quaderni di assorestauro

QA

YEAR11NR02
SEPTEMBER 2022

GRAND TOUR RESTAURO 2022

18-24 SEPTEMBER

19 SEPTEMBER
MILANO

20 SEPTEMBER
BOLOGNA

21 SEPTEMBER
FERRARA

22 SEPTEMBER
VENEZIA

23 SEPTEMBER
MANTOVA

RE USA HERITAGE INSIDE

PROJECT ORGANIZED BY

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

APT INTERNATIONAL APT EUROPE

FINANCED BY

Regione Emilia-Romagna

Quaderni di Assorestauro

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PROJECT PRESENTATION

GRAND TOUR RESTAURO 2022

19 SEPTEMBER | MILANO

20 SEPTEMBER | BOLOGNA

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22 SEPTEMBER | VENEZIA

23 SEPTEMBER | MANTOVA

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.

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The project intends to promote Italian companies in the restoration field to the sector for historical and modern buildings in the United States.
The project intends to create new exchanging relationship between the companies belonging to sectors of architectural restoration, sustainability and energy efficiency of the historical and modern buildings in the United States and Italy.
For the last few years, Assorestauro has registered an always growing demand from its member companies to turn a greater attention to the North American market, which is increasingly moving towards the redevelopment of the existing buildings and the revaluation of the historical ones.
The project is financed by the Emilia Romagna Region through a program to enhance the Made in Italy export in targeted countries.

WHY KNOWING THE ITALIAN MARKET?

Italy is the country of history and beauty. The sector companies are:

_ Manufacturers of specific materials and technologies dedicated to the preservation of Cultural Heritage
_ High experience of Designers and service providers for the development and analysis of listed buildings
_ Companies in the sustainability-built sector and energy retrofitting focused of adaptive reuse of buildings.

INVOLVED ITALIAN COMPANIES

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FIBRE NET composite engineering

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www.fibrebuild.it

ARDEA INGEGNERIA

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RC SRL

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GRAND TOUR RESTAURO 2022

Grand Tour Restauro is an immersive cultural journey into the art and culture of Italy to discover the preservation of its historic sites

Assorestauro (Italian association for architecture, art and urban restoration) planned this tour for the second time with APTI.

The program includes visiting active heritage work sites in Milano Bologna, Ferrara, Venice and Mantua.

There will be opportunities to meet Italian professionals and discuss preservation theory and the application of Italian methodologies and techniques in restoration and adaptive use projects.

Each day participants will visit several projects and attend special seminars with preservation experts including Italian engineers, architects, conservators and academics.

This is an intensive travel week focused on expanding your knowledge of preservation technology. During the visits, the guests can improve their knowledge about restoration and history through direct engagement, building relationships with like-minded preservation professionals. Expand cultural and economic relations and build your personal network.

27 AIA Continuing Education Credits will available for this tour.

PROGRAM GRAND TOUR

ITALY | 18-24 SEPTEMBER

MILAN | SUNDAY 18 SEPTEMBER	
8:00 pm	**Welcome Dinner**
MILAN | MONDAY 19 SEPTEMBER	
9:30 am	Visit to: **Shoah Memorial of Milan**
3:00 pm	Visit to: **Chiaravalle Abbey**
BOLOGNA | TUESDAY 20 SEPTEMBER	
9:30 am	Visit to: **San Petronio Basilica**
3:00 - 5:00 pm	**Meeting with: Regional Agency for reconstruction – earthquake 2012 and Cultural Heritage Sector of the Emilia-Romagna Region** at Mediateca "Giuseppe Guglielmi"
FERRARA | WEDNESDAY 21 SEPTEMBER	
9:00 - 11:30 am	Visit to: **Palazzo dei Diamanti and Palazzo Schifanoia – reconstruction, re-functionalization and enhancement of the frescoes**
3:00 - 5:00 pm	Visit to: **Duomo of Ferrara**
VENEZIA | THURSDAY 22 SEPTEMBER	
10:00 am	Visit to: **Italian Synagogue**
3:00 pm	Visit to: **Palazzo Diedo**
	Free time in Venice at Palazzo Ducale area
MANTOVA - MILANO | FRIDAY 23 SEPTEMBER	
10:00 am	Visit to: **Social Theatre of Mantova**
13:30 am	**Goodbye Lunch in Mantova**
	Free time in Milan

IN COLLABORATION WITH:

LITHOS Restauro e conservazione

CA

Leonardo

LARES VENEZIA

IBIX

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RegioneEmilia-Romagna

19 SEPTEMBER
MILANO

SHOAH MEMORIAL OF MILAN. A PLACE FOR MEMORY AND AWARENESS

Tania Ghensi,
Assorestauro

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

Arch. Annalisa De Curtis
Morpurgo de Curtis ArchitettiAssociati

THE LOCATION: CENTRAL STATION OF MILAN

The Shoah Memorial is located in the area below the platform level of the Milan Central Station: it is in this hidden place that, between late 1943 and early 1945, Jews and political opponents were deported to Nazi concentration and annihilation camps.
The history of the Central Station begins thirty-one years before this tragic event, in 1912, when the architect Ulisse Stacchini was awarded the first prize for the project "in motu vita", for the construction of a new train station for the city of Milan. The main aspect of this innovative project was its dual use: the elevated area was used by passengers, while the street level area was for freight transport; it is thanks to the separation between these two areas that it was possible to carry out these atrocities without affecting the daily life of the rest of the population.

AIM OF THE PROJECT

The main objective of the project, by Morpurgo de Curtis Architetti Associati, is to convert the place, 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) and looking through the windows in front of the original open gates, it is possible to observe the belly of the building which consists of an exposed reinforced concrete frame. Once enclosed and hidden, today the space openly shows itself for what it was while offering a place for research and re-elaboration. During its first phase, the project

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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)

focused on the respect of 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, 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, and also build the future: this is why it is not a simple museum but a memorial and a venue for dialogue. On one hand, we have the recollection of this tragedy, with a path that connects the places of the events; on the other hand, it is a space in which citizens can participate in workshops. The place of knowledge is conceptually kept separate from the one aimed at active re-elaboration, but there is visual continuity between the two environments thanks to the demolition of part of the slab and the relative pillars outside the path of the actual memorial. This operation allowed to restore new foundations towards the square and made it possible for the memorial to dialogue with the space of the city. The project consists of permanent installations, including the library and the auditorium, which communicate with the existing structure. The old is deliberately separated from the new, with the aim of preserving the original structure and making it eloquent, thanks to forms and materials that establish a relationship between history and those who cross and will cross it. All the interventions aim at making the history of the station legible. What the architects wanted to maintain is a correspondence between form and content, only possible through the addition of clear 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 made of iron, concrete, wood and train ballast but also glass that highlight the distance from the original materials of the station. These transparent slabs, in addition to acting as a security and delimitation system, have a strong symbolic meaning: it is an invitation to visitors not to take their eyes off them but to carefully observe the places of memory.

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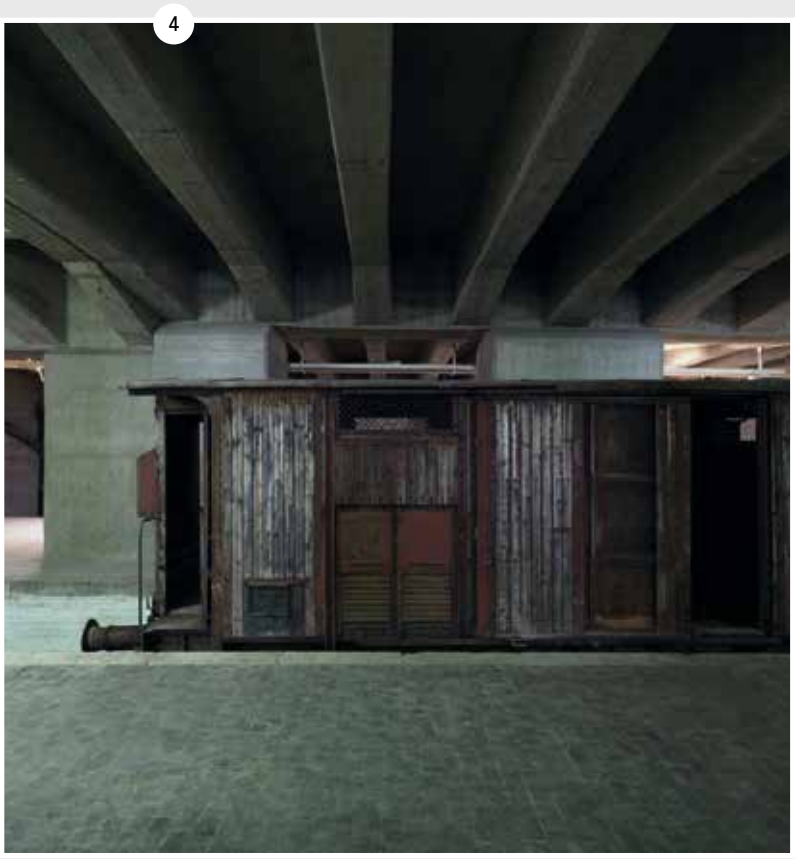


Fig 3. Connection between the two levels of the Central Station: space used for the lifting of the wagons (ph. Tania Ghensi)

