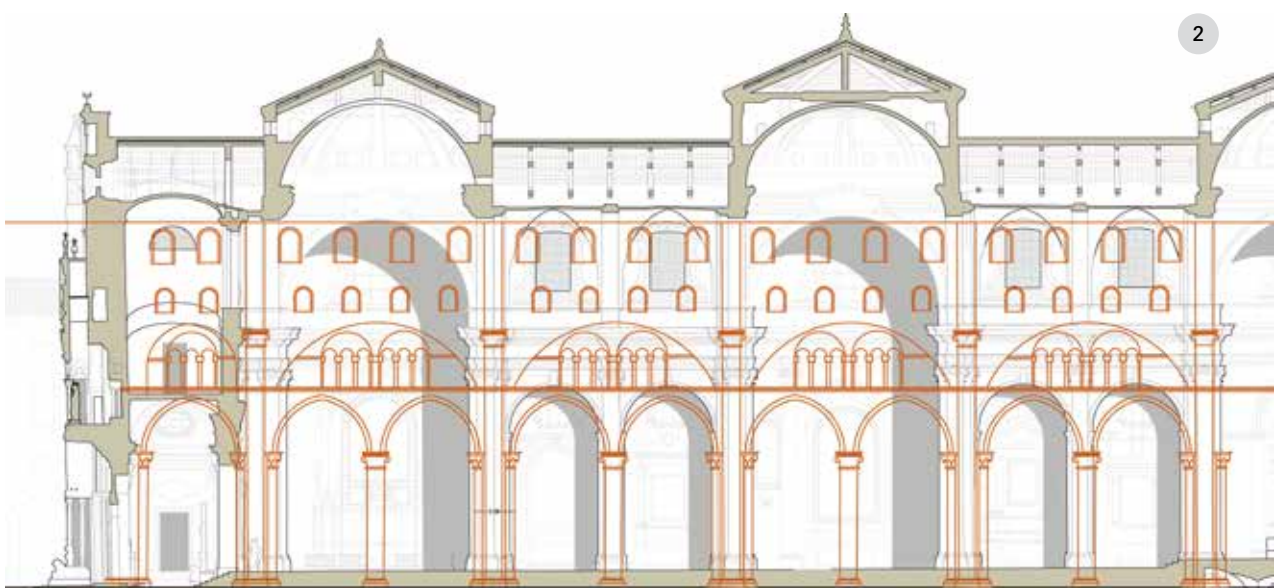
This involved for the entire development of each pillar (2.60 m long and 4.10 m thick) the creation of a grid of holes running through the pillars in the two orthogonal directions. In each hole, with a variable diameter of 3-4 cm anchors were inserted consisting of a stainless-steel bar immersed in a hydraulic mortar; in turn contained in a sock made by polymeric materials to avoid the transport of sulphates from mortar to historical masonry. The result is the creation of a reinforcement grid inside the pillar that allows the loads to overcome the discontinuities due to the particular masonry stratification.

To reconstruct a unitary resistant section, since the presence of numerous wall cavities, they also used injections of liquid hydraulic mortar with a composition compatible with the one detected. While to give a further reinforcement in the base part, a plaster reinforced with natural mortar was created.

This structural jacketing confining the pillars could be carried out to a maximum height of 1.70 meters due to the presence of sculptural elements inserted in the eighteenth-century niches.

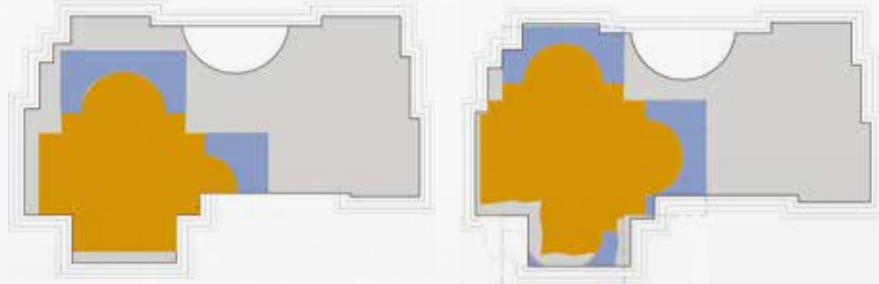
In the end, to improve the overall behavior of the cathedral for horizontal stresses, steel chains were installed at the base of summit arches.

A pair of chains with plate head hidden by the new plaster was placed in a direction parallel to the main nave, while in the opposite direction it was preferred to use single chains that contrast the thrusts of the arches by friction, collaborating with the historical masonry through resin injections.





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Noteworthy is the restoration-upon-restoration work on the first pillar south of the presbytery, where the intervention of an iron ring from the 1930s was found. It aimed to solve structural problems like those manifested today with techniques of the time. The iron hoop actually caused further problems to the masonry due to oxidative phenomena which required passivation procedures.

One of the most fascinating and unexpected aspects that emerged during the work on the pillars is the discovery of sculptural groups in stone with geometric and zoomorphic figures and small fragments of painting studied for now with portable XRF. In addition to causing problems in the structural response, these elements of the original medieval pillar constitute an unprecedented subject of study from a historical, artistic and iconographic point of view, as well as a stimulus for the restoration project.

The historical research conducted in the design phase, supported by the data that continue to emerge at the worksite thanks to Leonardo's technicians, allows the scholars who are working on it to investigate the ways in which the offset between the position of the eighteenth-century and medieval pillars was determined, as well as the layout of the original cathedral. The studies of Arch. Ing. Valeria Virgili, such as "La Cattedrale di Ferrara. Intervento di consolidamento fa riemergere I pilastri dell'antica chiesa" on *rec\_megazine163*, constitute a remarkable guide to understand the complex research and the horizons of this restoration.

This construction site lends itself to demonstrating that the continuous relationships between historical research and technical knowledge are mutually beneficial and stimulating for a project which aim is the safeguarding of an identitarian cultural heritage, even when threatened by the seismic risk common to the whole national territory.



