

THE PETRUZZELLI THEATRE

The rebirth

**Music, culture and an
imposing restoration project
using advanced technology:
respect for age-old traditions
yet with an eye on the future**



Photo: Beppe Gennone (Bari, Italy)

The Petruzzelli Theatre in Bari, one of the most prestigious and renowned theatres in the world, has risen from the ashes, and once again Mapei has left its mark. After closing to the public due to the fire that destroyed it on the 27th of October 1991, the theatre was finally re-opened with a double ceremony: the event on the 4th of October was devoted to local and institutional authorities, while that on the 5th of October was dedicated to Bari citizens and the workers. The season of the Petruzzelli theatre will instead begin on December, the 6th, (the day devoted to Saint Nicholas, the patron saint of Bari), by staging *Turandot* by Puccini. And here too, as with the Teatro alla Scala in Milan and an infinite range of sites ranging from small to large, Mapei shows its enormous passion for the restoration of both ancient and modern symbols of cultural heritage and of the territories they represent, patrimony of the entire international community. A passion which means care, dedication and commitment of Mapei personnel: from the research and fine tuning of special products to the constant presence of highly-qualified technicians in the field to offer a solution, in real time, to any kind of questions and requirements. A “hands-on” approach, a work method which transforms Mapei from just another supplier of materials to “partner”, a reliable interface who can supply an answer to any kind of queries and doubts.

The Petruzzelli Theatre was built in the early 1900's and is one of the first examples of modern architecture in Italy. In fact, the theatre was designed and constructed by mixing together traditional materials and technology with the most modern elements of the time, such as steel: with the vertical structure made using tuff, load-bearing pillars in steel, vaulted ceiling slabs (right up to the dress circle), girder floors and brick and tuff ceiling vaults. And lastly, the structure for the large domed roof and the trabeation for the proscenium made from steel were the latest word in “construction techniques” and an absolute first.





Mapei and the Rebuilding Project

Right from the day of the disaster, in spite of the immediate state of shock, people started to talk about rebuilding the theatre. Debates and public meetings were held, all those involved were literally buzzing with ideas, design proposals and offers and Mapei's heart beat in unison. Mapei followed the development of the site right from the very start through its local technical and commercial departments. They worked alongside the construction companies involved in the restoration work and offered the most innovative technical solutions to solve the

problems when they arose at various stages. The restoration work included three main phases:

- firstly, the whole building was consolidated;
- followed by construction of the walls and restoration of the magnificent foyer;
- and lastly, the finishing operations.

Consolidation and Construction of the Walls

After removing all the rubble, the first emergency to overcome was the rebuilding of the structures which had

been totally destroyed or whose functionality were irredeemably compromised.

The new beams were made by casting a concrete mix designed by Mapei's laboratories using STABILCEM SCC cementitious binder for dimensionally-stable self-compacting concrete mixtures. The old structure had been partially damaged and repaired using mortar from the MAPEGROUT range of shrinkage-resistant fibre-reinforced cementitious mortars. This type of mortar was used to repair concrete after treating the old reinforcement rods with MAPEFER



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Photo 1. More than 6.000 m² of internal and external heated and normal screeds were laid using TOPCEM and TOPCEM PRONTO.

Photos 2 e 3. In the foyer, after laying MAPETEX SEL anti-fracture fabric, terrazzo tiles were laid using KERAQUICK+LATEX PLUS.

Photo 4. Rebuilding and structural strengthening work was accomplished with mortars from the MAPEGROUT range.

Photo 5. Hexagonal terrazzo tile floor was laid in the gallery, boxes and corridors using KERAFLEX MAXI S1.

Photo 6. The marble in the bathrooms was laid using white ELASTORAPID.



Commission, Bari City Council and the Delegated Commissioner. Each choice was made after lengthy discussions, with the aim of finding solutions which considered both technical and architectural implications and functional requirements according to final use. Mapei was consulted and required to assess the solutions and to transform ideas into their corresponding technological systems.