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

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

THE MEMORIAL

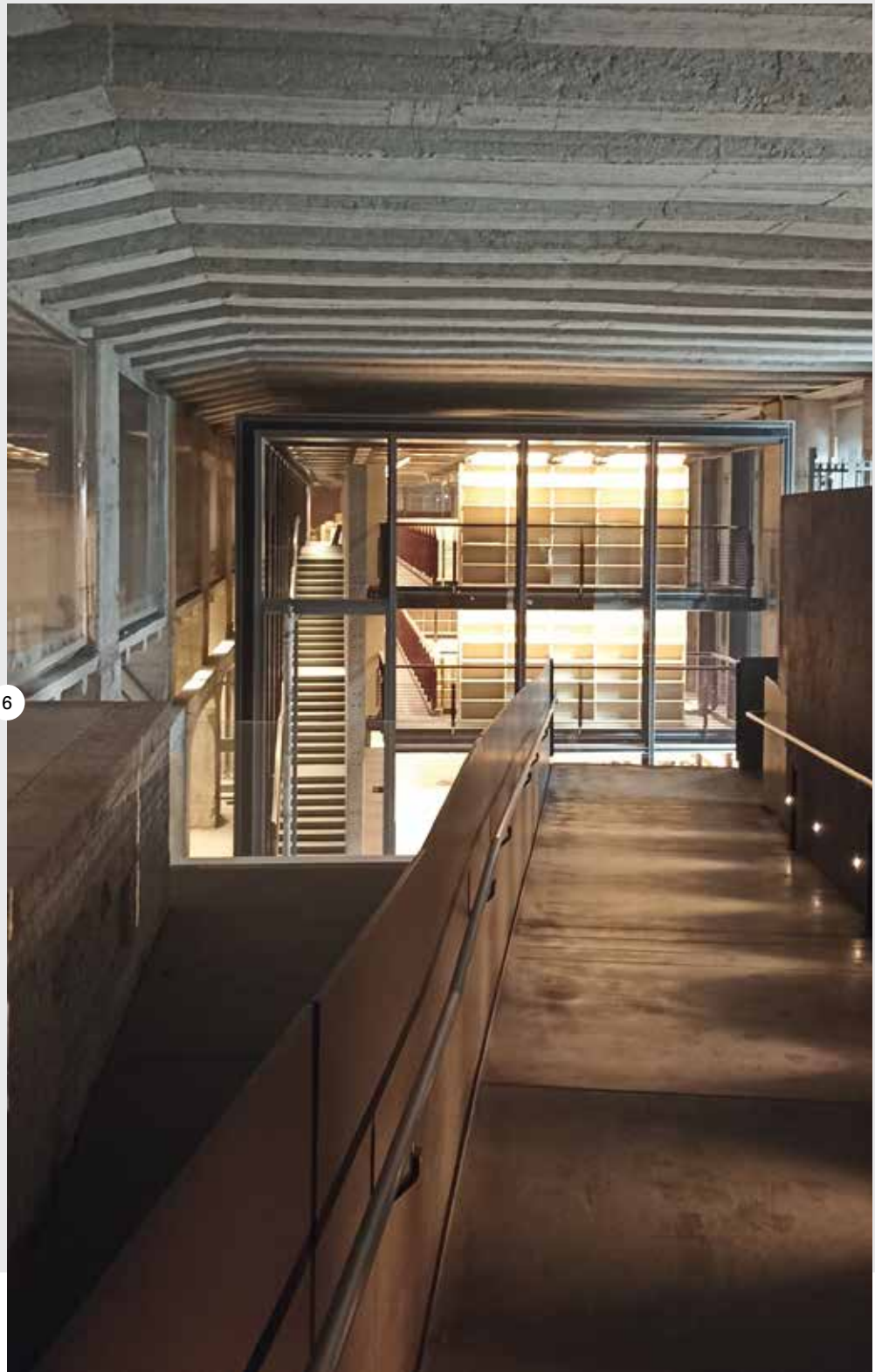
The Memorial, intended as a place of commemoration and awareness, involves people on multiple sensory fronts. The sound plays a fundamental role as the structure was conceived as a large chest capable of emphasizing and propagating the noise of trains departing and arriving at the upper level. It develops 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 starts a journey that touches the pivotal points of the complex spatial system in an effort to make the story of the events clear. The observatory was designed to explain the functioning of the machinery that allowed the movement of the wagons; this installation allows people to watch videos by Istituto Luce, which show the manoeuvres performed by both the moving wagons and the lift. From a gap in the attic between platforms 18 and 19 (Fig 3) in the raised floor of the Memorial, it is possible to see the upper floor of the Central Station. Once lifted, all the wagons were hooked together and then connected to a motor vehicle to leave for Auschwitz-Birkenau, Mauthausen and other annihilation and concentration camps, both abroad or in Italy, such as those in Fossoli and Bolzano. Along the first of the two platforms (Fig 4), which still have the original floor, visitors reach the so-called “track towards an unspecified destination”, where they will find the original stock wagons now restored and donated by the State Railways. At the end of the itinerary, it was also created a place of reflection (Fig 5) where people can think about 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 of study, research, discussion and a centre for 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 incomplete, has the shape of a large shell and is the skilful combination of metal structures and large glass slabs (Fig 6); inside there are birch bookcases, that unfold on three levels, and walkways illuminated by a sophisticated home automation lighting system (Fig 7-8).



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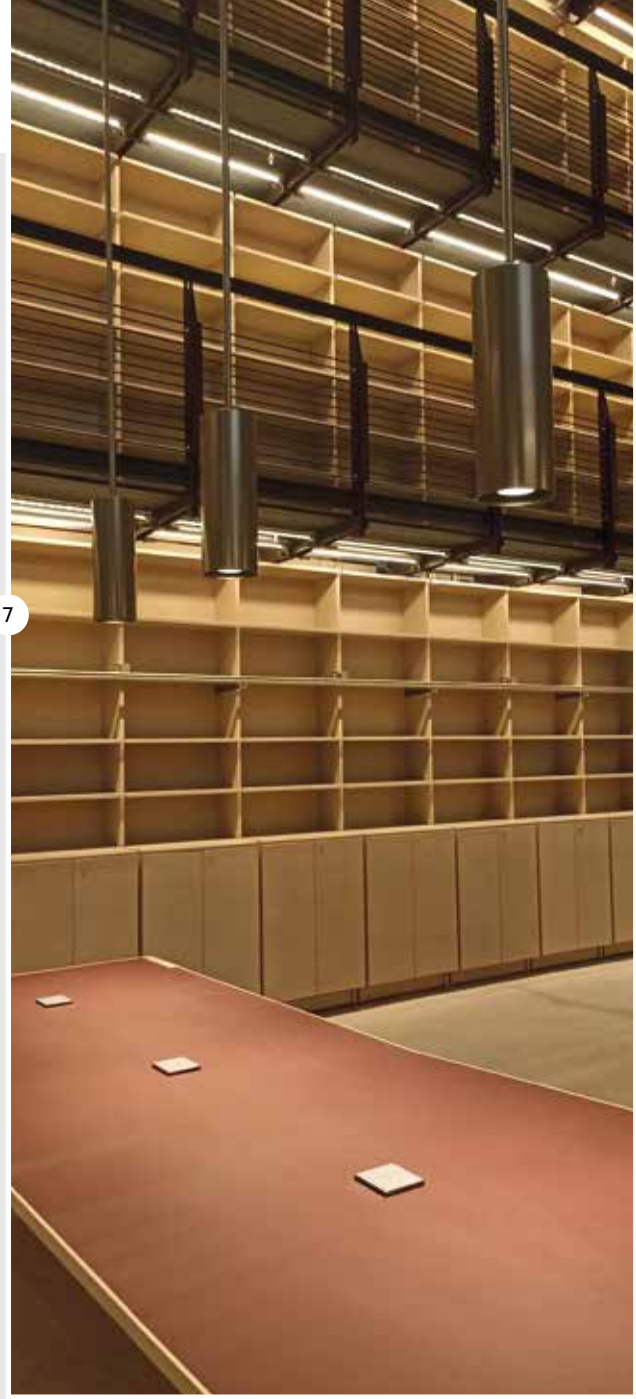

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As a place of commemoration, so steeped in memories and meaning, from the early stages the company has proposed a shipbuilding system that not only would act as a "semi-opaque" protective screen, but also as a means of dissemination and remembrance. It consists of a series of transparent windows on the working areas with graphic and didactic representations, that focused not only on memories but also on the mutual spirit of sympathy, participation and peace.

The Director of Works, Eng. Valerio Arienti, in cooperation with the Responsabile of the work, Arch. Andrea Costa, periodically monitored the work following what was designed by Morpourgo de Curtis Architetti Associati studio, which also assumed the role of Artistic Direction. Meanwhile, the global work was conducted and coordinated, on the company side, by Eng. Antonio Allegrini as Project Manager.

The peculiar logistics of the intervention sites as well as the the limited load capacity of the stalls, isolated from the pre-existing structures and characterized by a system of dampers to contain the induced vibrations, have brought out several issues. Therefore, the

Fig 9. Library – A tailor-made lighting system was realized for the library. 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

Company opted for a composite system of overhead cranes, suitable for the movement of large windows, that cope with the limited manoeuvring space and preserve the glass elements and respect the maximum safety and protection constraints for workers. The use of existing structures, which consisted of reinforced concrete capitals and roof beams, and on which were placed metal sections subsequently removed, made it possible to add the glass elements. Industrial metal profiles were welded to the aforementioned existing structures that acted as imposing bidirectional sliding rails; here, a winch system connected to an electric suction cup handler with very high lifting load capacity was installed, to ensure the safe vertical translation of the glass panes.