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## THE RECONSTRUCTION AFTER THE EARTHQUAKE IN 2012. THE ARCHBISHOP'S PALACE OF FERRARA



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### HISTORICAL DESCRIPTION

The Archbishop's Palace of Ferrara (Fig 1) is located in Corso Martiri della Libertà, in a block strategically adjacent to the San Giorgio Martire 's Cathedral and the Town Hall: here the two monuments face each other with equal architectural dignity and with measured weight space (Fig 2).

The Archbishop's residence was built between 1718 and 1720 by the will of the Ferrara's Bishop Cardinal Tommaso Ruffo and by the roman architect Tommaso Mattei (1652-1726). The latter, with the aim of giving greater prestige to the new bishopric, decided to merge the terraced houses of the medieval era and the ancient Episcopio designing the Palace as the union of three units that overlook the same large central courtyard.

A monumental architectural intervention on an urban scale was therefore born.

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Fig 1. Archbishop's  
Palace facing  
Corso Martiri della Libertà

Fig 2. Archbishop's Palace  
and Town Hall

Fig 3. Main façade's portal,  
Archbishop's Palace

## DESCRIPTION OF THE ARCHITECTURAL AGGREGATE

The bishop's residence of considerable size has a long facade divided into three bays, the two lateral ones covered with a flat pseudo ashlar. The windows are framed in marble and the grandiose central portal (Fig 3) is made of the same material, double-height with free columns which in the singular solution of the orders and branch decoration they seem to be more in keeping with the language of late Roman Baroque than with the place's architecture. The interiors (Fig 4) are refined and decorated with stuccoes, frescoes and decorations both from the eighteenth and nineteenth centuries. Inside there is a monumental double flight staircase (Fig 5) which it is very significant from an architectural and artistic point of view for the eighteenth-century Ferrara period and also there are important decorated wooden ceilings, belonging to the sixteenth-seventeenth century phase of the first Episcopio. From the distributive functional perspective, in the past the rooms of the three blocks had different uses: on the ground and first floor there were the arrangement of shops with relative warehouses, on the second floor the private Bishop's offices and the reception rooms. The entire building's plant is in mansory; in part it dates back to the eighteenth century, in part it also seems to belong to much older periods. In the past, the Archbishop's Palace underwent several transformations; in particular it was subjected in the nineties to important restoration works; they were concentrated on the main building with the aim of resolving the conspicuous problems of decoration (the restoration of the staircase and of the painted ceilings, the loggia's plasters and of the entrance hall, the restoration of the plasters and stone parts of the external facades) but also those were concerned with its safety, usability and functionality.



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Fig 4. Interior,  
Archbishop's Palace



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Fig 5. Monumental staircase,  
Archbishop's Palace

## DESCRIPTION OF THE DAMAGE DUE TO THE EARTHQUAKE

In plan and in elevation the building is characterized by a considerable geometric and constructive complexity. After the earthquakes the crack pattern that appeared was quite widespread, especially as regards the masonry's vaults on the noble floor of the Archbishop's Palace main part. In general, diagonal passages and not cracks had occurred in the masonry; almost on each floor all the brick's platbands had suffered injuries on their key and/or extremity; some columns had shown vertical crushing cracks along their development. The structural cracks of the masonry's walls had caused the plaster's rising and in some cases the detachment of portions of it; on the other hand there were deficiencies and fractures as regards the stone elements. There was also a sliding of the roof covering and the displacement of some elements of the roof's wooden framework (Fig 6).

## MAIN RESTORATION INTERVENTIONS

The archiepiscopal complex was therefore the subject of a complete campaign of works; the consolidation of the walls, the pictorial restoration and the remaking of the roof were carried out at the same time as the extradossal reinforcement of the wattle and masonry's vaults present on the noble floor. The structural works of the project were of a local type, involving repair and strengthening constructions; therefore they haven't substantially changed the original behavior of the three units that they make up the Archbishop's Palace and consequently they haven't changed the mutual interaction between adjacent structural units. The earthquake also highlighted some building's vulnerabilities, thus making it essential to carry out both to repair the cracks and to remove the vulnerabilities found.



## THE APPROACH TO RESTORATION AND STRUCTURAL CONSOLIDATION THROUGH THE USE OF NEW TECHNOLOGIES

As a part of the structural consolidation of historical and monumental heritage, the architect can opt for traditional techniques or innovative technologies. Often, however, especially in the case of cultural public assets, the chosen technique must ensure not only structural benefits but also compatibility with the support, durability over time and the lowest possible impact from notches and demolitions. Before intervening on the vaults, the cracks on the underlying wall faces were repaired with reinforced mending of the cracks on the corner walls and to restore the clamping and meshing between the orthogonal walls. Finally, again to restore the walls' continuity, stitching was carried out with stainless steel elements inserted in the restyling of the flat lesions (Fig 7). Therefore, the extradossal reinforcement of the wattle and masonry's vaults present on the noble building's floor was carried out, in agreement with the Superintendency's offices, with composite materials, that they today represent the most widespread and effective solution for a structural work. The crack pattern was found to be quite widespread; the preliminary diagnostic phase had highlighted many structural criticalities such as through cracks and detachments, especially on the wooden vaults.

The typology of the vault itself determined the choice of which composite system to use for their reinforcement. The following types were found: wattle (that is "cannicciato") and camorcanna vaults and in masonry. In general, the construction manager opted for interventions characterized by low invasiveness, low weight and mechanical compatibility. Then the vaults in wattle (Fig 8) and in camorcanna (Fig 9) were consolidated with the application of bands in FPR (fiber-reinforced polymeric matrix composites) of glass fiber, positioned to form a mesh, thus improving the overall behavior of the area and re-

Fig 6. Damages on masonry after the 2012 earthquake

Fig 7. Stitching with stainless steel elements inserted in the restyling of flat lesions



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Fig 8. Reinforcement of arched vaults with GFRP

Fig 9. Reinforcement of camocanna vaults with GFRP

Fig 10. Reinforcement of masonry vaults with basalt FRM

Fig 11. Reinforcement of masonry vaults with carbon FRP

distributing efforts in a uniform way. This material was chosen for its greater compatibility in terms of resistance and elastic modulus with the wooden structure and also to optimize the adhesion of the bonding resin to the support, thus re-establishing a correct connection between the caniccio and the wooden slight arc. Instead the masonry's vaults (Fig 10) saw the use of different structural interventions because of the different support's nature (Fig 11). Again the construction manager decided to use systems that they were able to give greater resistance, always guaranteeing a work characterized by lightness and low invasiveness. The creation of a mesh in which the composite is positioned precisely on the surface had the additional function of not limiting the breathability of the support, leaving the thermohygrometric behavior of the surfaces unaltered.

