

Pier Luigi Nervi Project Foundation

Fondata nel 2008 dai nipoti di Pier Luigi Nervi, la **Pier Luigi Nervi Project Foundation** è un'organizzazione senza scopo di lucro che contribuisce al rinnovamento degli studi e della conoscenza sulla vita e l'opera di questo eccezionale ingegnere e costruttore del XX secolo. Dal 2010 la Fondazione ha curato la mostra internazionale **Pier Luigi Nervi. Architecture as Challenge**. Oggi il principale impegno della **PLN Project** è la **conservazione del patrimonio architettonico di Nervi** in Italia e nel mondo.



Pier Luigi Nervi Project Foundation

2008-2013: Mostra “**Pier Luigi Nervi Architecture as Challenge**” in Italia, Europa e Stati Uniti

2011: Ottenimento del **vincolo** di **Palazzo del Lavoro a Torino**

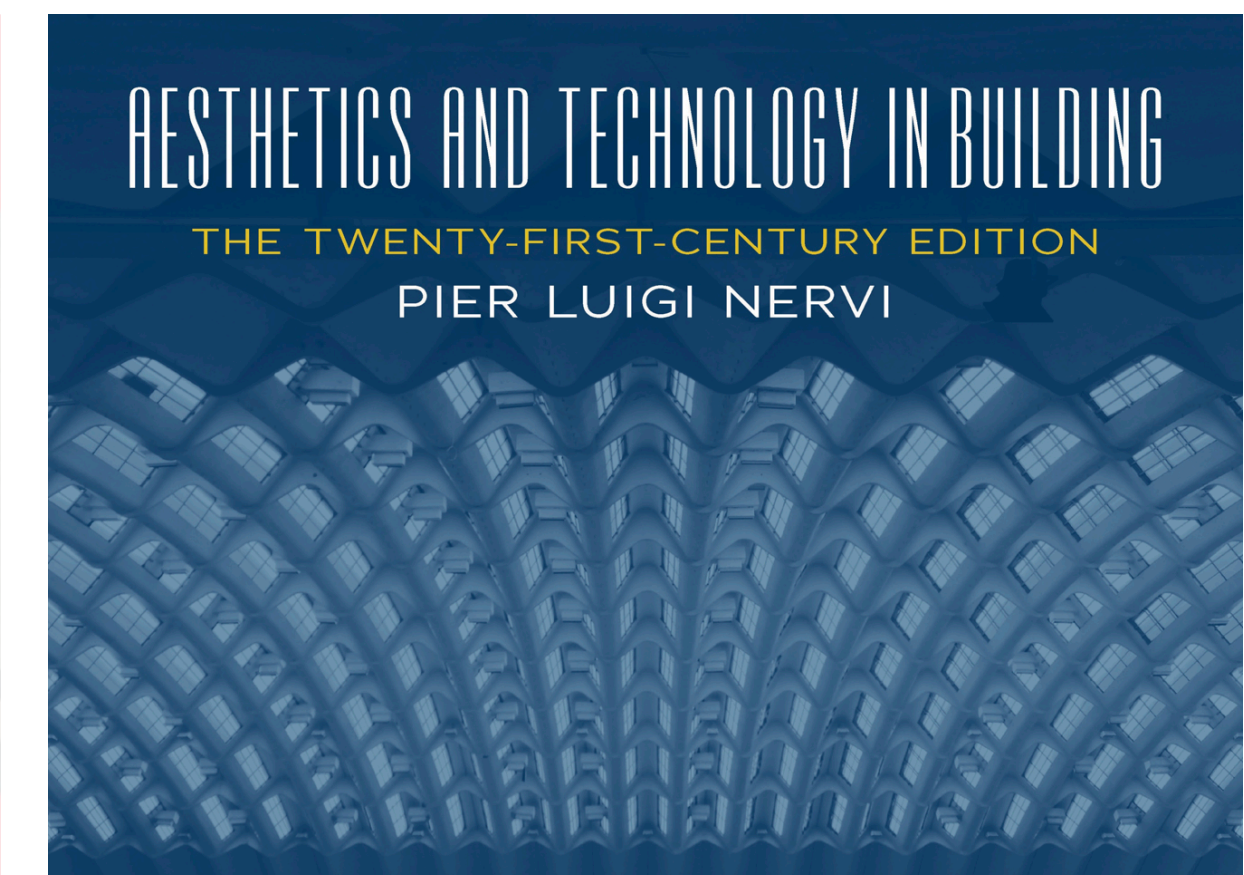
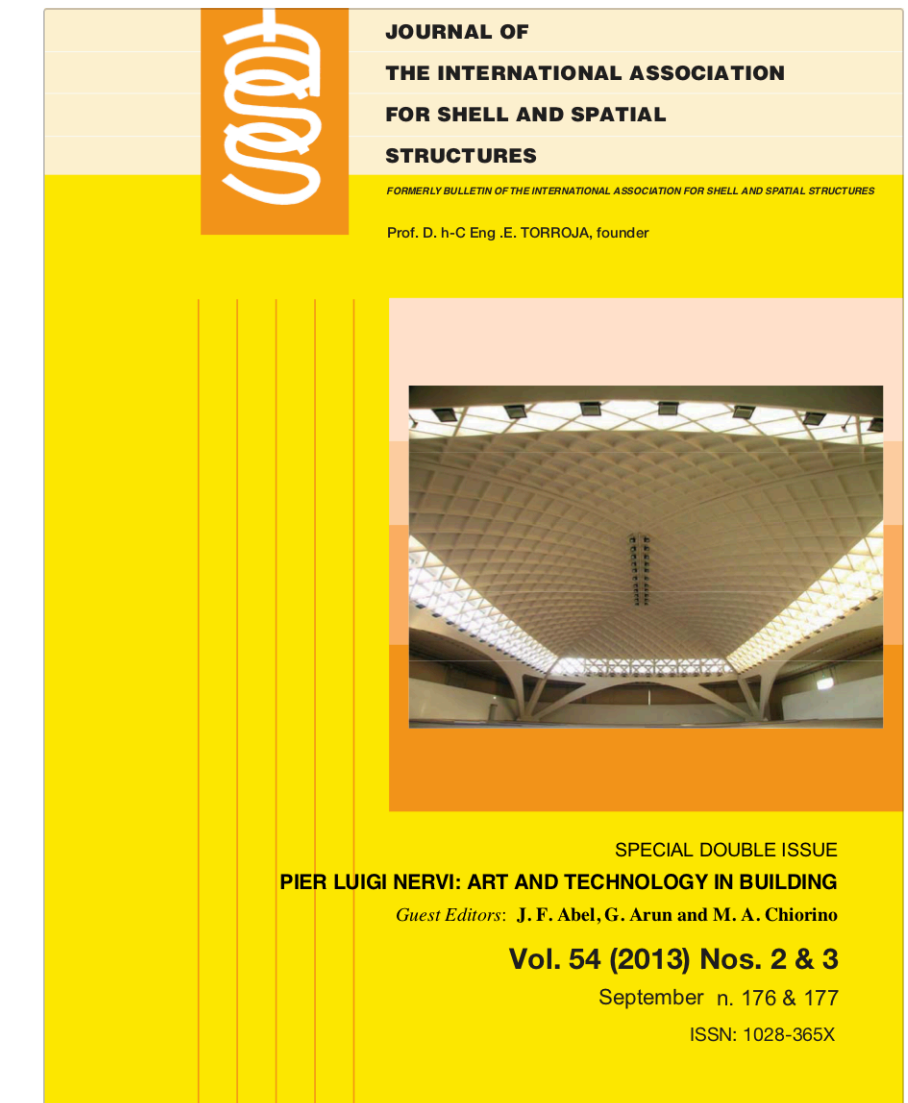
2015: catalogazione delle **strutture a guscio** di Nervi in IASS WG17 “Historical Spatial Structures” iasswg17.com

2016: partecipazione alla conferenza **Sauvegarde des grandes oeuvres de l’ingenierie du XX Siècle**, EPFL a Lausanne Svizzera