The fire-fighting system created for the library, unlike those present in the other rooms of the Memorial, is a sophisticated water-mist nebulization system with a pressure of 120 bar, designed to preserve the integrity of the 45,000 volumes on display and the electronic equipment. The special water mist nozzles (Fig 9) that constitute the architectural and


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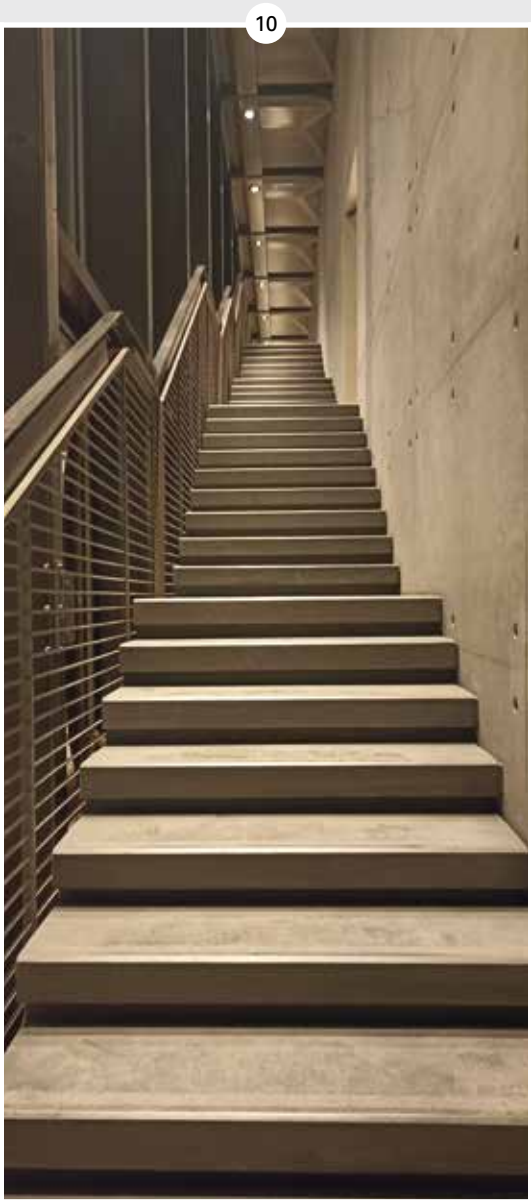
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Fig 10. Library - Existing staircase behind the west wall. Here we can find the large windows housed between the metal pillars, the sheet metal roofing elements with insulating panels as well as the entire electrical and lighting system

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

plant terminals of the mechanical distribution system, allow the evaporation of water by gradually increasing its volume, thus inducing a rarefaction of the oxygen present in the air. This system avoids damaging the protected property and ensure the positive effects of cooling, inertization and separation. In addition, with the aid of a crane, it was installed an impressive pressurization unit in small spaces into the external technical compartment, below the road level. The technological group was positioned on a horizontal structure made of metal profiles and steel grids previously consolidated and enlarged, comparing to the walkable surface.

The construction drawings translated the need for coordination between structures and systems. These drawings were of fundamental importance to create elements that put in synergy the plant and the lighting system, the workshop and the carpentry work, all necessarily tailor-made. Everything inside the construction site applies on a “macro” scale due to the imposing staircase (Fig 10), which leads to the colossal South Gate (more than 5 meters high!) (Fig 11) and the magnificence of the iron and glass envelope set inside an even larger “box”. However, the constant dialogue between the professional figures involved made it possible to shift from a macro scale to a micro scale, tailoring the project to transform the details into customized and peculiar creations with a high technical and aesthetic profile.

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

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The present article illustrates the restoration and consolidation work 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 presents 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 four principal

1

Fig 1. View on Chiaravalle Abbey

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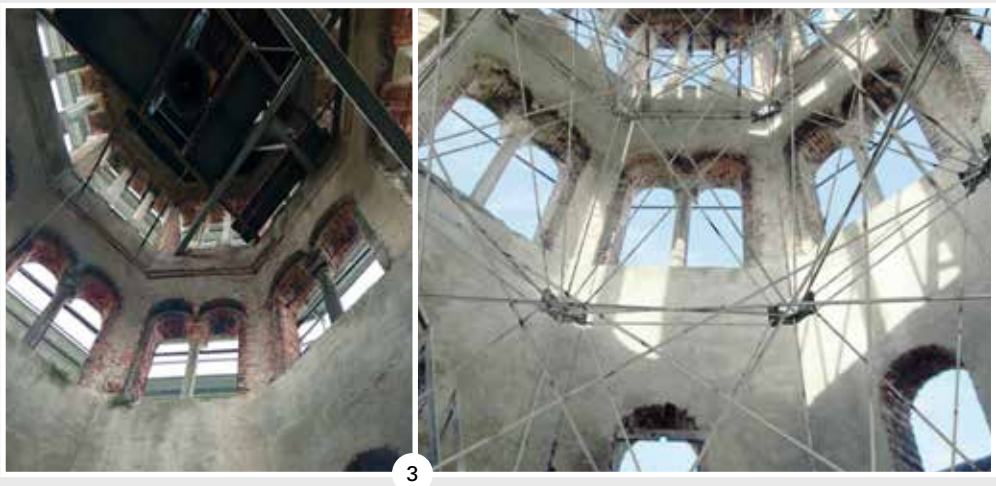
Fig 2. View of the tower from the internal courtyard

filiations of the Cistercian order. It was founded in 1135 by Saint Bernard in an originally swampy and uncultivated area, a few kilometers from the Porta Romana area, in Milan, and its construction was funded by the Milanese donations. Chiaravalle Abbey represents the purely Gothic-Cistercian style, with a simple and slender structure and its bell tower soaring in the sky, unlike the sisters of Clairvaux (to which it is inspired and from which it takes its name) and Fontenay, both characterized by massive and square architecture. The wise use of proportions, the essentiality of the shapes, and the study of light result in a combination of beauty and simplicity in a mystical atmosphere. According to the principles of the Rule of St. Benedict of Norcia, over the centuries the monastic community has played 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 after the abbey, probably by the architect Francesco Pecorari, and rises above the tiburium. The tower, 56.26 meters tall, is stylistically different from the stern architecture wanted by San Bernardo, since it is made of full masonry. The structure distributes the weight on the four arches of the tiburium; three of them are reinforced, shifting 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 a 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 with worked terracotta frames along the entire perimeter. 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 Ciribiciaccola by the Milanese, a word that in the local dialect describes the characteristic sound of storks which in the past would make their nest in the tower. The stork, 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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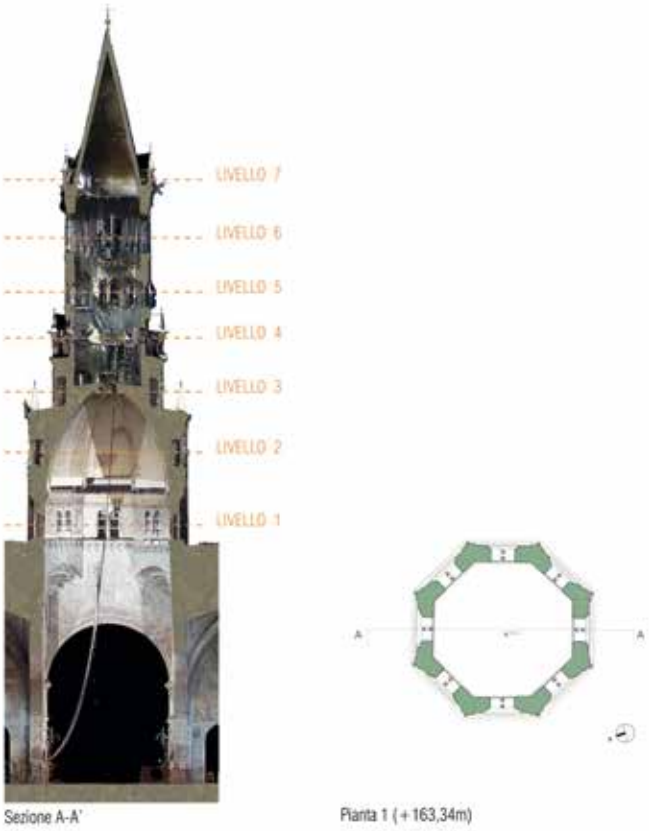

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Fig 4. Section of the tower divided into levels to identify the intervention areas

Fig 5. The scaffolding of the bell tower

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 work was carried out on the arches of the transept, probably due to the inadequacy of the supports which were not designed and sized to withstand the weight of such a high tower. During the 17th century additions and renovation works were made as well as some replacements. Since the end of the 19th century, we can mention the restoration and consolidation of the tower in 1905 by Gaetano Moretti and Raineri Arcaini. The sphere and the terminal cross placed on the upper end of the tower were also removed, repaired and gilded. This intervention was of considerable historical-methodological interest, because it proposed the 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 using stone instead of terracotta;

_ the application of a bituminous waterproofing membrane on the overhangs;

_ the insertion of bird nets and the replacement of the wooden staircase with a metal one to ensure 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 of the abbey, and focused on its geometry (through a laser scanner survey), materials (through a diagnostic and investigation campaign, such as flat jack tests, sonic tests) and loads (via dynamic recording); the second phase focused on the static and seismic vulnerability analysis of horizontal loads and the design of structural and restoration interventions; the current final phase 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 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 performed on the surfaces revealed several issues regarding the conservation of materials and the degradation of the architectural surfaces, due to the stratification of thick black crusts, salt efflorescences and bird droppings; in addition, the analysis pointed out the localized detachment of terracotta and stone decorations.

Deposits of atmospheric dirt well attached to the surfaces were detected in all the open-

Fig 6. Detail of the spontaneous vegetation

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

6 7

Fig 8. Treatment of metal elements

ings. Both the original and the reconstructed stone elements showed signs of detachment: the stone surfaces were severely damaged and eroded, to the point that in some cases it is not possible to recognize the original shape/form. From a structural point of view this was related to the large quantity of openings and the slender structure of the tower.