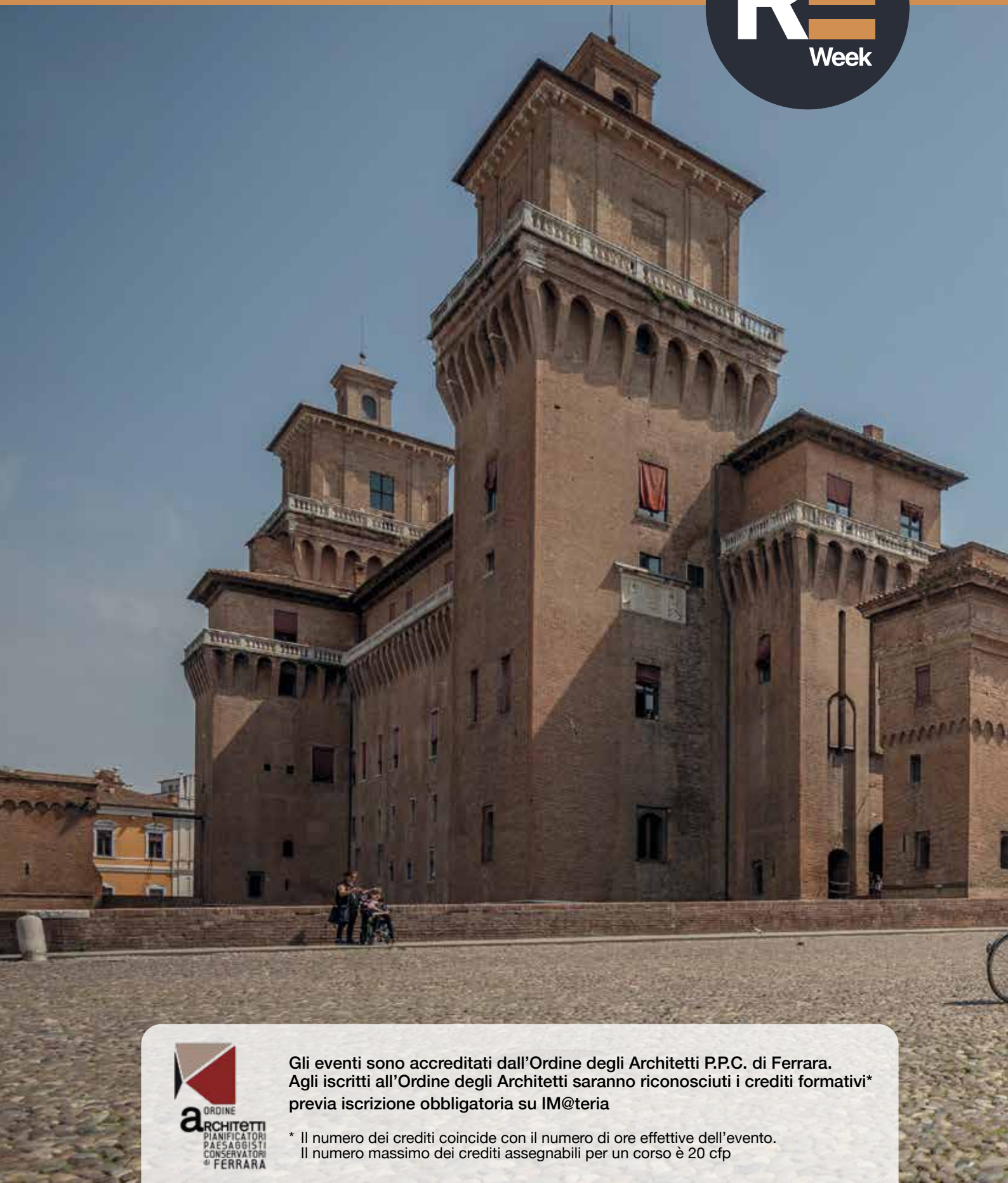
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WEDNESDAY

**Il paesaggio in Italia pianificazione,  
tutela, sviluppo sostenibile**  
**The landscape in Italy planning,  
protection, sustainable development  
of cultural tourism**



08 June 2022 | 2.00 pm to 6.00 pm<sup>GMT+2</sup>

Salone del Restauro, Ferrara Fiere | Sala Oceania | 1° floor | Hall

*Curated by: Scientific and Technical committee Assorestauro and Salone del Restauro*

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**Heritage & Sustainability: Le esigenze  
del PNRR e dei CAM alla luce del recente  
Taxonomy Report**  
**Heritage & Sustainability: The needs of  
the PNRR and CAM in view of the recent  
Taxonomy Report**



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**Cantieri in movimento. Ricostruzione e  
nuove competenze a 10 anni dal sisma 2012**  
**Construction sites in motion.  
Reconstruction and new competences  
10 years after the 2012 earthquake**



09 June 2022 | 2.00 pm to 4.00 pm<sup>GMT+2</sup>

Salone del Restauro, Ferrara Fiere | Pad. 5 Sala America

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10 JUNE  
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## THE RESTORATION PROJECT OF PALAZZO DIEDO IN VENICE

### HISTORY OF THE PALACE DIEDO

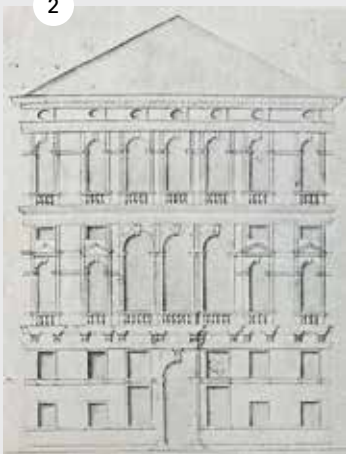
Venice. Sestiere of Cannaregio. It is the story of a powerful family that interests the construction of Palazzo Diedo in Santa Fosca. Arrived from Altino in 790 this family of Venetian nobles stands out in Venetian political life thanks to the “Serrata del Maggior Consiglio” of 1297 which allows them to assume important positions. In fact, they will be Proti di San Marco, generals of land and sea, ambassadors to the European courts and distinguished prelates. They fought against the Genoese in the fifteenth century and on behalf of Pope Sixtus IV in Romagna and many other important offices distinguished this family until the nineteenth century.