2016: Ottenimento del **vincolo** della **Cartiera Burgo a Mantova**

2017: project di ricerca finanziato dal **Getty program “Keeping it Modern”** sullo Stadio Flaminio a Roma stadioflaminio.org

2018: PLN e University of Illinois Press ripubblicano le lezioni americane di Nervi alla Harvard University: **Aesthetics and Technology in Building**



Pier Luigi Nervi Project Foundation

2018: Ottenimento del **vincolo** dello **Stadio Flaminio in Rome**

2018: Nervi Lab apre al Politecnico di Milano sede di Lecco

laboratorionervi.polimi.it

2019: Contributo alla enciclopedia **critica del restauro e riuso dell'architettura del XX secolo** progetto della confederazione elvetica **EPFL ETH SUPSI MENDRISIO**

2019: progetto di ricerca finanziato dal **Getty program "Keeping it Modern"** per Torino Esposizioni

torinoesposizionigetty.polito.it

2021-24: Erasmus+ project REcube: REthink, REvive, REuse

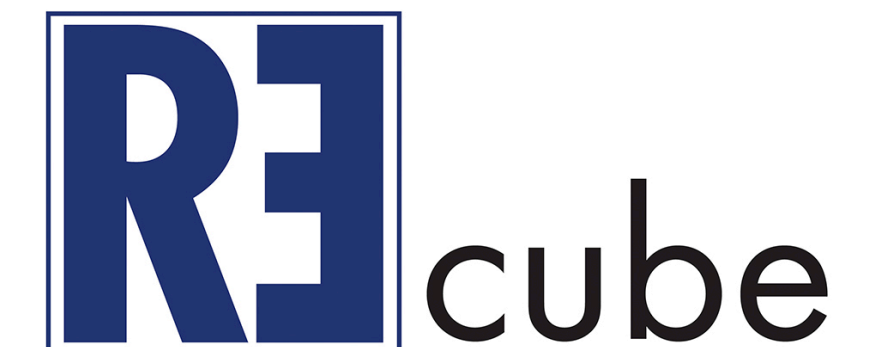
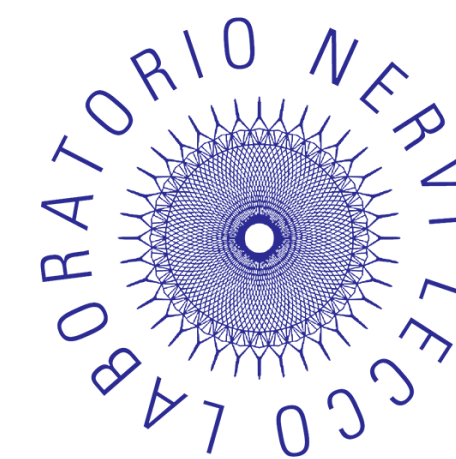
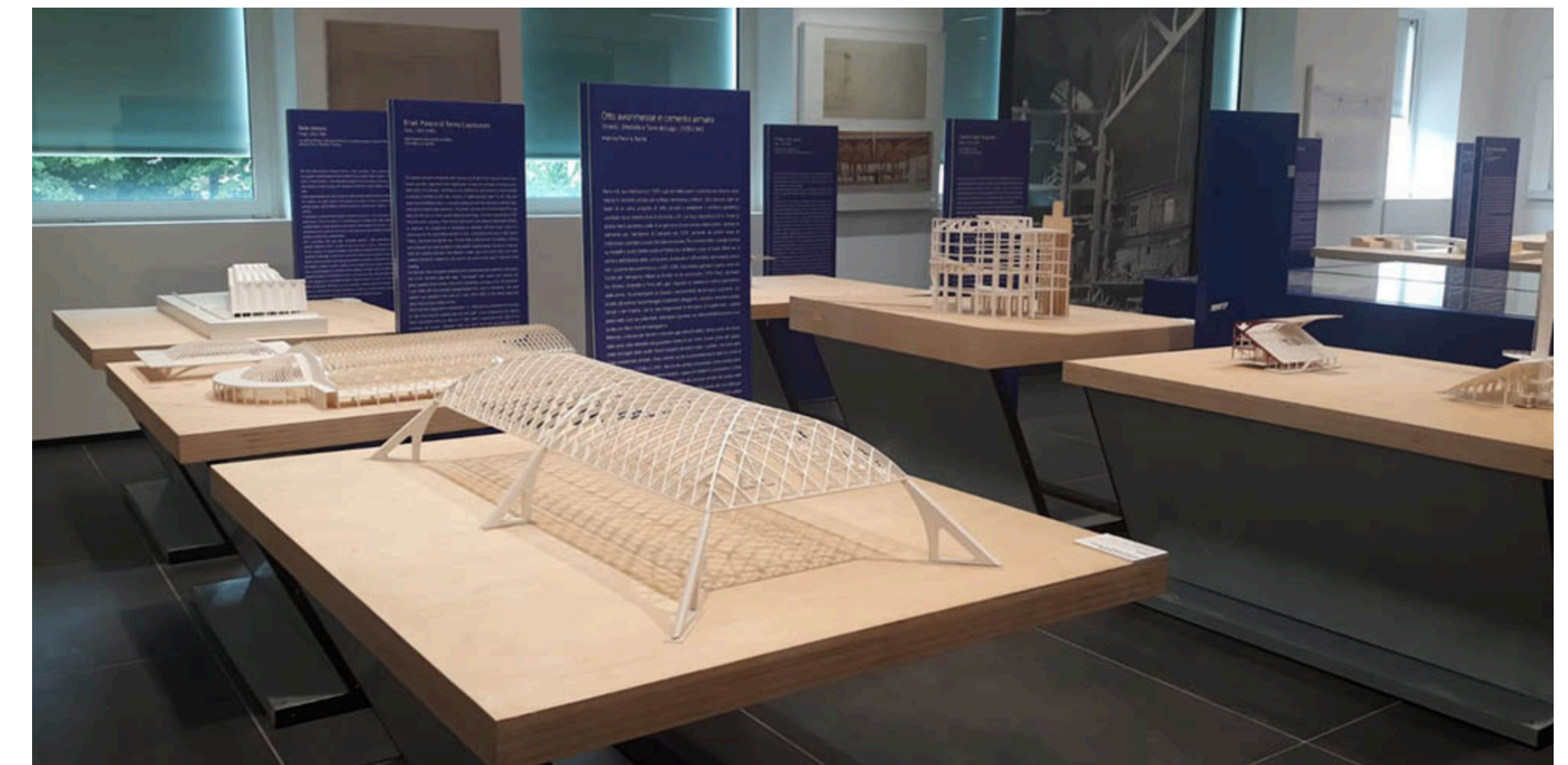
Transmitting knowledge for the green regeneration of the European Concrete Heritage

recube-project.eu

2024-27: Erasmus+ Alliance for Education and Enterprises

Concreto Academy Empowering the green rehabilitation of European Concrete Architecture

concreto-academy.org



Quali sono le sfide della conservazione?

Criteri di selezione: Alcune **opere iconiche** stanno subendo pesanti trasformazioni mentre altre stanno affrontando **perdite di funzionalità** e, in alcuni casi, negligenza o addirittura abbandono. È importante sensibilizzare ma soprattutto definire i **criteri** per la selezione delle opere da preservare a qualsiasi costo

Nuove tecniche di restauro: Oggi molte opere di Pier Luigi Nervi subiscono i consueti **processi di degrado** che normalmente interessano le opere strutturali in calcestruzzo. molta attenzione va posta alle tecniche sperimentali usate da Nervi come **elementi prefabbricati in ferrocemento molto sottili ampiamente utilizzati da Nervi** nelle sue opere principali.