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, which are the most affected by deterioration from weather.

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

As regards the stone elements, the conservation work differs depending on the type of

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Fig 9. View on the Abbey from the tower

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stones used for the monument. Overall, the project provides every brick, stone and iron material surfaces with:

_ a pre-consolidation of the detached surfaces, followed by a wet cleaning by spraying all surfaces to dissolve black crusts;

_ a punctual cleaning with compressed air, the use of a broad-spectrum biocide spray and a brush;

_ a final treatment of the metal elements with ferromicaceous products and rust converters.

Concerning 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. The consolidation of the original layers, which date back to the restoration phases, was realized through injections of consolidating mixtures based on natural hydraulic lime free from salts, while the grouting and sealing was 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
Lorenzo Jurina
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 of 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, it has been identified the presence of masonry elements close to detachment, along with significantly eroded stone columns, with very low residual strength, and oxidized iron elements that do not provide 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 a light structure in steel cables inside the tower. This system offers a confinement action and works as a three-dimensional bracing structure, collaborating with the masonry walls of the tower. It consists of a parabolic hyperboloid post tensioned structure, a sort of "hourglass", made of inclined cables. In case of a seismic event, the masonry structure will be compressed, on one side, and a tensile action will be exerted in the cables, on the opposite side. The choice of cables was made because of their resistance, effectiveness, and their ability to provide 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 intervened specifically on every material of the bell tower respecting its history, following the principle of non-invasiveness and realizing the consolidation and restoration work in compliance with the criterion of reversibility.

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TECHNICAL REPORTS OF THE EXECUTIVE PROJECT – JUNE 2019 disclosed with the authorization of the designers

Atti del convegno Il Sud Milano e l'Abbazia di Chiaravalle. Una grande risorsa di storia, di agricoltura e di fede (30 gennaio 2015) LE NECESSITA' DI CONSOLIDAMENTO STRUTTURALE DELLA "CIRIBICIACCOLA", LA TORRE NOLARE DELL'ABBAZIA DI CHIARAVALLE- 2015 prof. Ing.Lorenzo Jurina - Politecnico di Milano

INDAGINI STRUTTURALI R PROPOSTE DI INTERVENTO PER LA CONSERVAZIONE DELL'ABBAZIA DI CHIARAVALLE MILANESE – 2014 Master's degree thesis in civil engineering by Enrico Buizza - Politecnico di Milano

Torri e campanili : caratteri tipologici e analisi delle patologie di strutture a prevalente sviluppo verticale in muratura, 2013 thesis in Civil Enginnering by Alessio Battiston -Politecnico di Milano

Fig 10. View of the bell tower from the internal courtyard before the preservation works

10

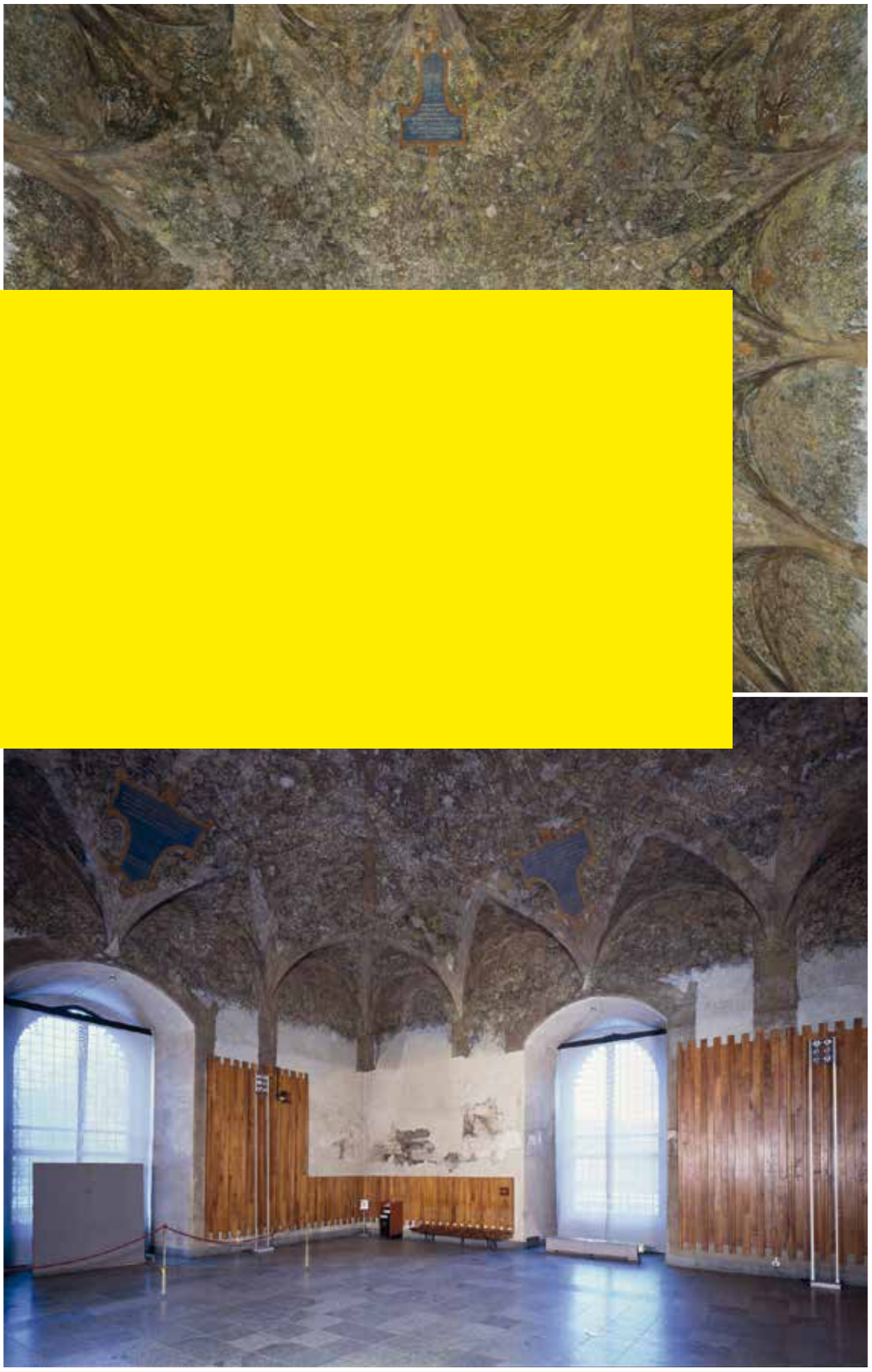
20 SEPTEMBER
BOLOGNA

SAN PETRONIO – ARTICOLO SUL RESTAURO DELLA FACCIATA – MATERIALI SOSTENIBILI

Anna Turrina
Polimi

In a letter dated 21st April 1498, the secretary Gualtiero da Bascapè informed the duke Ludovico Maria Sforza called *il Moro* that Leonardo da Vinci had promised to complete the decoration of the Sala delle Asse, a large square room in the north-east corner of the Sforza Castle in Milan, at the bottom of the Falconiere tower.
The decoration designed by Leonardo in 1498, perhaps aided by a team, includes a large

by the duchy under his rule.
A letter dated 1498 specified that "Lunedì si desarmerà la camera grande da le asse c<i>oè da la tore."– that is to say that the wooden planks on the walls, often used at the time to insulate rooms against cold and damp, would be removed. Based on this element, architect Luca Beltrami, who supervised the complete restoration of Sforza Castle at the end of



the nineteenth century, rechristened it the “Sala delle Asse (Room of Planks)”. In fact, in Ludovico’s time the room was known as la camera detta de’moroni (the mulberry room), as recorded in chapter 20 of Luca Pacioli’s Divina Proporzione (1509).
Over the years, the Leonardesque decoration was covered several times with white lime, often used in the past to sanitize the rooms, and the room was used for the most different uses. The Sforza Castle was in fact used as a barracks during foreign dominations and the Sala delle Asse was systematically used as a shelter for horses. From 1893, when the Sforza Castle became the property of the municipality of Milan, the Sala delle Asse underwent two major restorations.
At the end of the nineteenth century, under the direction of the architect Luca Beltrami,

corner while in the remaining walls it reached the base of the polychrome lunettes.
The Monochrome, as indeed the entire decoration of the hall, was affected by extensive phenomena of degradation which, in addition to threatening the conservation of the work, distorted its correct reading.
The recovery project of the Sala delle Asse was started in 2006, with a first phase of diagnostic investigations that highlighted the degradation of the pictorial surfaces, caused by pollutants and the surfacing of salts that have progressively degraded the decoration. Beginning in 2012, the wooden boards of the BBPR set-up were removed from the walls and an important study and investigation campaign was initiated aimed at getting to know the work and its restoration, in collaboration with the Opificio delle Pietre Dure of Florence and the Ministry of Cultural Heritage.
The first phase of the restoration project ended in 2015 with the important recovery of the Monochrome. The preparatory design, executed with charcoal graphic signs finished with ocher-based pigments spread by brush, presented several superficial incoherent deposits and film-forming materials applied during previous restorations. These, together with a diffuse whitish patina due to the presence of saline efflorescences, as well as damaging from a conservative point of view significantly altered the perception, compromising their correct reading. It was therefore decided to intervene through a conservative restoration with the dry removal of inconsistent surface deposits and saline efflorescences, proceeding in parallel with constant monitoring of environmental values. Furthermore, localized

detachments of the plaster were fixed, ensuring stability through punctual anchoring and targeted injections of premixed mortar.
Thanks to the systematic campaign of diagnostic investigations that involved the Sala delle Asse as a whole, a band of ancient plaster was found, still hidden under numerous layers of lime and repainting, which runs continuously along the four walls of the hall. A second phase of study was therefore opened for the identification of the most appropriate methodology for the removal of the lime layers and the repainting overlays. These layers were tenacious and strongly adherent to the most superficial layer of ancient plaster and traditional removal techniques would inevitably have led to a loss of the fifteenth-century material. The correct use of laser technology, thanks to its gradual and selective action, allows instead to remove the numerous layers of lime very quickly until reaching the last plaster veiling that hides the preparatory drawing traces underneath it, without compromising the ancient material.
For such a complex operation, a single type of laser could not be used. In general, the most common devices are lasers that operate in the near IR with different pulse durations, from microseconds to nanoseconds. Their main use is the direct removal (ablation) of degradations of various kinds, but mainly inorganic, which cover both artworks and architectural surfaces. In recent years the number of applications of this technology has considerably increased, above all on the different problems regarding restoration of wall paintings.
In this context, an operational protocol (secondary spallation) has been devised that is very useful for the *"descialbo"* of polychrome surfaces. The term *"descialbo"* means the removal of one or more layers of plaster covering a pictorial wall surface. In many of our