From the sixteenth century the Diedo reside in Santa Fosca, in the “Casa da Stazio” which will become Palazzo Diedo and in 1710 they commission the architect Andrea Tirali to design their family palace. Legend has it that the Diedo asked the architect to build a palace higher than the one beyond the river belonging to the Grimani and the architect designed a building with 7 meters high floors and from whose attic today we can admire Murano and the island of San Michele almost from the same point of view as a Venetian bell tower.

Andrea Tirali is a fashionable architect when he is commissioned to design this building with impressive dimensions both in height and extension, occupying an entire Venetian insula. He was first a stonemason and bricklayer, vice-protector to the Magistrate at the waters of Venice in 1688 and designer of the bridge of the Three Arches in Cannaregio. He also designed a lot in Chioggia and of particular importance is Palazzo Grassi designed for the homonymous family that has similarities with the façade of Palazzo Diedo.

The building looks like a typical Venetian palace with a passing hall, or portego, along the whole building, destined to be on the ground floor the filter between water and earth and on the upper floors the family boardroom. The beautiful façade (Fig 1) is composed of a central round three-light window with side windows framed by large bands of Istrian stone, which originally should have been surmounted by protruding triangular gables, as we can find in the only drawing of Tirali that has come down to us (Fig 2).

The construction of the palace lasts about 10 years from 1710 to 1720 but unfortunately remains incomplete. The back on the Rio del Trampolin (Fig 3) is in fact not finished and today we can see a conglomerate of houses that complete the insula and that we can deduce to be part of the original property of the Diedo. The atrium of the Palace is very particular because it is drawn on a square plan with Latin cross (Fig 4): on three sides there are the entrances of the house (two from the ground and one from the water) while the fourth should have opened on the large staircase of the building never realized. The distribution stairs of the building, in fact, are presumably of the sixteenth century and date back to the Casa da stazio, like the foundations and some walls that still construct the building. Original are instead the two gables with sculptures and columns that we find in the entrance hall object of great transformations as the whole building that at the end of the XIX century is sold to the Municipality of Venice. Since then, there have been several





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Fig 1. Shooting of the main façade from Rio Tera de la Maddalena, ph. Alessandra Chemollo

Fig 2. Andrea Tirali. Autograph drawing for the Diedo palace. Facade (private collection of Florence). Taken from the Book by Elena Bassi, *Architettura del sei e settecento a Venezia*, Filippi Editore, Venezia, Ristampa anastatica 1980

Fig 3. Shooting of the Palace from Rio Tera de la Maddalena, ph. Alessandra Chemollo

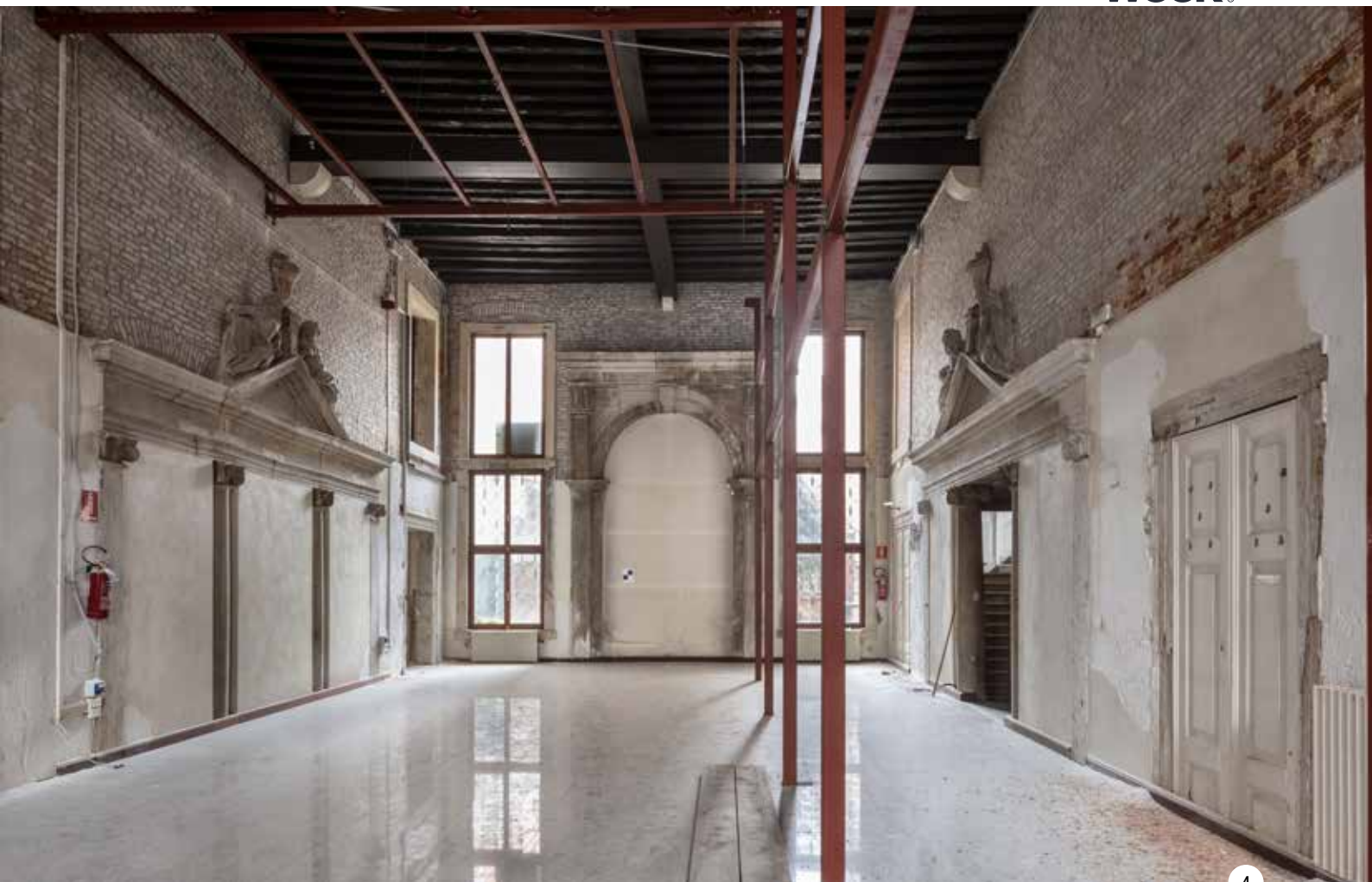
Fig 4. Main entrance of the Palace. Note the side portals with gable and sculptures currently walled, ph. Alessandra Chemollo