Valutazione di vulnerabilità sismica: Il monitoraggio strutturale e la rivalutazione di queste strutture sono fondamentali, a causa della loro intrinseca vulnerabilità, ma anche in considerazione delle esigenze di conservazione, che devono essere contemperate con i requisiti di sicurezza strutturale



Stadio Franchi Firenze, progetto di riuso, 2022

Getty Keeping it Modern Initiative

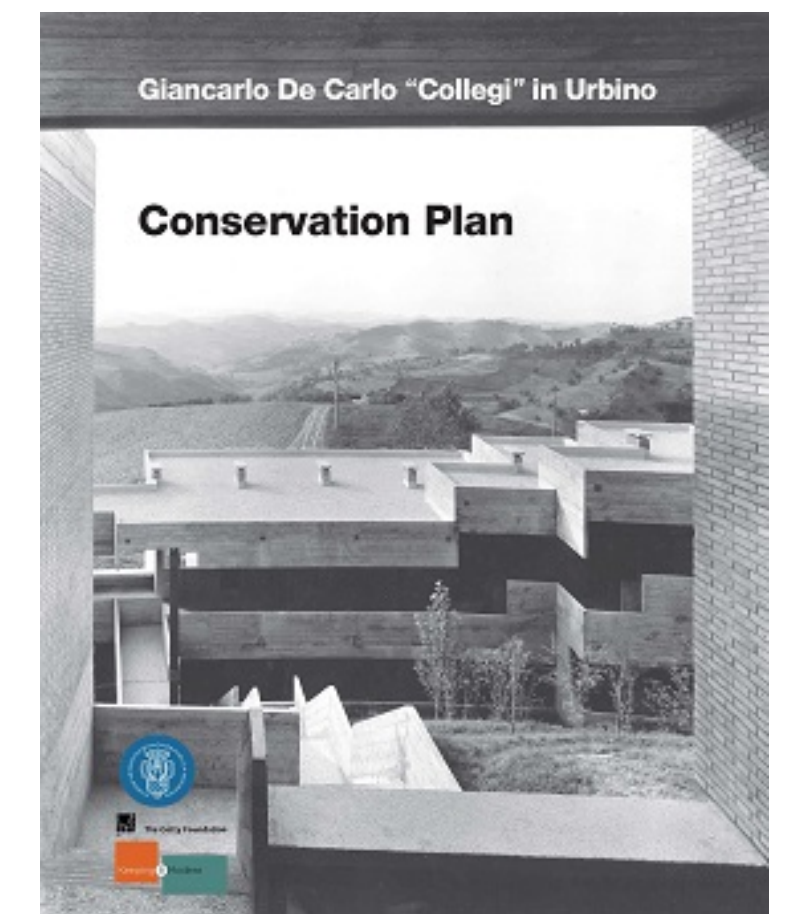
"**Keeping It Modern**" è un'iniziativa internazionale promossa dalla Getty Foundation per la conservazione dell'architettura moderna attraverso ricerca, piani di conservazione e formazione attraverso l'assegnazione di sovvenzioni annuali su base competitiva dal 2014 al 2020 con valutazione di esperti internazionali

77 progetti finanziati su edifici di grande rilevanza architettonica

Ricerca approfondita sui **materiali sperimentali utilizzati nell'architettura moderna**

"**Keeping It Modern Report Library**": una raccolta online gratuita di piani di gestione e rapporti di ricerca.

Dal 2022 diventa "Conserving Black Modernism", un progetto correlato che supporta la conservazione di edifici statunitensi progettati da architetti afroamericani.



Cosa è il piano di conservazione?

COSA: Il piano di conservazione è uno **strumento preliminare** al progetto di restauro e consente anche di gestire i processi di cambiamento del bene.

COME: È costituito da 4 parti si sono basate sull'analisi indiretta e diretta del caso studio conducendo indagini e valutazioni specifiche:

1. **ricerca di archivio**
2. **rilievo**
3. **valutazione strutturale e materiale**
4. **elaborazione di linee guida**

OUTPUT: un documento liberamente consultabile e un **modello H-BIM** che diventa così uno strumento non progettuale, ma programmatico



2022



2024

Torino Esposizioni Conservation plan

2019-2022

Grant vinto da Politecnico di Torino, Pier Luigi Nervi Project, IUAV di Venezia, Università di Miami e diversi partner industriali

Ricerca sviluppata di concerto con Città di Torino e Scr Piemonte

2021

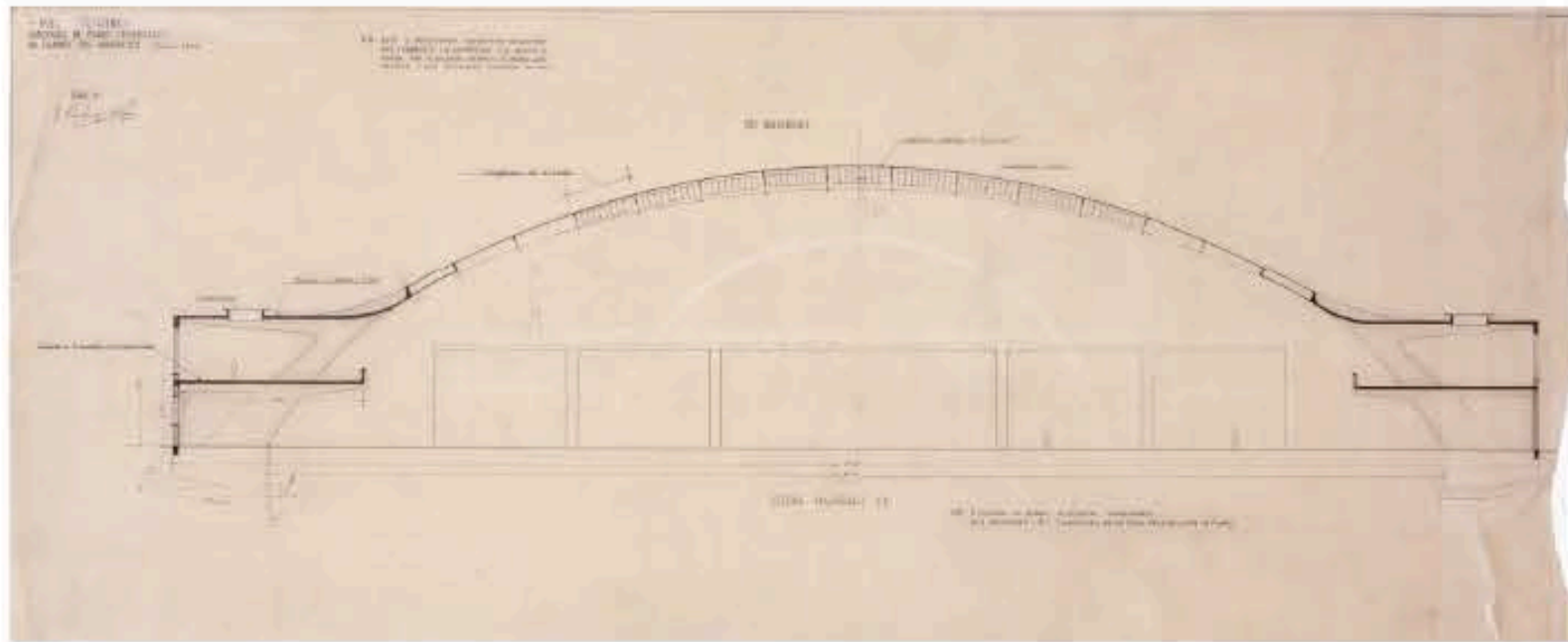
Il progetto Torino, il suo parco e il suo fiume: memoria e futuro rientra tra i 14 interventi strategici inseriti dal Governo nel Piano per i Grandi attrattori culturali