Italian monumental complexes, both palaces and churches, this is a common event due to the subsequent renovations and modifications that these buildings have undergone over the centuries.
After the first experiments in the Roman catacombs (S. Tecla's and Priscilla's) where this procedure allowed to free the ancient paleochristian funerary paintings from the earthy and carbonatic incrustations typical of those contexts, this methodology has been applied also on real wall paintings. Over time and with experience, very complex situations were faced in which action was taken not only on actual frescoes but also on monochrome charcoal drawings.
The most significant experience was that of Rome in the Farnese Gallery of Palazzo Farnese. Here in the lower part of the hall several layers of plaster covered drawings, sketches, signatures of visitors and artists who came to admire the frescoes of the Carracci brothers' vault (1597 -1607). It is thanks to this long and delicate intervention that it was possible to acquire the indispensable experience to be able to intervene on the Leonardesque masterpiece of Milan.
The relevance and complexity of the case have required the use of innovative techniques. including the laser cleaning on the decoration surfaces in order to remove scialbature (whitewash), altered retouches and organic fixatives applied during past restoration interventions, biological infestation and soluble salts. Compared with other techniques, the laser allows more versatility, accurate control and minimum surface damage In fact it provides a selective elimination of unwanted layers without any mechanical contact with the surface and the preservation of superficial Texture. The used lasers have been provided by

21 SEPTEMBER
FERRARA

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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 in 1135, thanks to the antipope Anacleto II, changes have been continuously made to its decorative apparatus as well as to its structural parts; in fact, important personalities of the history of architecture, like Leon Battista Alberti and Biagio Rossetti, had the opportunity to leave their mark on the church. 1712 is a very important landmark, since Cardinal Taddeo Luigi dal Verme entrusted Francesco Mazzarelli with the spatial configuration of the cathedral, which led to the construction of the main nave with three transepts and as many domes. As will be seen, it is precisely this intervention that has caused structural problems that soon manifested themselves through cracks, due to the construction methods.

The 2012 earthquake that hit the Emilia region caused the aggravation of the complex crack pattern of the nave pillars, a security risk for all those citizens and tourists who visit the Cathedral, as well as for the preservation of the remarkable Cultural Heritage of the building.

The Piano di Ricostruzione Post-Sisma 2012 regional funds, made it possible to design and begin the safety and structural consolidation of the eight major pillars, which support the eighteenth-century domes. This intervention, not yet completed, is characterized by a high level of complexity since the pillars are highly stratified.

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

This significant data comes from both historical sources and diagnostic investigations. The latter show that all the pillars investigated consist of a portion of a polylobed medieval pillar, off centered from the final configuration of the pillars built in the eighteenth century. This decentralization, caused by the differences in plan between the original three-nave basilica and 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 earthquakes that affected the cathedral over the last three centuries.

Therefore, phenomena linked to instability pressure occurred, aggravated by seismic horizontal force, but that could not be immediately deduced from the cracking patterns of the plaster.

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

INTERVENTION: BETWEEN TRADITIONAL AND INNOVATIVE SOLUTIONS

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

Since the operations directly affected the load-bearing elements, a multidirectional scaffolding was created during the most delicate and invasive phases, to unload the weight of the domes from the pillars to the ground. For the same reasons, the entire structure is monitored by a vibration control system and a network of crack meters.

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 ran 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 the project. In addition, 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) posed a problem for the consolidation works, so it was necessary to carry out an invasive and delicate intervention of detachment of 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), enabling the setting of protection priorities.

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

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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 position of the original polylobate (orange) is one of the most crucial elements to consider for the intervention

Fig 4-5. Restoration of the removed eighteenth-century wall paintings

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

Once the work on the masonry pillar was completed, and in addition to the already described studies on the walls, it was possible to carry out the most delicate interventions on the load-bearing elements. Firstly, Bossong technology of controlled injection anchors with socks for the confinement of the pillars were used.

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

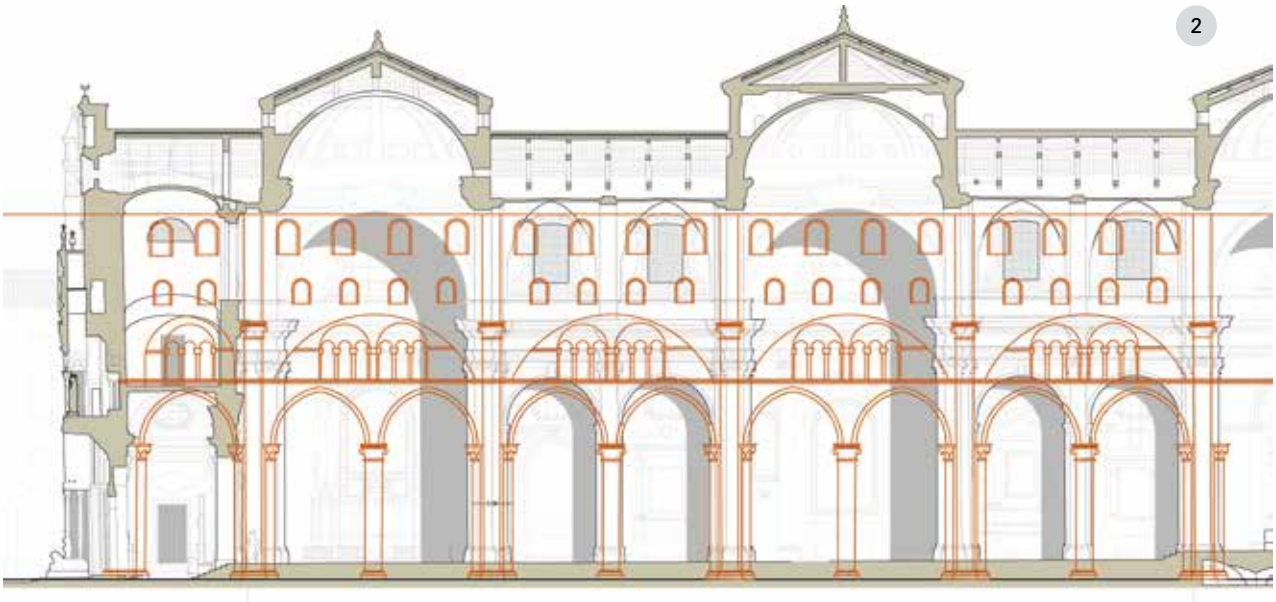
Given the presence of numerous wall cavities, injections of hydraulic mortar liquid with a composition compatible with the one detected were used to reconstruct a resistant unitary section. On the other hand, to give a further reinforcement to the base, a plaster reinforced with natural mortar was created.

This structural jacketing confining the pillars could be used up to 1.70 meters due to the presence of sculptural elements inserted in the eighteenth-century niches.

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

A pair of chains with flat heads, hidden by the new plaster, was placed 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.

Noteworthy is the restoration-upon-restoration work on the first pillar south of the pres-



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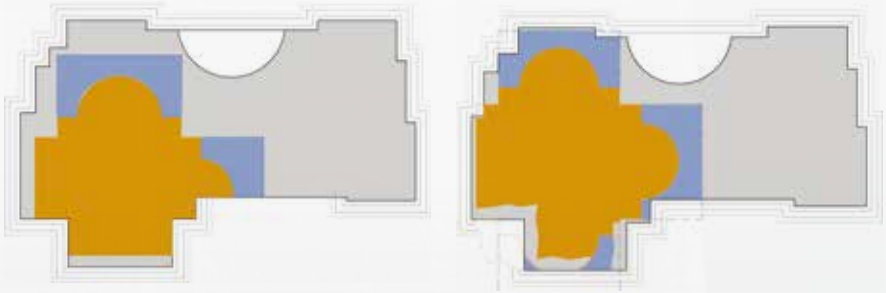

bytery, where an iron ring from the 1930s was found. It was supposed to solve structural problems, like the present cases, with ANCIENT techniques, but instead the iron hoop caused further problems to the masonry due to an oxidative phenomenon which required passivation procedures.

One of the most fascinating and unexpected aspects that emerged during the work on the pillars is the discovery of sculptural stone groups with geometric and zoomorphic figures and small fragments of painting now studied with portable XRF. In addition to causing problems with the structural response, the elements of the original medieval pillar represented 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 on the design phase and supported by the data that continue to emerge at the worksite thanks to Leonardo's technicians, allowed the scholars who are working on it to investigate how the offset of the eighteenth-century and the 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, represents a remarkable guide to understand the complex research and the horizons of this restoration.

This construction site shows that the continuous relationship between historical research and technical knowledge is mutually beneficial and stimulating for a project which aim is the preservation of an identity and cultural heritage, even when threatened by the seismic risk common to the whole national territory.