functions within the building that have unfortunately varied the spaces with infills and new floors to avoid the phenomenon of high water and modified the surfaces, covering or erasing the frescoes of the eighteenth century. In the first noble floor there are two cycles of frescoes: the first with an allegorical-mythological theme (*Ebe accolta nell'Olimpo, La Sapienza soccorre la virtù per sconfiggere il Vizio alla presenza dell'Eternità, della Prudenza e della Fama e il Trionfo della Pace e della Giustizia*) realized by Francesco Fontebasso on the occasion of the marriage of Girolamo Diedo with Alda Priuli in 1765, the second always on the occasion of the wedding but this time of Antonio Diedo with Lucrezia Adriana Nani in 1795 by Costantino Cedini (*Imeneo con Giunone* (Fig 5), *Giove, le Grazie, la Fama, Apollo sul carro e Quattro cortei di putti giocosi e musicanti, Il Merito incoronato dalla Virtù, con la Gloria dei Principi, le Virtù cardinali e le Scienze*). The second noble floor, incomplete perhaps due to the economic problems of the family, is decorated only with six monochrome whims (Fig 6).

## THE RESTORATION PROJECT

Over the course of more than a century the Palace has been remodeled several times becoming the seat of a gymnastics society, educational institution, Monte di Pietà and finally Surveillance Court. Today the restoration project affects the building at 360 degrees going to act both on the external facades and the interiors.





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Fig 5. Hymeneus with divinity of Olympus by Costantino Cedini, 1795, ph. Alessandra Chemollo

Fig 6. Passing hall of the first noble floor with stucco panels and perspective frescoes of the eighteenth century, ph. Alessandra Chemollo

The restorers will work on the stone surfaces in Istrian stone and on the external plasters, composed of a pinkish or light gray background plaster and a plaster with ivory finish, removing the surface deposits, the biological patinas, the vegetation, the black crusts, the spots and the grouting, they will act on the saline efflorescences, on the cracks, on the gaps and on the degradations of the disintegration stone, exfoliation and hurling. A first cleaning test has already involved the Istrian stone frame of one of the windows of the main façade with compresses of saturated solution of ammonium carbonate, a cleaning method that respects the principles of restoration by intervening in a non-invasive way on the material (Fig 7). Even the metallic materials that we find in handrails, external gratings and grappas and tie rods will have to be passivated and treated with a protective.

The wooden beams, the perimeter frames of the halls with many layers of paint overwhelmed, the doors several times repainted and the external portals will be cleaned of surface deposits, brought to light the decorations, healed the cracks, integrated the gaps and finally treated with a protective (Fig 8).

Different instead will be the approach to the entire decorated wall apparatus because over the years it has been the part most affected by the tampering dictated by the changes in use and here it will therefore be necessary to proceed on a case-by-case basis. In the first noble hall completely repainted there are numerous gaps, extensive renovations due to the insertion of electrical and hydraulic systems, application of enamel boiserie and many



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<https://artslife.com/2022/03/18/venezia-palazzo-diedo-nuovo-centro-arte-contemporanea/>

Fig 7. Cleaning tests on the window frame: three different cleaning samples were conducted, with the same compress method but with different application times in order to taste different levels of cleaning, ph. Lithos

Fig 8. Detail of the sample on the wooden frame where the original paint layer is observed, ph. Lithos

Fig 9. Detail of the cleaning sample on the mirrors of the walls of the first noble hall: decoration of a female body executed in fresco with dry shots, ph. Lithos

cementitious patches. Precisely this hall was the subject of the first cleaning tests and they brought to light fresco decorations still well preserved, with the exception of the cement stuccoes, under different layers of repainting, of female figures and framed plant elements for a fake architecture and decoration bands along the mirroring with ochre architectural motifs, brown and blue to simulate a boiserie that ran along the entire perimeter of the room. Even the mezzanines are the subject of study with samples that have brought to light the stuccoes of marmorini in colored paste (Fig 9).

## A NEW BEGINNING

A new story is therefore ready to be told inside Palazzo Diedo which, after being the residence of one of the most important Venetian noble families, school and Court, will host exhibitions, events and artistic events promoted by the Berggruen Art & Culture Philanthropic Foundation that inside Palazzo Diedo will promote the artist-in-residence program. A new spirit will inhabit these places hopefully capable of recognizing their great value.



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## THE RESTORATION PROJECT OF THE DOGE'S PALACE IN VENICE

### INTRODUCTION

The Doge's Palace, the former seat of the "doge", is now one of the symbols of the city of Venice and home to the Doge's Palace Museum, part of the Civic Museums Foundation, and the offices of the Venice Superintendency. It stands in the monumental area of St. Mark's Square in continuity with the basilica and extends toward the Basin. The building, whose foundation dates back to the 6th-8th centuries, takes on its present configuration from the 14th century. It consists of three large bodies of the building that incorporated and unified previous constructions: The first toward the Basin, containing the Hall for the Great Council, completed in 1366; the second toward the Piazza, placed in continuity with the Basilica, containing the Hall of the Scrutiny, completed after an interruption of work of about half a century; and the Renaissance one, on the opposite side, containing the apartment of the doge and various magistracies, rebuilt by Antonio Rizzo after the fire of 1483. The two main facades relating to the first and second bodies are developed on two colonnaded levels that frame large ogival windows and are surmounted by a crowning composed of battlements and spires. The entrance for the public is the "Porta del Frumento", which opens under the portico of the first body.