Ottobre 2022

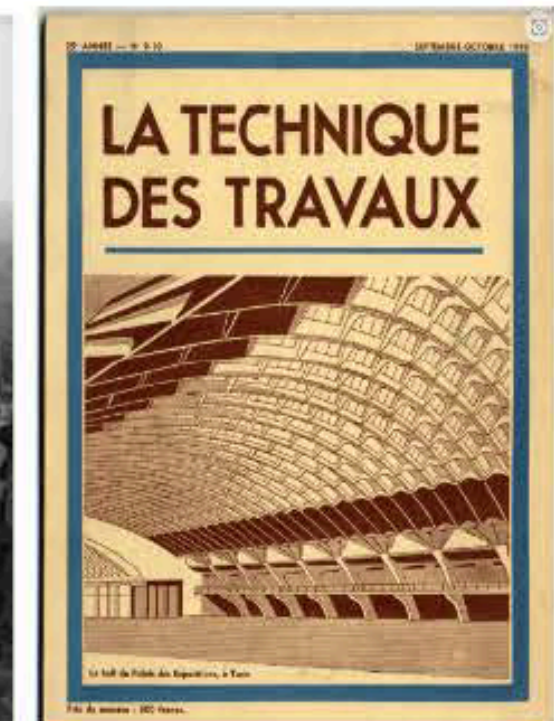
Progetto di fattibilità tecnico economica della nuova Biblioteca Centrale di Torino



Torino Esposizioni Conservation plan



HISTORICAL
RESEARCH



approfondire la **conoscenza dell'opera** di tutte quelle parti non visibili nella sua conformazione attuale, **confrontare le fasi storiche** tra loro per evidenziare eventuali incongruenze, comprendere le **differenze tra il progetto originario e quanto effettivamente realizzato**, studiare il **cantiere**, individuare le **aggiunte**, le **modifiche** e gli interventi succedutisi nel corso degli anni e le conseguenze da essi derivanti



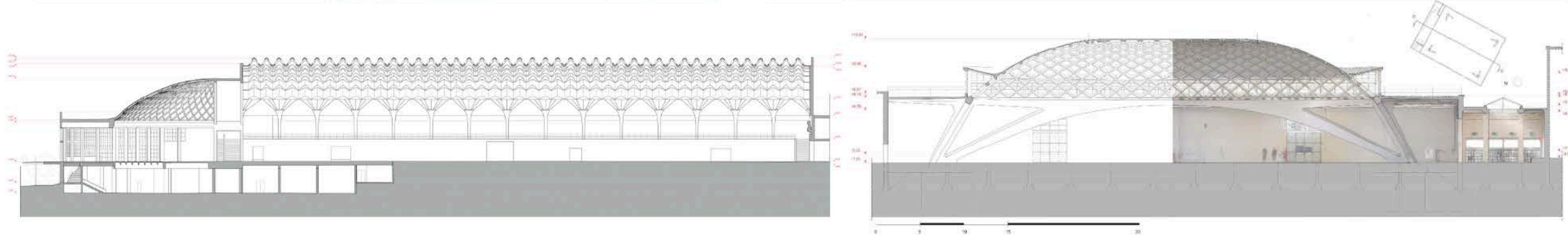
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https://www.getty.edu/foundation/initiatives/current/keeping_it_modern/report_library/turin_exhibition_center.html

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3D METRIC DOCUMENTATION
USING GEOMATIC METHODS

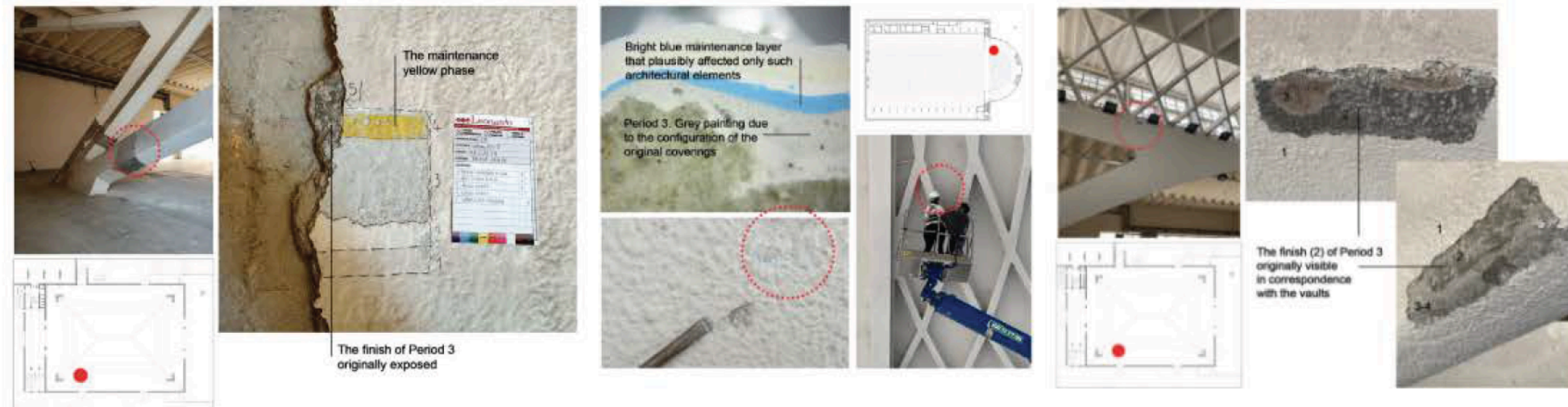
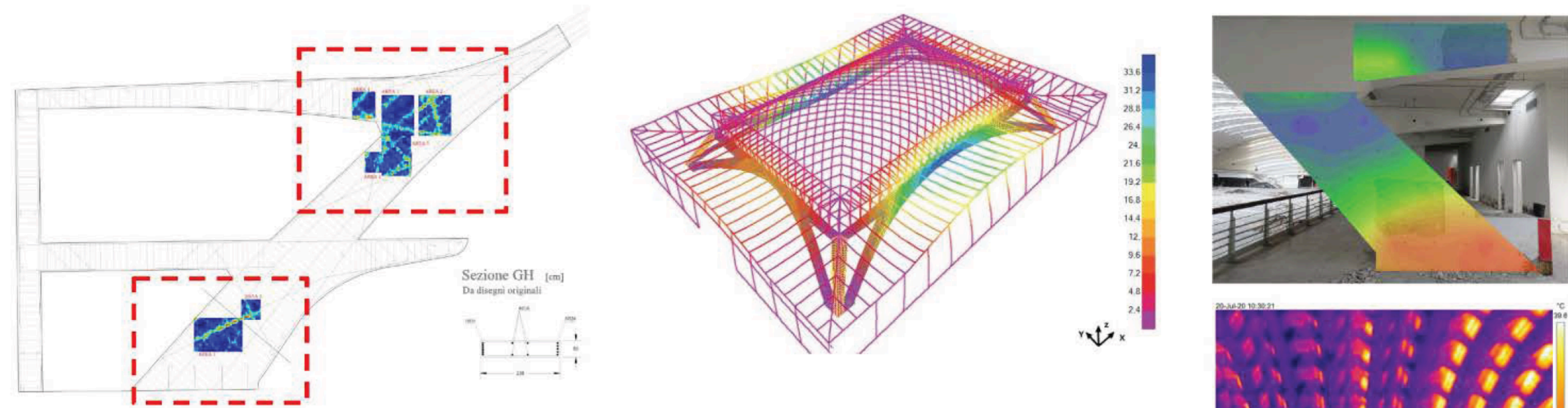


laser-scan e modellazione 3D dello stato attuale, inclusa l'implementazione dell'analisi del **degrado**