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Arch. Francesca Pozzi
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Assorestauro Director

PALAZZO SCHIFANOIA: POST-EARTHQUAKE SEISMIC RETROFITTING AND VALORISATION OF THE COMPLEX

The former building, started in 1385, was erected by Alberto V d'Este as a "Delizia estense"[1]. Its name was meant to emphasize the vocation of the palace as the ideal place for relax and amusement, since Schifanoia means "to avoid (schifa) boredome (noia)". The Palace was expanded under the Duke of Ferrara, Borso d'Este, around 1470 (Fig 1).
It was built on a quadrangular base, without the side wings, designed as a small place with a main facade and a second one facing the garden, in imitation of the typical suburban villa in the ancient Rome. It had been used as a model for the Renaissance Belvedere built by Pope Nicholas V in Rome.
The architecture of the Palazzo provides clear evidence of these two construction phases especially in the volumetric extension given by the contiguity of the late 14th century's with the 15th century's wing.

(1) *Amusement of the noble Estense Family, Dukes and masters of Ferrara at the time*

From the end of the 19th century, Palazzo Schifanoia hosted the collections of the Civic Museums of Ancient Art of Ferrara.
Palazzo Schifanoia has been closed to the general public since May 2012, after the strong earthquake which hit the Region. It consisted in a series of tremors located in the seismic district of the Pianura Padana, mainly in the provinces of Modena, Ferrara, Mantua, Reggio Emilia, Bologna and Rovigo, with the first strongest quake, magnitude 5.9, recorded on the 20th of May 2012 at 04:03:52, with its epicentre in the municipality of Finale Emilia (MO).
Immediately after the earthquake, the main issue was to secure the building itself and the precious artifacts inside; the challenge, since the beginning, war to open it, even partially, in the immediate and aside the ongoing restoration.
The knowledge process started to assess the current condition of the building, by means of geometrical surveys, structural and chemical/physical analysis and mapping of the cracks and structural damages.. This first process showed clearly the inner vulnerability of the entire building, emphasized by the earthquake (Fig 2).
To allow an immediate access to the Hall of the Months and the adjacent Stucco Hall, consolidations and repair works were carried out on the damage masonry together with the specialised restoration of the decorative apparatus of these two important halls; these interventions made it possible to re-open the halls to the citizens and tourists in Spring 2013, albeit only to this limited portion of the 15th century wing.
The architectural interventions involved in this new approach include the recovery of a number of different environments - in particular the restoration and valorisation of the torn mural paintings which re-emerged from the stratigraphic tests in the “Loggia” room, its wooden ceiling and other rooms prevously hidden under plasterboard false ceilings (Fig 3).


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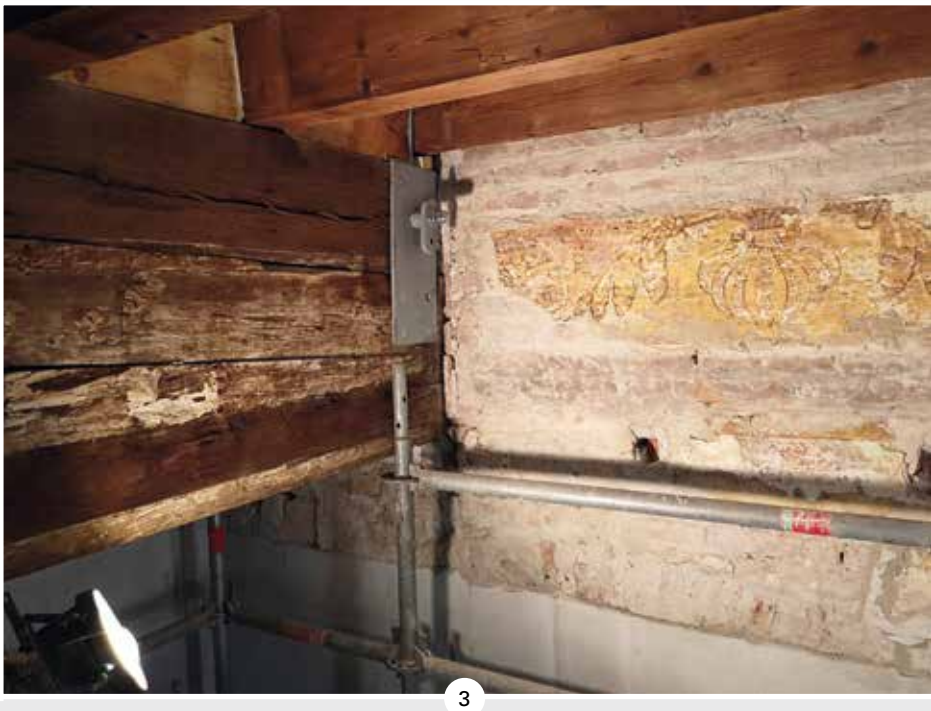
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In order to carry out the post-earthquake intervention on the floors of the noble level and the overlying roof structures of the 15th century wing, it was necessary to protect the decorative apparatuses of extraordinary artistic value necessary with suitably customized protection systems to guarantee comprehensive protection of wall paintings, wooden ceilings and stuccos against vibrations, shaking, dust, and anything else that could cause damage. Due to the peculiarities of the artworks and the related preservation procedures, the project aimed at identifying a modular system consisting of wood frame covered with non-woven fabric and plastic material to completely cover the surfaces of the walls and ceilings (over 2,000 sqm.). The protection project has been carried out jointly between the Museum Management at Palazzo Schifanoia and the competent Heritage Department and it is still in progress (Fig.4).

Referring to the effects of the earthquake on the building, the crack mapping showed that the structural damages are so extensive that, in some cases, it has undermined the preservation of the asset.

In the14th century wing, the poor or lack of clamping of the perimeter walls to the spine walls has generated a repeated series of damages in the corners; cracks on the walls in the vicinity of the floors of the attic are also visible, showing the start of the rotation of the façade walls.

The 15th century wing is the most damaged part due to its geometry and the higher height, along with the of any important restoration or recovery works in the recent years. Numerous cracks, easily visible on the walls, the arch covers, and on the areas weakened by the passage of flues, together with detachments of the non-anchored vertical walls, are visible all along the structure. The floors show widespread separations from the masonry and cracks in the sand ceilings. On the noble floor: systematic lesions of a diagonal type can

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be seen on the top corners of the spine walls, which show the start of the rotation of the front wall linked to the considerable height and increased by the trusses of the roof. The delamination between the masonry and the ceilings are mainly due to the total absence of horizontal anchoring systems and to the fact that the ceilings themselves do not provide rigidity, hence the masonry walls have no intermediate supports and very high vertical floor spans.

The analysis of the cracking issued, led to design the structural interventions aimed at restoring the damage incurred and the creation of a diffused combination of reinforcement interventions that will ensure an improvement of the local and overall seismic response of the entire building (Fig.5).

The structural measures, in addition to the repair and restoration works such as the injection in the cracks, nip-tuck, reinforced seaming, retipping of the mortar couplings, also include the widespread stiffening of the wooden flooring on the various floor and the attic, the consolidation of the composed beams, the insertion of structural chains and the sub foundation in masonry work which highlighted the absence of a wider section at the foot.

The structural buffering of existing apertures has also been foreseen, in particular on the north façade, to integrate the existing walls and obtain an improvement of the static and seismic behaviour of the treated walls.

The need for structural interventions on the building, gave the Schifanoia Museum Management the opportunity to replan the museum functional features. The exhibition spaces of the 14th century premises and the extraordinary areas on the noble floor were extended to include additional rooms of the 15th century wing. The addition of the funds granted by the region for the seismic retrofitting and the funds of the local Municipally transformed a tragic event into the opportunity to create a new modern Museum into a well-restored Palace.

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22 SEPTEMBER
VENEZIA

THE RESTORATION PROJECT OF PALAZZO DIEDO IN VENICE

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HISTORY OF PALAZZO DIEDO

Venice, Sestiere of Cannaregio. The construction of Palazzo Diedo in Santa Fosca is linked to the story of a powerful family. This family of Venetian nobles came from Altino in 790 and stood out in the Venetian political life thanks to the "Serrata del Maggior Consiglio" of 1297, which allowed them to fill important positions. In fact, they were Proti di San Marco, generals of land and sea, ambassadors to the European courts and distinguished prelates. In the fifteenth century they went against the Genoese, they fought in Romagna on behalf of Pope Sixtus IV and they held many other important positions that distinguished their family until the nineteenth century.

From the sixteenth century, the Diedo resided in Santa Fosca in "Casa da Stazio", which will later become Palazzo Diedo; in 1710 they commissioned 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. Tirali designed a building with 7 meters high floors and from the attic, today we can admire Murano and the island of San Michele, almost from the same point of view as the Venetian bell tower.