### HISTORY OF THE RESTORATION OF THE PALACE

In the years following the annexation of Veneto to the Kingdom of Italy, the condition of the Ducal Palace was considered critical; in particular, the main bodies of the building, the one facing the Basin and the one placed in continuity with the Basilica, manifested structural subsidence. Already during the 17th century, following the fire of 1577, some interventions directed by Antonio Da Ponte had been carried out, such as the reconstruction of part of the roofs, the closing of some arches on the ground floor and the consolidation of all the damaged capitals by means of metal hoops. During the 19th century a Commission was established to examine the static conditions and propose necessary measures to ensure the stability of the building, which highlighted the need for a general intervention to the facades by providing for the dismantling of all the loggias in successive work batches. Beginning in 1876, the direction of the works is entrusted to engineer Annibale Forcellini, who proposes to structure the intervention in a series of site phases: preparatory, executive and final. The intervention takes the form of the introduction of a new system of tie-rods, the restoration of the stone elements, and the demolition of the curtain walls introduced by De Ponte in 1577. The system of new tie-rods is made for both levels of the facade with the aim of improving the existing one. For the lower level, the new tie-rods are limited to the corner arches and consist of through bars and intermediate rods; for the upper level, the tie-rods scheme resumes the existing one through the introduction of continuous tie-rods with the purpose of tying the ends of the facade. The restoration of the stone elements partly involves replacing with copies of the capitals of the loggias, showing the year of construction on each, and partly involves consolidation. Parts of the stone cladding of

Fig 1. The image provides a view of the site of the first lot

the main facades are replaced in areas where they had structural cracks. In order to conceal the many replacements that have taken place, the application of patinas is experimented with on all newly constructed stone pieces, choosing a glaze with coloring substances suspended in unfired linseed oil. The ground floor is reorganized to allow the display of pieces replaced during the restorations, particularly capitals and shafts. Finally, new benches are inserted, every two bays, at the back wall of the portico.

## THE CURRENT PROJECT

The Ducal Palace is a heterogeneous and complex system in terms of type of materials and the state of preservation. The restoration project, which started in 2019 (Fig. 1-2), involves a series of consolidation, restoration and securing of the elements that make up the building. The first part of the project concerns the analysis phase with the aim of defining the state of conservation, the stability of the surfaces and some stone elements. The following analyses were conducted by means of: archival research, site surveys, photographic and Laser Scanner surveys, in order to obtain precise information on the current layout of the building. They led to the definition of a project of investigations that was divided into three phases: phase zero, which allowed for preliminary information on a portion of the facade; phase one related to radar investigations on the entire surface of the cladding and the summit edge; and phase two by means of which disassembly and reassembly operations were carried out on some of the elements constituting the cladding and the summit frame in order to know their construction characteristics. As a result of the investigations, it was possible to define the interventions to be carried out, which concern the consolidation of the material and the structural principals.



1

Fig 2. Product sampling processes currently in progress

Fig 3-4-5. Removal of protection nets

The Consolidation of the material aims to improve the cohesion and adhesion characteristics between the constituents of the stone material. In the specific case of the Doge's Palace, consolidation is extended to all stone elements, particularly concerning:

- \_ The crowning of the elevations including the battlements, the spires, the summit cornice and the construction system between said elements and the building. The heterogeneity of the crowning from both a textural and structural points of view, directs toward an in-depth diagnostic campaign on several elements in order to obtain a complete knowledge, particularly by analysing the composite, monolithic battlements and the three different types of spires present. The first phase of the site involves the removal of the wire mesh to verify the actual stability of the elements (Fig. 2-3-4)
- \_ The external stone facade cladding located on the main elevations, made of Verona red, Istrian stone and other reused ancient marbles, called "mattonellato." Considered both as a constituent element of the wall structure and as a surface particularly exposed to agents of alteration and degradation.
- \_ The horizontal and perimeter cornices of the facade forometries and to ornamental stone elements present on the facade above the loggias.
- \_ The mullioned windows placed on the inner courtyard, both for the stone elements and for the elements constituting the window and door frames.

Interventions aimed at eliminating or containing water infiltration through the functional restoration of rainwater disposal systems, are included in the action of the consolidation of the subject matter as well.

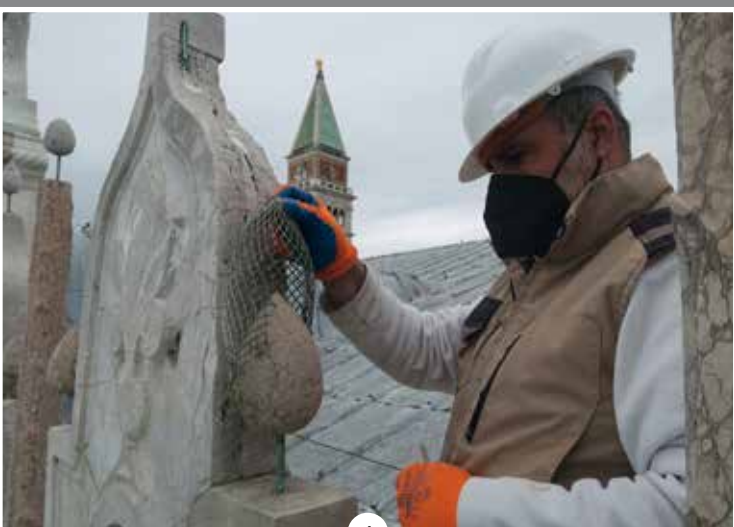
The structural principals aim to ensure the stability of the elements against the wind and the earthquake and have as their object of intervention the elements of the crowning and the brickwork. For the former, operations are required to secure the stone frame to the wall face behind, in order to eliminate the risk of overturning of the monolithic crowning element. For the latter, these are operations that integrate, in limited areas, the connection between the facing of the brickwork and the masonry by making new connection points.