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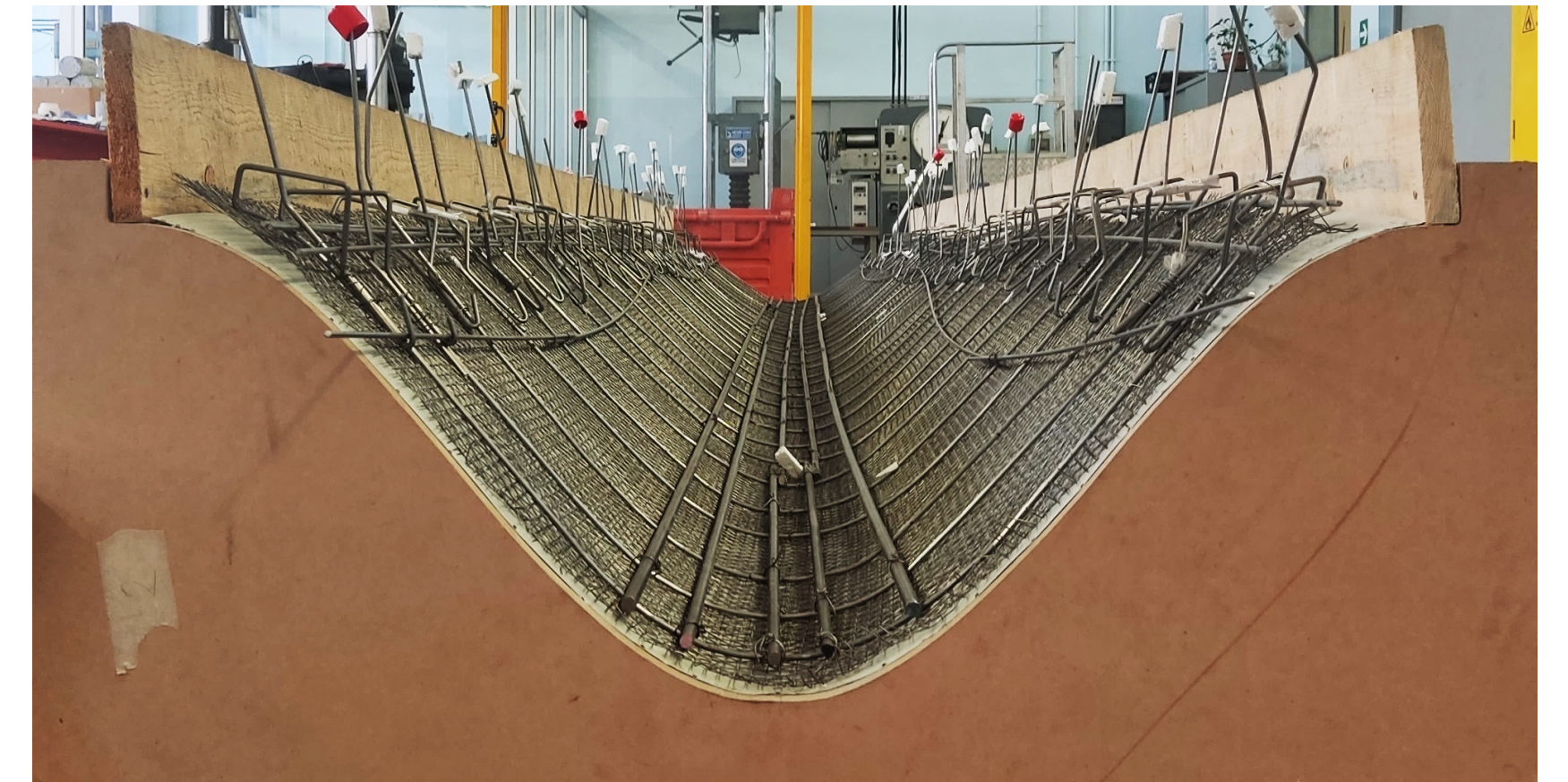
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Torino Esposizioni Conservation plan



STRUCTURAL, MATERIAL AND SEISMIC ASSESSMENT
FIELD & LABORATORY

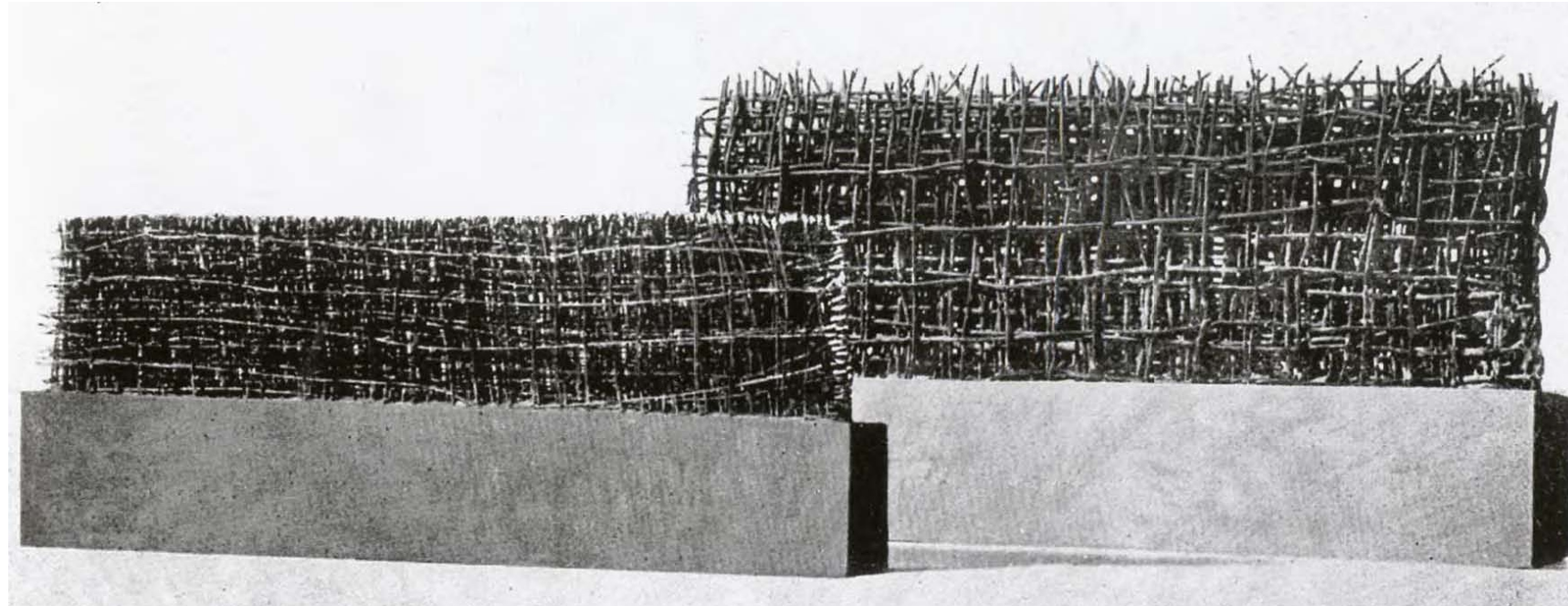
svolgimento di una campagna di **indagini** per la valutazione strutturale e dei materiali attraverso diversi metodi di indagine tra cui **carotaggi, prove dinamiche, analisi delle pitture** e la **riproduzione in laboratorio di mockup di ferrocemento** partendo dalla ricetta originale di Nervi.