Andrea Tirali was a fashionable architect when he was commissioned a building of impressive dimensions, both in height and extension, which occupied an entire Venetian insula. Originally, he worked as a stonemason and bricklayer, in 1688 he was vice-protector to the Magistrate of the waters of Venice and the designer of the bridge of the Three Arches, in Cannaregio. He also designed several buildings in Chioggia: of particular importance is Palazzo Grassi, designed for the homonymous family, that shows 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. The ground floor was designed as a filter between water and earth, while on the upper floors was the family boardroom. The beautiful façade (Fig 1) consists of a central round three-light window with side windows framed by large bands of Istrian stone, but originally, they should have been surmounted by protruding triangular gables, as attested by the only drawing of Tirali passed on to us. (Fig 2)

The construction of the palace lasted for about 10 years, from 1710 to 1720, but remained incomplete. The back of the palace, that overlooks Rio del Trampolin (Fig 3), was let unfinished and today we can see a conglomerate of houses that complete the insula and that can be considered as part of the original property of the Diedo. The atrium of the Palace is very peculiar because it spread over a square plant with a Latin cross (Fig 4): on three of the four sides there are the entrances of the house (two from the ground and one from the water), while the fourth side should have opened on the large staircase of the building but was never realized. The stairs of the building are presumably of the sixteenth century and date back to Casa da stazio, as well as the foundations and some walls that make up the building. The two original gables decorated with sculptures and columns in the entrance hall have undergone great transformations as well as the whole building, that was sold

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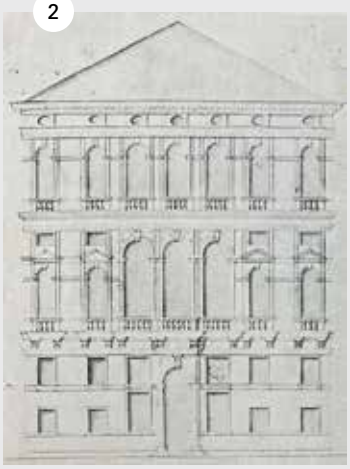

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Fig 1. Photo of the main façade from Rio Tera de la Maddalena (ph. Alessandra Chemollo)

Fig 2. Andrea Tirali. Autograph drawing for the Diedo palace. Façade (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. Photo 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)

to the Municipality of Venice at the end of the XIX century. Since then, it has had different roles which determined the transformation of the building: infills and new floors has been added to avoid the phenomenon of high water; the frescoes of the eighteenth century has been covered or erased. In the first noble floor there are two cycles of frescoes: the first one features an allegorical-mythological theme (Ebe acccolta 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) and was realized in 1765 by Francesco Fontebasso to celebrate the marriage of Girolamo Diedo to Alda Priuli. The second one, was realized in 1795 by Costantino Cedini for the wedding of Antonio Diedo with Lucrezia Adriana Nani (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, probably left incomplete because of the economic problems of the family, is only decorated with six monochrome patterns(Fig 6).

THE RESTORATION PROJECT

Over the course of more than a century, the Palace has been remodeled several times becoming the home of a gymnastics society, an educational institution, Monte di Pietà and finally the Surveillance Court. Today the restoration project involves the whole building, both the external facades and the interiors.

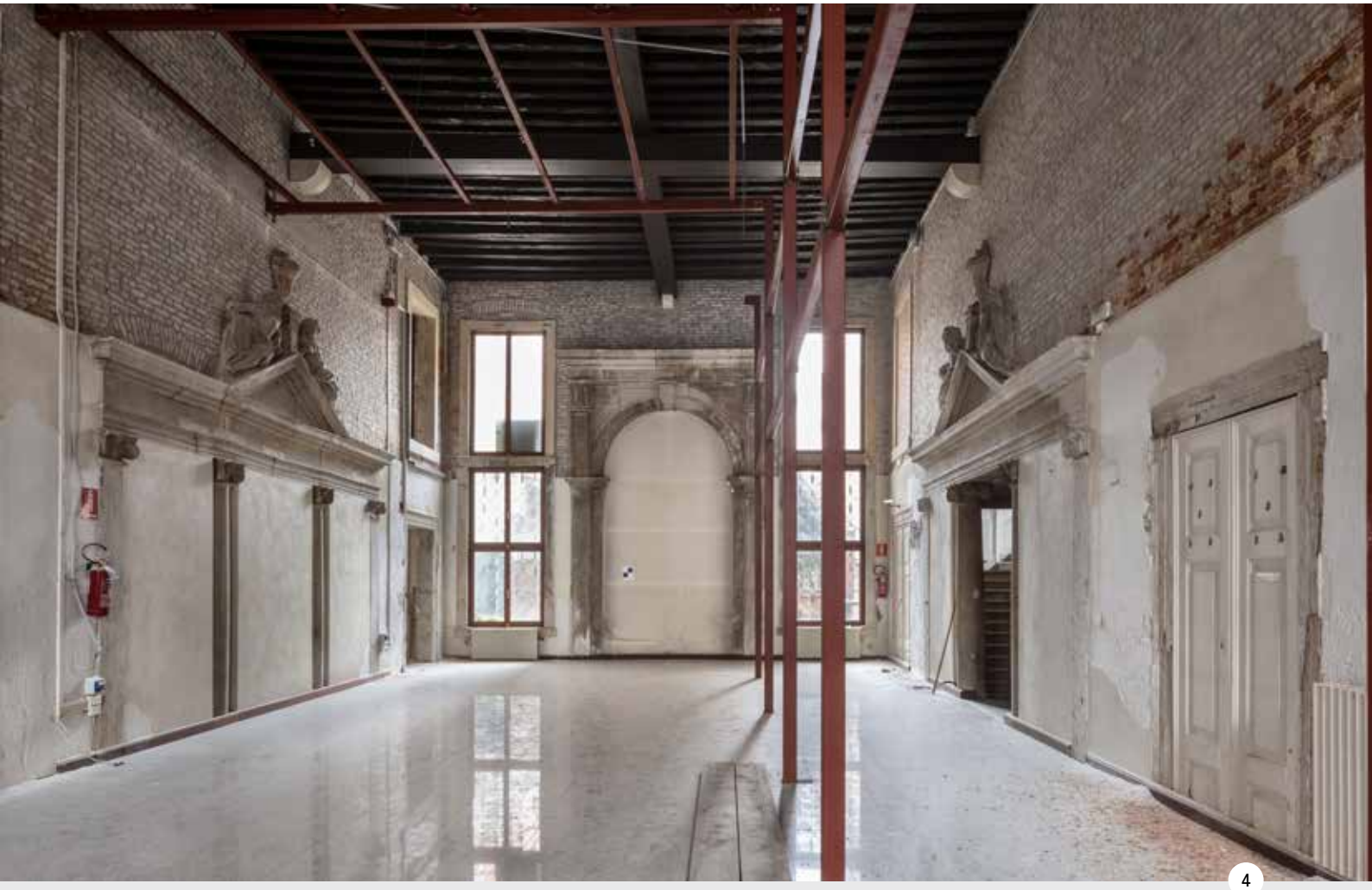

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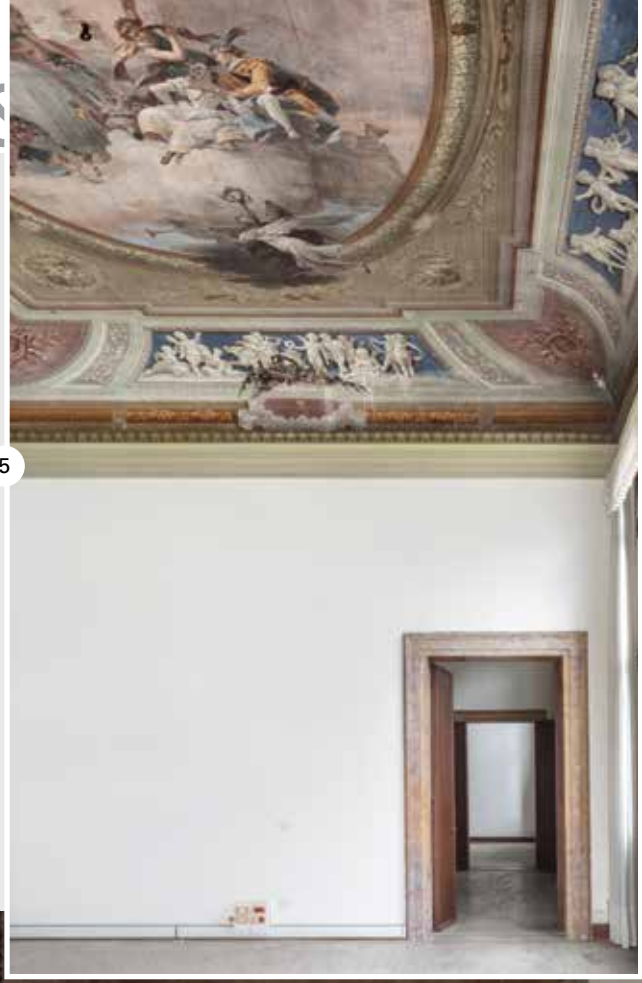
Fig 5. Hymenaeus with t he divinity of Olympus by Costantino Cedini, 1795 (ph. Alessandra Chemollo)

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, made of a pinkish or light gray background plaster and a plaster with ivory finish, and will remove surface deposits, biological patinas, vegetation, black crusts, spots and grouting. They will act on saline efflorescences, cracks, gaps and the degradations of the disintegrating stone, through exfoliation and hurling. The Istrian stone frame of one of the windows of the main façade has already undergone a first cleaning test via 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 overlapping layers of paint of the perimeter frames of the halls, the several-times-repainted doors and the external portals will be cleaned of surface deposits, the decorations will be brought to light, the cracks will be healed, the gaps will be integrated and finally treated with a protective (Fig 8).

A different approach will be used for the entire decorated wall apparatus because over the years it has been the most affected by the alterations dictated by the change in use; therefore, it will be necessary to proceed on a case-by-case basis. In the completely repainted first noble hall there are numerous gaps, and extensive renovations were carried out, such as the insertion of electrical and hydraulic systems, the application of enamel boiserie



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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)

and many cementitious patches. This hall was the subject of the first cleaning tests which brought to light well preserved fresco decorations of female figures and framed plant elements hidden under different layers of repainting. These decorations acted as a fake architecture, with the exception of the cement stuccoes. In addition, along the mirror were found decoration bands with ochre, brown and blue architectural motifs, to simulate a boiserie that ran along the entire perimeter of the room. Even the mezzanines were the object 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 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 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.