2



3



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## THE FORMER CASINO IN VENICE LIDO. THE COMPLEXITY OF A PROJECT

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Studio Nafta, Seingim,  
Prof. arch. Eugenio Vassallo

*Works:*  
SACAİM Venezia



### HISTORY

1938: In Venice Lido, the Casino, built at the expense of the Municipality, is opened to the public. In the Government aims, the gambling house “should have become, in a short time, the most elegant one in Europe”. The operation was a key pawn in the building of the Great Venice. After the first world war, this new Venice had unraveled around the city core: it included Porto Marghera, and had encompassed dry-land Municipalities through the highway bridge.



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The Casino of Venice was built on a project by Engineer Miozzi, aided by architect Guido Iskra. It partly lent on the foundations of a former 18th century Austrian Fort known as Forte delle Quattro Fontane, still clearly visible on the ground floor. The building, covering over 4000 square meters, displayed a structure made of bricks and hollow core concrete floors. It included concrete pillars in the larger elements, and lattice girders.

The interior distribution introduced a strict separation between the paths reserved to the staff and those reserved to the public. A monumental staircase led to the upper gam-

Fig 1. The main Facade of the Casino: a peculiar monumentality (ph. Caterina Redana)

Fig 2. Lido in Venice, project of the complex known as “Casinò e Palazzo del cinema di Venezia”, bird’s eye perspective, Reale Fotografia Giacomelli, 1937  
Archivio fotografico del Comune di Venezia, Fondo Giacomelli, n. inv. GN000340, scheda 34937

Fig 3. The Ex-Night Hall before its restoration

Fig 4. The Ex-Night Hall before its restoration

Fig 5. The Ex-Night Hall before its restoration, when it was used as a cinema hall

Fig 6. Restoration of the Ex-Night Hall (ph. Caterina Redana)

Fig 7. Photomontage: project for the Ex-Night Hall, restored as a restaurant

Fig 8. Photomontage: project for the Ex-Night Hall, restored as a restaurant

bling halls. On the ground floor, towards the sea, the great hall opened wide, its floors and walls punctuated with polychrome marbles. Tall, square pillars supported the floor and the suspended ceiling structure. On the upper floor, the wide, triple height rooms, hosted the gambling rooms. Six wall panels in golden marble mosaics offered allegorical and mythological scenes, celebrating Venus and Neptune.

In the Lagoon hall, the coffer ceilings and the colored panels echoed a game of cards. The halls were lit by wide windows, covering around 70 square meters. The main facade displayed a monochrome stone coating, paving the terraces of the upper floor and of the – now no longer existing – access stairs.

At the outbreak of war, in 1940, the dream of a “citadel of pleasure and amusement” was cast aside and, along with it, the Casino remained there, witness to the effects of an interrupted dream.

Until the intended use remained that of a Casino, namely until the early 2000s, the building was subject to a constant building and plant maintenance. Its partial disposal, resulting in a sporadic use by the International Film Festival, from August to September, meant by then a reduced maintenance.

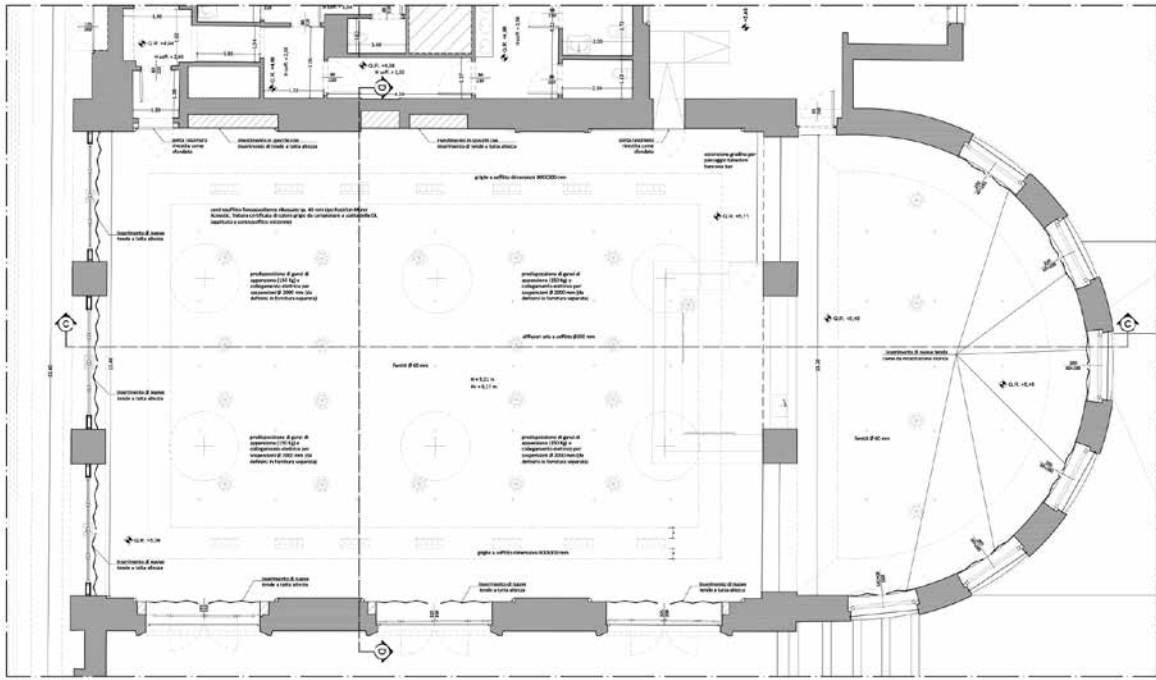
## THE PROJECT

The intervention, aiming to increase and enhance the spaces available for conferences and shows in Venice, affected a high level of complexity. It required a search for new solutions, capable of reconciling the regulatory and performative demands with conservation, enhancement and safety regulation needs.