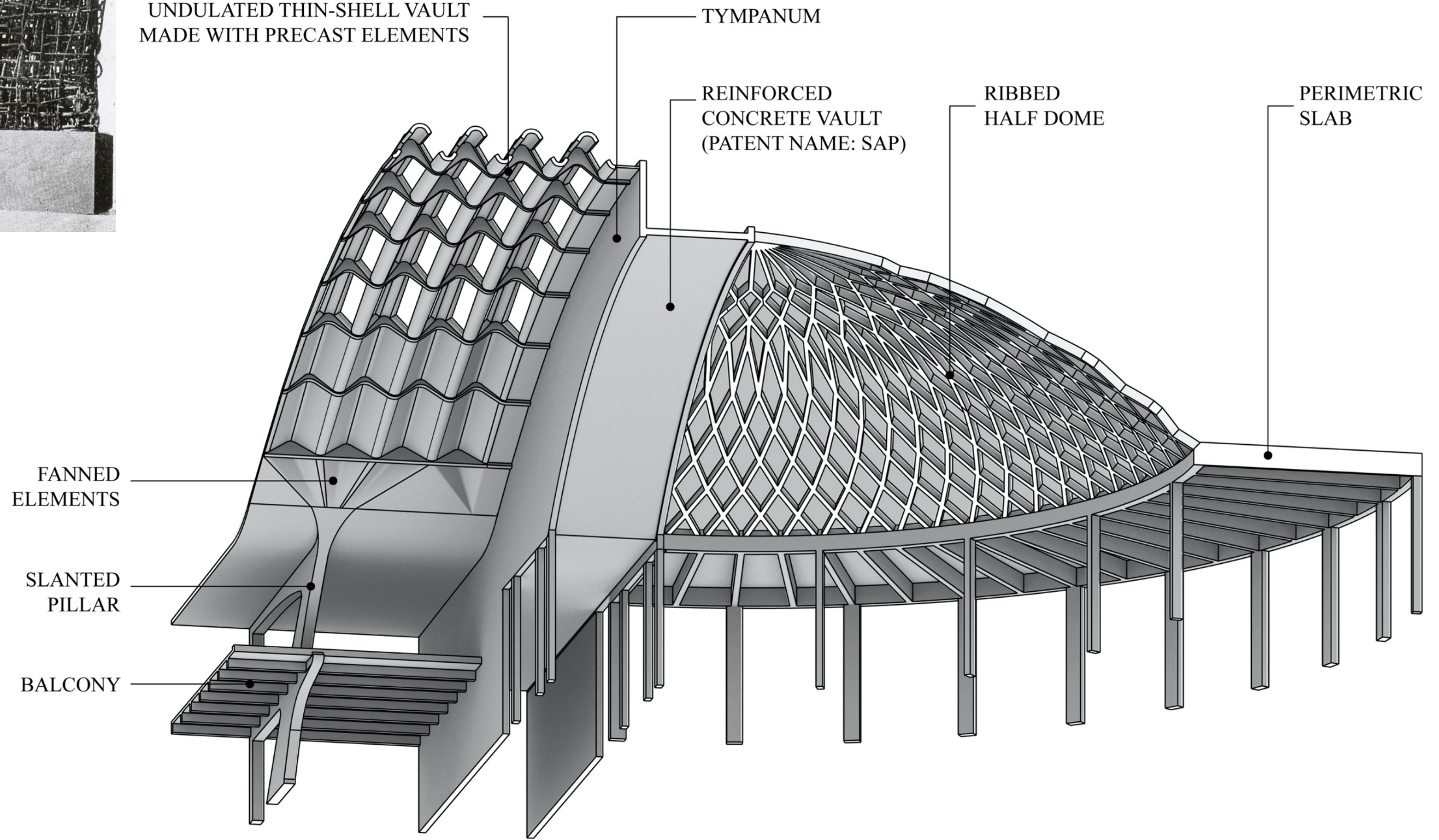
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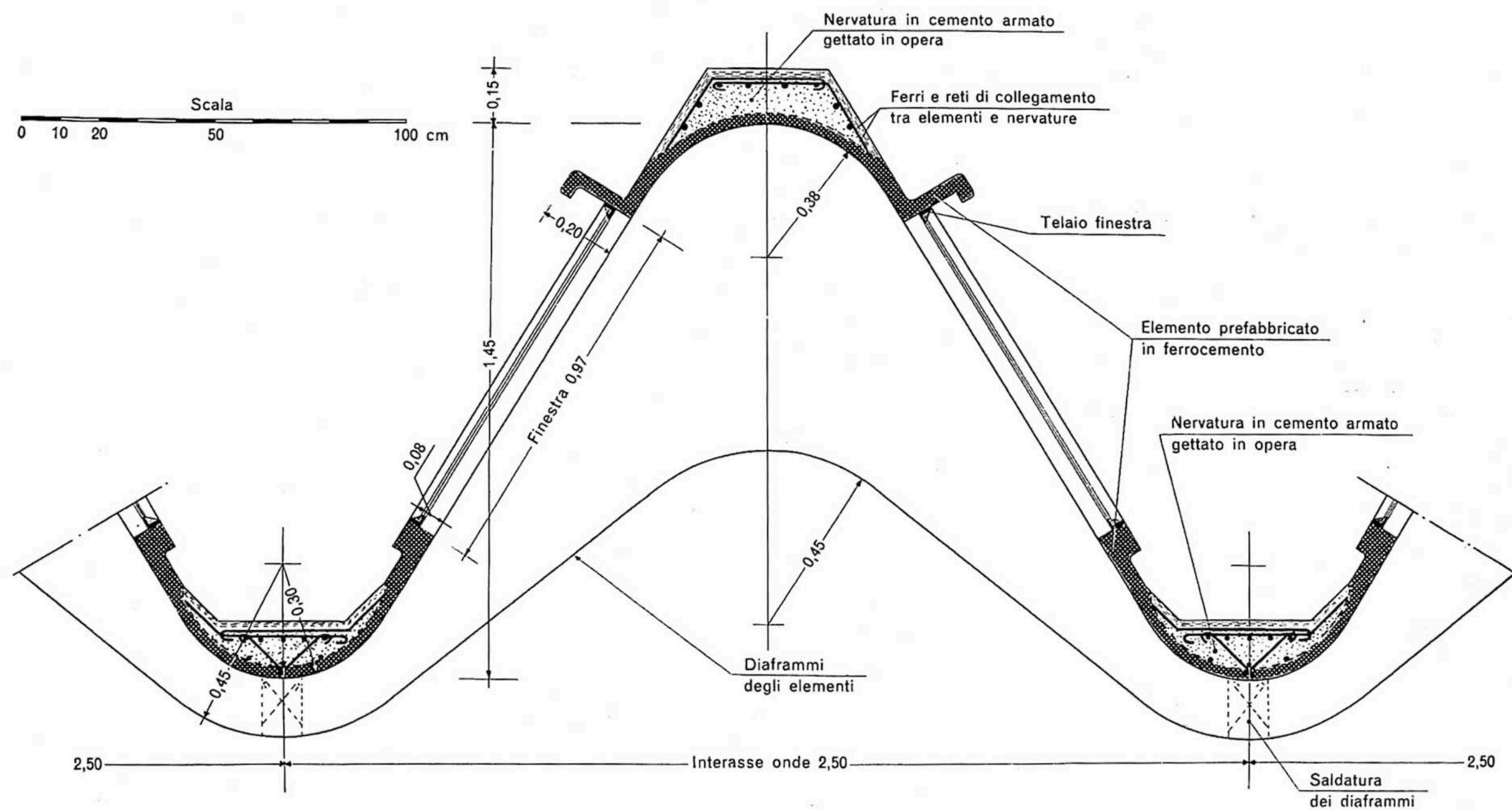
L'uso sperimentale del ferroceemento