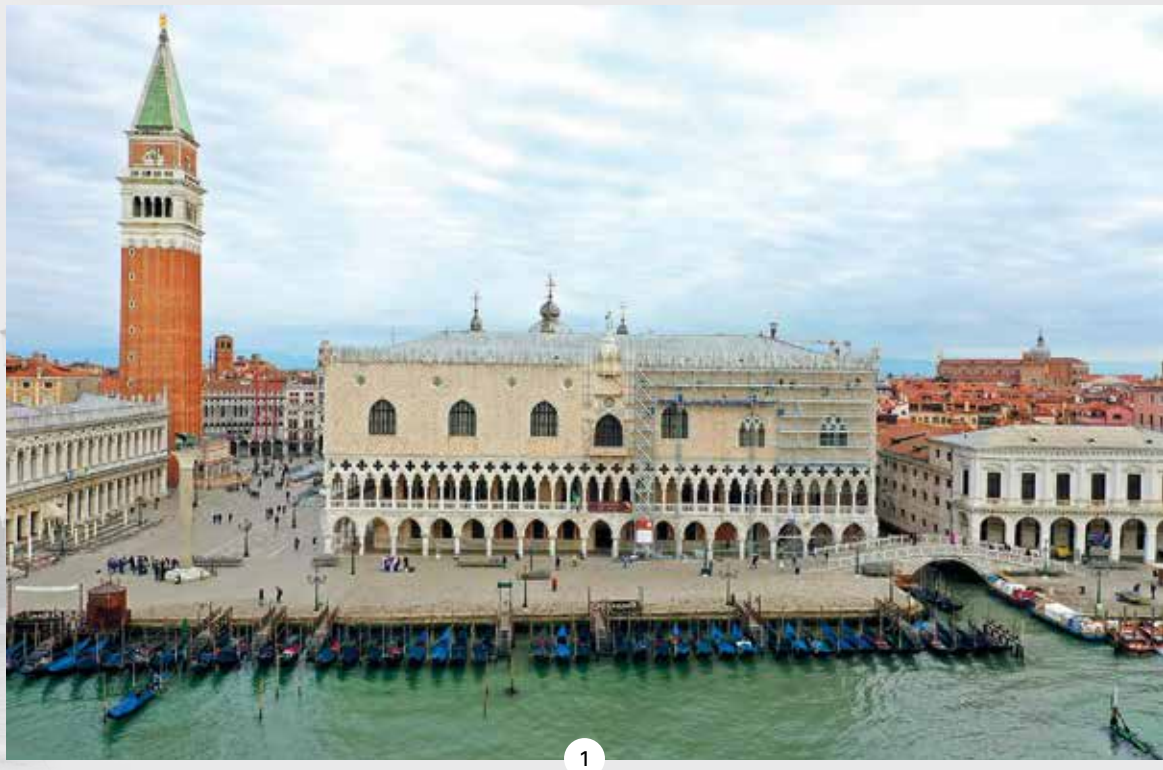

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Fig 2. Product sampling processes currently in progress

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.

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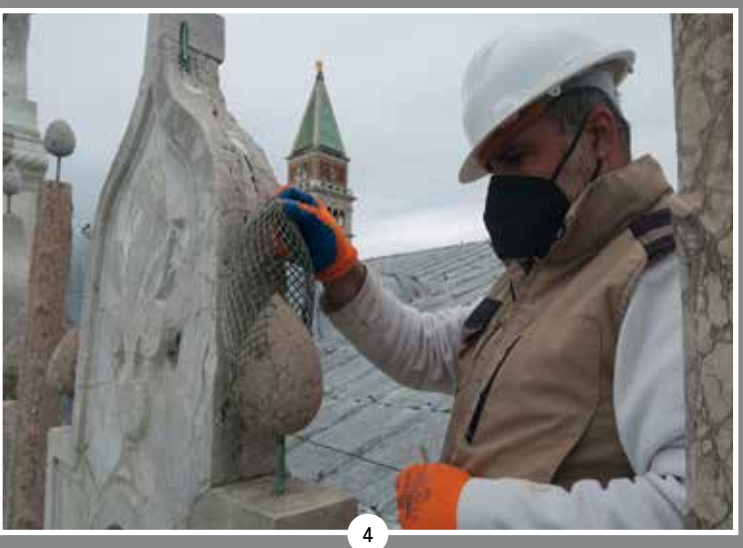

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23 SEPTEMBER
MANTOVA

1

TEATRO SOCIALE IN MANTOVA. RESTORATION OF THE FACADES

Sonia Vallese
Assorestauro

INTRODUCTION

The Teatro Sociale is an imposing building erected in neoclassical style between 1818 and 1822 on a project by the Swiss Architect, Luigi Canonica. The building, inspired by the most characteristic schemes of the Italian opera house of neoclassical taste, has a low and wide facade but retains a stretch of majesty thanks to a six-columned pronaos surmounted by a tympanum (Fig 1).

The Social Theater of Mantua, due to its particular characteristics, is defined by the Italian Ministry for Cultural Heritage: “Theater of Tradition” together with 23 other Italian theaters (Fig.2).

CURRENT STATE

The interventions carried out during the restoration work mainly concerned all the facades of the theater, including those on the inner courtyard. All these surfaces showed Several signs of deterioration which in a first phase of the works were mapped into diagrams (Fig 3).

The presence of biological patinas and encrustations, chromatic alterations, lacks and gaps in the plaster layers, coherent surface deposits, dust, soil, guano, encrustations, graffiti and so on were verified. These deteriorations were equally present both on the wall face, on the plaster and on the stone parts (Fig 4).

The main facades on Piazza Cavallotti and Corso Umberto I, had been subject to intervention around ten years ago, and therefore were in a considerably better condition than those indicated above. however, over the years, the presence of colonies of pigeons and the constant passage of vehicular traffic have meant that even on these facades there were coherent superficial deposits that had to be removed.

WORK STAGES

For the restoration of the side facades, the following operations were carried out, both on the stone and on the plaster areas:

_ Dry removal of inconsistent surface deposits with the use of flat brushes, brushes and vacuum cleaners (aspirators);
_ Disinfestation from colonies of autotrophic and/or heterotrophic microorganisms by applying biocide and subsequent mechanical removal;
_ Cleaning of surfaces from coherent surface deposits and stains with thorough washing with brushes and broom brushes, sprayers and sponges;
_ Removal of coherent superficial deposits, encrustations, concretions and fixatives by applying compresses soaked in a saturated solution of inorganic salts or ammonium carbonate. Subsequent mechanical removal of solubilized deposits using flat brushes, brushes, scalpels and probes. The stone parts were cleaned with sandblasters.
_ Reestablishment of cohesion by spray impregnation until rejection of ethyl silicate or by injection of filler adhesives;
_ Mechanical and/or chemical removal of grouting carried out during previous interventions
_ Grouting in cases of cracks, fractures and shortcomings with the correct coloring and granulometry mortars tested on site.

The stone parts were then finished with the chromatic overhaul in watercolor for the balancing of the grouting, and with the application of a surface protective to slow down its degradation.

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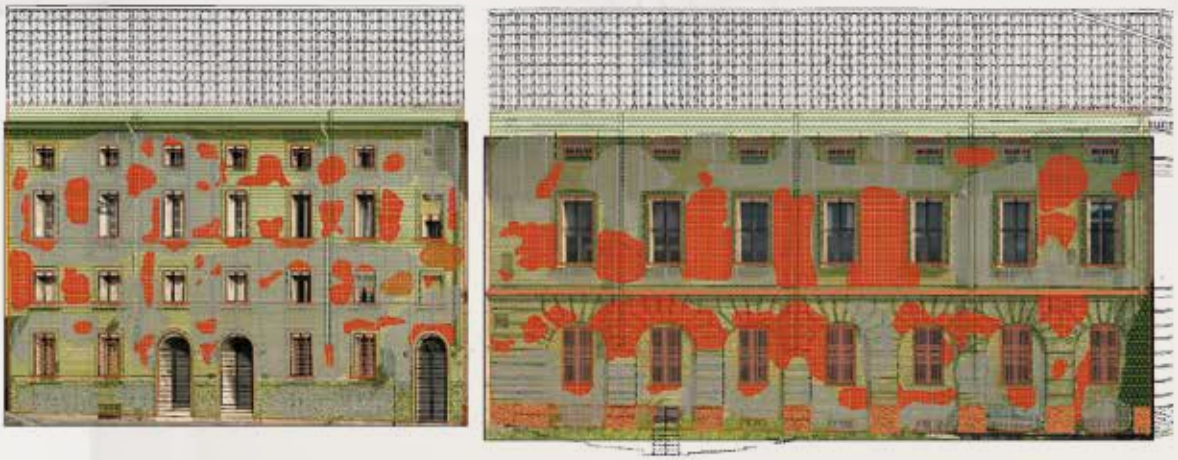
For the plastered areas, the restorers proceeded with the removal of the damaged parts that are no longer recoverable, the reconstruction of the removed areas and those initially missing (both civil plaster and bugnato plaster), the removal of metal elements such as pins, brackets that were a possible future cause of degradation and that were no longer useful, the application of water-based impregnating primer based on silicates, filler primer with silicates, painting of the surfaces, glazing with an antiqued effect and the final application of protective product.
The iron parts were also restored and cleaned with a micro-sandblaster and coated with a rust-proof primer applied with a brush and painted.
The facades that had already been the subject of recent preservation works, were cleaned by removing the surface dry deposits with brushes and small vacuum cleaners thanks to the use of a lifting platform. The bird deterrents have also been restored, to avoid the grown of new nests (Fig 5).



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