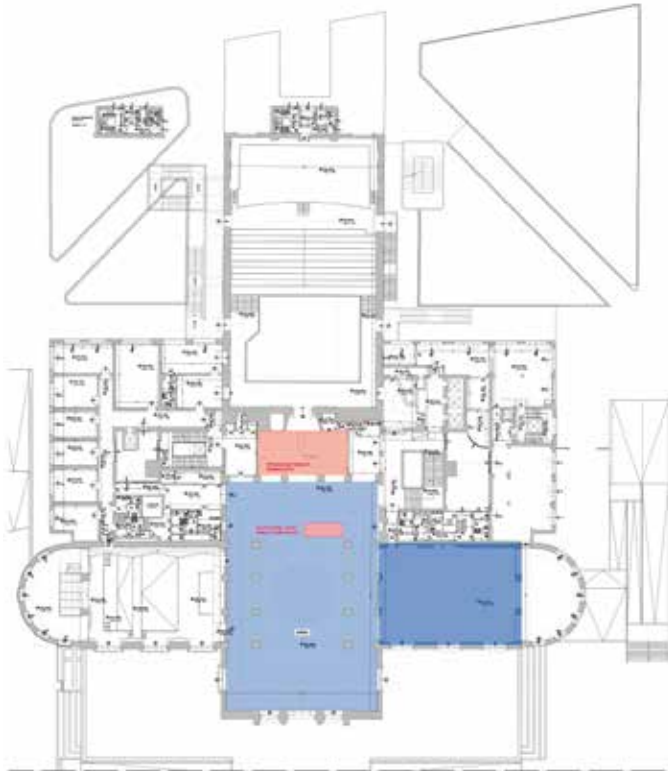
As an example, the fire prevention project involved the most advanced fire safety engineering techniques. The first and the second batch of works on the former municipal Casino







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Fig 9. Project plan of the Ex-Night

Fig 10. Project plan of the first floor

Fig 11. Restoration of the moldings in the Ex-Night Hall  
(ph. Caterina Redana)

Fig 12. The Atrium on the first floor: before the intervention  
(from the project report)  
(ph. Caterina Redana)

Fig 13. The Atrium on the first floor: after the intervention  
(ph. Caterina Redana)

mainly consisted in plant adaptation and conservative restoration. On the ground floor, on the side exposed to the docks, were created four new rooms, used by the cinema operators in the weeks of the Film Festival, and to host conferences and congresses during the rest of the year. To this end, each room was rehabilitated, with the installation of new floors and false walls, all with adequate technical features. On ducts, external to the existing brick walls, new plant systems were predisposed, hidden within new wall cavities or suspended ceilings. On the first floor, the minor screening room known as Ex Night was subject to a massive conservative restoration intervention, in order to restore its original function as a restaurant hall. The project approach, here, aimed to an enhancement of the original plant and appearance of the hall. The solution included wall mirrors and fireproof draperies as well as an alternation between glazings and curtains, as seen in the historical photographs. In the atrium on the first floor, particular attention was paid to conservative restoration. The intervention enhanced the central rose window, thanks to the cleaning of wooden elements and the restoring of the lighting fixtures, as well as the fire prevention systems. The existing suspended roof was dismantled, removing the asbestos elements found in the rose window, and two new perimeter frames host led lamps. The consolidation of the wooden, plastered entablature was granted by a ceiling suspension.

On the third floor, the works aimed to adapt the architectural spaces to plant engineering and fire prevention needs, while respecting their valuable compositional issues.

In the Adriatic Room, the Mosaic Rooms and the Lagoon Hall, particular attention was paid to the conservative restoration of the false ceiling, faithfully reconstructed after its dismantling. Given their historical value, the appliques and the chandeliers were adequately protected from any possible damages. A safety intervention was carried out by installing watertight hooks in their anchoring points.

Likewise, the mosaic coverings were subject to a careful monitoring, granted by the installing of vibrometers, to detect any possible anomalies caused by vibrations during the works.

Fig 14. Gambling hall  
(known as Lagoon Hall), Reale  
Fotografia Giacomelli, 1960  
Archivio fotografico del Comune di  
Venezia, Fondo Giacomelli,  
n. inv. 6N005097, scheda 35045

Fig 15. The facades before  
the intervention

Fig 16. Project  
of the facades' restoration

Fig 17. Project plan of  
the third floor

On the upper floor and in the attics, a massive intervention was carried out, in order to grant remediation and sanitation. As for the exteriors, the project aimed for a restoration of the travertine surface, with the cleaning, the grouting of cracks, the closing of gaps thanks to coherent materials, chosen in relation to the marble colorimetry, the eventual refixing with suitable products and the applying of a protecting treatment.

Another important intervention was carried out on the attic structures in the rooms known as “Sala Laguna” (the Lagoon Hall, on the third floor), “Atrio” and “Sala Perla” (on the first floor). The project simulation, here, considered multiple functions, each connected to public entertainment events, in addition to the cinema hall. The client’s demand required cinema installations, which would significantly increase the loads weighing on the attics. New reinforcements flanked the existing structures, working alongside them. The main challenge was to lighten the existing structures, simultaneously providing an efficient carrying of loads, and preventing floor distortions or cracking. The project asked for a careful study of the local deformation system.

The uniqueness of the intervention here consisted in new metallic preloaded trusses. They are able to counter the loads, thanks to the presence of screws generating an upward stress. As for the fire resistance of the structures, the intervention called for a particular care, due to the presence of historical suspended ceilings. Therefore, active protection measures were carried out. Both the halls were provided with an automatic switch-off function, watermist type, and a forced smoke ventilation system. An accurate analysis was conducted through performance methods, in order to evaluate the temperatures on the surface of the suspended ceiling and the consequent decay of the metal supporting structures. A punctual thermal analysis of the interiors (as seen in paragraph 3.6.1.5.1 of the DM 18 gennaio 2018 “Norme tecniche per le costruzioni”) replaced the standard fire curve (paragraph 3.6.1.5.1). The REI resistance obtained was then compared to the expected performance level. Different sceneries were carried out, following the NFPA 101 and NFPA 914 regulations. This complex project path, involving fire resistance checks carried out with performance methods, was conducted on a regional level.

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# QA

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