UNDULATED THIN-SHELL VAULT
MADE WITH PRECAST ELEMENTS



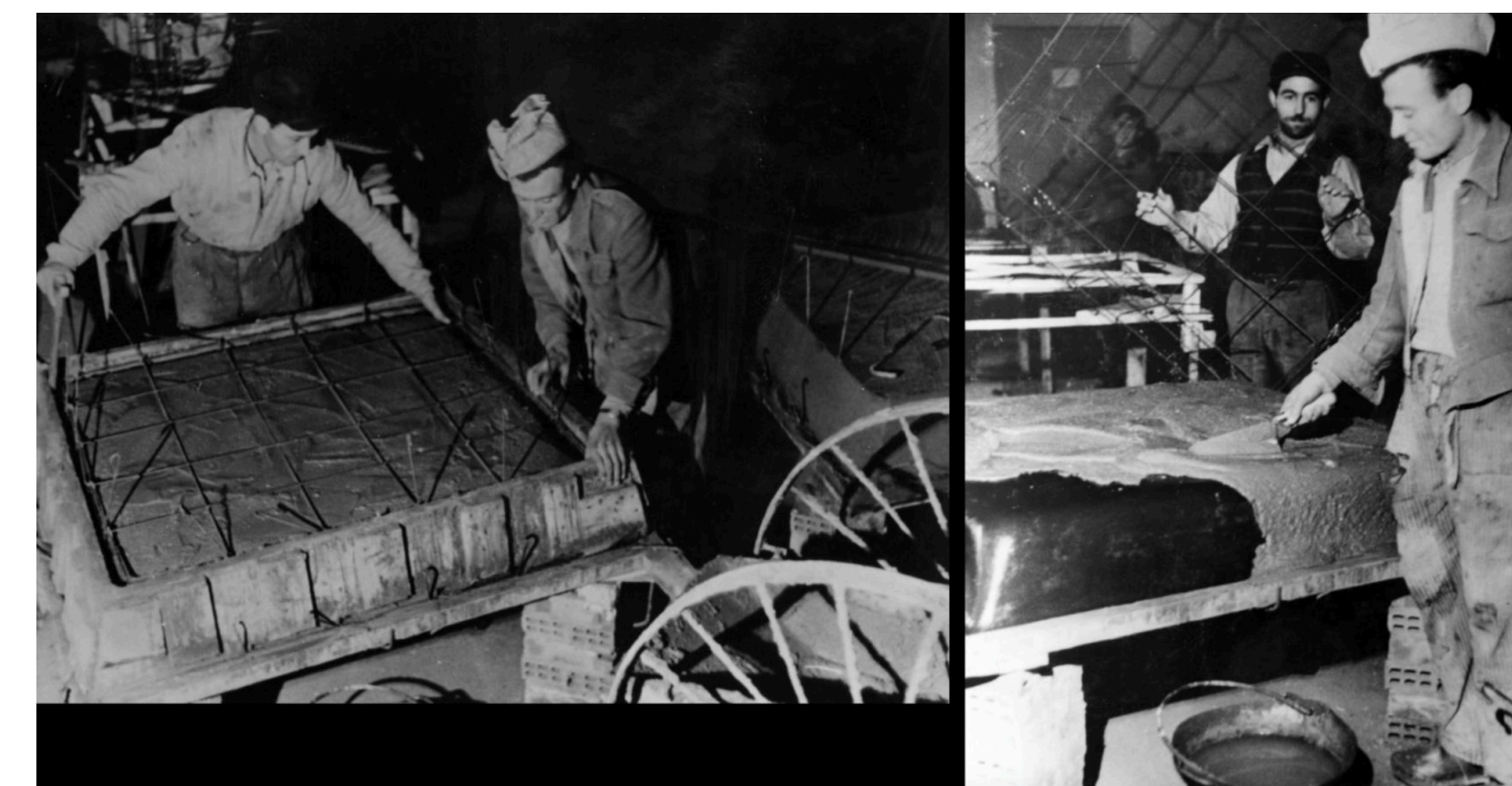
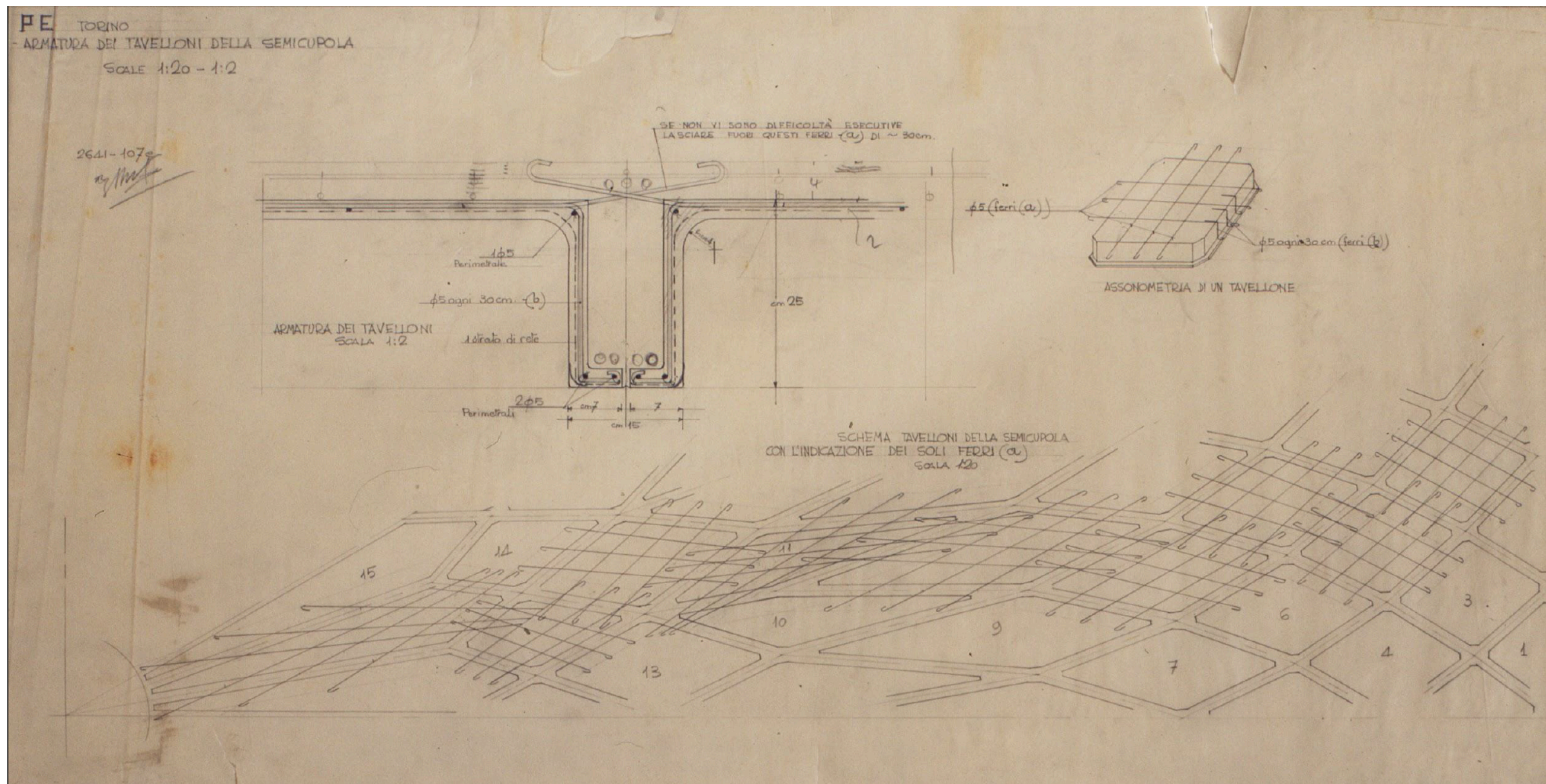
L'uso sperimentale del ferroceemento



Brevetto n. 445781 (1949): il "concio d'onda". La particolare forma ondulata, facilmente ottenibile con il ferroceemento, consente di sfruttare la resistenza per forma anziché per massa, con conseguenti grandi economie di materiale



L'uso sperimentale del ferroceemento



Brevetto n. 465636 (1950): il "tavellone romboidale" e il sistema "nonna, madre, figlia": I tavelloni sono in ferroceemento e funzionano come cassero a perdere per il getto delle nervature. Il brevetto comprende in parte il processo generativo, ovvero la sequenza "nonna, madre, figlia" che garantisce un grande risparmio di tempo in cantiere.

Torino Esposizioni Conservation plan

CONSERVATION MANAGEMENT PLAN

HALL B
B.1.1 BALCONY ROOF

Floor:
The balcony roof was built during both the I PHASE and the II PHASE.
I PHASE:
Faint, connecting elements between the pillars and the roof, made in three parts. They are made with high resistance cement and 2 layers of mesh and Ø8 and Ø12 bars, arranged in regular number in the perimeter (B7).
Plaster, originally probably not covered with any plaster, today the surface is characterized by finishing layer with rough texture of white (C1 Chapter 4, in particular last 1).
Faint roof with skylights, floor similar to the I PHASE one (B7/Chapter 4).
Plaster, originally probably covered with a plaster similar to the one applied to the pillars, today the surface is characterized by a finishing layer with rough texture of white (C1 Chapter 4).
"Down" in case of re-arranging.
II PHASE:
Faint connecting elements between the pillars and the roof, made in three parts. They are made with cement type ABE (C1), similar to the I PHASE one.
Plaster, originally probably not covered with any plaster, today the surface is characterized by a finishing layer with rough texture of white (C1 Chapter 4, in particular last 1).
Faint roof with skylights, floor in white with unpolished glass 20 cm high. The skylights are made with glass (Fornici and pasta - B7).
Plaster, originally probably covered with a plaster similar to the one applied to the pillars (Fornici in hydraulic mortar and smooth white lime mortar), today the surface is characterized by a finishing layer with rough texture of white (C1 Chapter 4).
"Down" in case of re-arranging.

Material specifications:
The balcony roof was built during both the I PHASE and the II PHASE.
I PHASE:
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"Down" in case of re-arranging.

Analyses on the elements:
STRUCTURAL ANALYSIS:
A few inclined elements of the roof do not appear to be shear walls. The elements that are directly connected to the level of the posterior gable do not satisfy either the bending or the shear checks.

State of conservation:
It is strongly characterized by the presence of humidity due to water infiltrations, both in correspondence with the skylights and in correspondence with the roof film.

Possible preventive conservation intervention techniques:
Clearing of the surfaces with a low pressure cleaner and subsequent collection of waste water (using an existing system for primary ventilation).
Shear and bending strengthening and structural improvement of the framed elements in reinforcement with Ø16 steel extradosed reinforcement with natural fiber mesh fabric.
Application of waterproofing consolidating sealant.
Reinforcement of skylights.
Minor skylights allow moisture to penetrate.

Critical issues:
Minor skylights allow moisture to penetrate.

MULTI-DISCIPLINARY APPROACH FOR DIAGNOSIS AND PRESERVATION

CONSERVATION MANAGEMENT PLAN

HALL B
B.2 TOP SURFACE ROOF

Material specifications:
Cover:
I PHASE: likely in waterproofing membrane (B7).
II PHASE: likely in construction site technical documents (B7) reference is made to a smoothing that the company will have to carry out on the roof for the installation of a waterproof covering.

Analyses on the element:
No critically detected.

State of conservation:
On the vertical, also 2008 there is a large presence of technical equipment and bituminous sheets, no longer effective. There are water infiltrations.

Possible preventive conservation intervention techniques:
Faintness:
Removal of all conditioning systems and plant equipment.
Removal of the existing sheath.
Application of corrosion inhibitor product.
Application of waterproofing consolidation with a water-based and wear-resistant finish (also in correspondence with the cover of the side galleries).
Application of seal strength to concrete with vapors.

Critical issues:
Necessity of a preliminary stabilization and re-organization of plant equipment.

MULTI-DISCIPLINARY APPROACH FOR DIAGNOSIS AND PRESERVATION

CONSERVATION MANAGEMENT PLAN

HALL C
C.3 CENTRAL VAULT

Material specifications:
Plaster, a white finishing layer in white body. In correspondence with wall and 20 cm girth walls is visible due to the original layer attributable to the original structure. The wall is continuous at its point of support, it is only by steel cables connected with the ring that supports them. C1 last 6). Chapter 4, B.4.11 can be assumed that the prefabricated elements of the central vault were also made in the same way.
Plaster on concrete made with high strength cement (range 4) cement of sand (C1). Thickness about 2 cm. Reinforced with 1 layer of GAB (mesh in the center part 8 cm Ø8 placed in the central area, 300 placed in the perimeter part 8 cm Ø8, installed on steel cables).
Slab upper reinforced slab (range 3) 4 per cubic meter of compressed. The perimeter area, closed to the vault level, is reinforced with a Ø8 mesh of 10 cm, the central part is reinforced with Ø8 mesh of 20 cm (C1).

Analyses on the element:
STRUCTURAL ANALYSIS:
Plaster is a weak layer. The reinforcement elements of the vault are also strongly compressed in fact the moment component is very low. From the structural checks carried out, despite the reduced thickness, equal to 2-3 cm, they are able to satisfy the pressure-bending verification, demonstrating that they are likely to still have considerable strength reserves. From the stress-strain state, the thickness is not suitable also for the perimeter area. Concerns in terms of stability, no signs of loss and lateral displacement on the selected horizontal levels, as reported in Chapter 7.
Also, the ribs of the vault are well dimensioned in pressure and bending. Like arches, they were designed by hand according to the pressure curve, therefore the prevailing component is the axial compression force. Unfortunately, from the drawings found there is no indication of the number and location of the rings for these elements, therefore it was not possible to carry out quantitative checks.
The surface has aspects completely obscured and painted in shades of white, in the central band and in the perimeter there are lighting bodies, not dated back to the initial phase. The presence of superficial aspects can be noted. There are serious distortions on the perimeter. Some patches can be seen.

State of conservation:
The surface has aspects completely obscured and painted in shades of white, in the central band and in the perimeter there are lighting bodies, not dated back to the initial phase. The presence of superficial aspects can be noted. There are serious distortions on the perimeter. Some patches can be seen.

Possible preventive conservation intervention techniques:
Extracts:
Should remove:
Plaster and concrete: Testing the application and selecting an appropriate engineering cement or plaster for durability.
Risks:
More specific specific investigations are needed to decide on possible interventions, which must be necessarily specific.
Waterproofing consolidation type waterproofing for absorbable waterproofing consolidation.
Application of liquid sheath (by spray, with vapor).
Possible application of reinforcement in horizontal form.
Insects:
Insect removal.
Removal of superficial deposits.
Possible removal of the most recent finishing system.

Critical issues:
Necessity of a preliminary stabilization and re-organization of plant equipment.
Presence of plaster and painting.
Compression phenomena of reinforcement mesh.
Possible conflict between the penetration of forms and wall of plaster (see mock-up testing on Chapter 7).

MULTI-DISCIPLINARY APPROACH FOR DIAGNOSIS AND PRESERVATION

CONSERVATION MANAGEMENT PLAN

HALL C
C.3 FLOORING

Material specifications:
1.2.1 Paving A:
Paving in stone elements in shades of gray, cm. 60 cm x approximately 40.5 cm (approximate), without floor joints.
1.2.2 Paving B:
Paving in stone elements in shades of gray, cm. 60 cm x 40.5.
1.2.3 Paving C:
The surface is finished with stone elements in shades of gray or yellowed tones.
1.2.4 Paving D:
Paving in stone elements in shades of gray, cm. 75 x 60.
1.2.5 Paving E:
Paving in stone elements in shades of gray, cm. 60 x 60.
1.2.6 Paving F:
Paving in stone elements in shades of dark green, cm. 75 x 60.
Current mortar patches in cement, a material due to subsequent interventions, probably for the reduction of plaster deviations.

Analyses on the element:
No critically detected.

State of conservation:
It is possible to detect the widespread presence of millimeter and centimeter cracks, most of them between the stone elements. Current patches are also common, presumably in correspondence with the installation of systems.

Possible preventive conservation intervention techniques:
Primary maintenance and re-organization of maintenance and floor systems.
Cleaning and desaturation of stone materials.
Removal of concrete patches and integration with stone flooring.
Integration of the missing finishing system.
Replacement of completely degraded or broken stones.
Surface polishing.
Vertical protective treatment.

Critical issues:
Necessity of a preliminary stabilization and re-organization of plant equipment.
Faint cracks due to all-scale forces of moisture and
Some patches in cement and in possible conflicts with their material conservation.

MULTI-DISCIPLINARY APPROACH FOR DIAGNOSIS AND PRESERVATION

CONSERVATION GUIDELINES

sono state sviluppate delle **linee guida** per ogni componente della struttura da seguire e da implementare quando si intraprenderanno interventi futuri di conservazione e restauro. Per ogni componente dell'edificio è stata sviluppata una linea guida specifica, includendo raccomandazioni per la manutenzione e per futuri interventi in base alle condizioni osservate durante la campagna di indagini

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