During the planning stage Mapei often intervened to give indications to help and guide the technical groups. Once the preliminary phase had been completed, the work on the finishing operations were intensified during the final year of restoration work. The site was a hive of activities carried on according to a tight schedule with no room for breaks or indecision.

The support offered by Mapei's corporate and local Technical Assistance Department proved to be invaluable during this phase: every problem was tackled and solved quickly, with particular care and attention for the timely acquisition of all the materials required. Time-wasting was forbidden. Synergic operations were developed and communications became vital in making the mechanism work perfectly.

The supply of Mapei technology started with the laying of approximately 6.000

two-component corrosion-inhibiting cementitious mortar. The newly-built part of the structure was then joined to the repaired older structure by using enormous quantities of EPORIP two-component epoxy based adhesive for cold joints, EPOJET super-fluid epoxy resin used for monolithic repairs of cracked structures and for bonding and structural strengthening and ADESILEX PG1 thixotropic epoxy adhesive for structural bonding, used particularly with the beton plaque technique.

Restoration of the Foyer

Mapei was called in for its technical expertise to offer a solution for laying the new floor and for the restoration of the old floor in the foyer.

After carrying out a number of surveys on site with technicians from the works management team and the consortium of building companies, two different types of floor slabs were identified: the new floor with a reinforced concrete screed and the old floor with no screed and the upper surface of the steel beams. There was very little margin available on either floor which made it impossible to install an unbonded screed thick enough for service use. The solution opted for was the application of EPORIP before installing a screed made from TOPCEM PRONTO

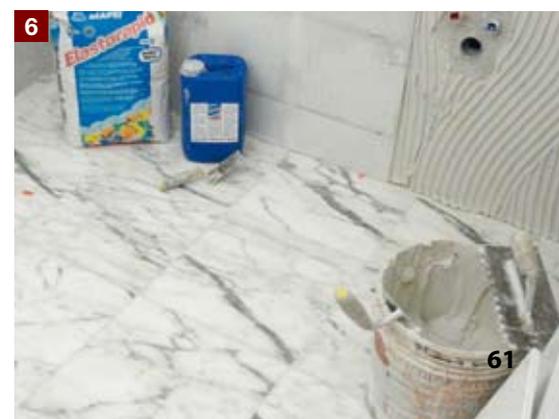
pre-packed, ready-to-use, normal-setting, controlled-shrinkage mortar for fast-drying screeds.

The next step was to install the MAPETEX SYSTEM made up of non-woven fabric and an adhesive strip to create an anti-fracture layer. This layer was bonded in place with KERAQUICK+LATEX PLUS. KERAQUICK is a cementitious adhesive with no vertical slip classified as C2FTS2 according to EN 12004 standard when mixed with LATEX PLUS latex admixture. KERAQUICK+LATEX PLUS was also used to bond the terrazzo tile floor.

Finishing Operations

Finishing operations often lead to a wide array of problems. For a building contractor, therefore, it is imperative to have a reliable technical partner that guarantees not only expertise and professionalism, but which also has a solid support structure which can solve problems quickly and efficiently sustained by a solid background in research: and who better than Mapei can offer such credentials!

An enormous challenge had been set for everybody: a race against time in the pursuit of excellence. A long period of consultation between the technical teams started: consultant groups, works directors, the Superintendent for Fine Arts & Heritage, the Theatre





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Photo 7. The pre-finished Iroko parquet in the stalls area was laid with ULTRABOND P990 1K.

Photo 8. After laying the parquet, installation of the stalls seats could begin.

Photo 9. The stalls after the renovation work.

Photo 10. Adriana Spazzoli, Marketing and Communication Director for the Mapei Group, visits the site and meets Nicola Scarci who followed the laying of the fabrics.

Photo 11. Inside the theatre and in the club rooms where SILANCOLOR PAINT, SILEXCOLOR MARMORINO and COLORITE PERFORMANCE were used as the final coatings.

Photo 12. The Mapei experts Fiorella Rodio, Paolo Sala and Luca Carcagni with the site manager Giuseppe Festa during a site visit.

Photos 13 and 14. Preparation and laying of the textile coverings in the boxes using ADESILEX MT 32 adhesive.

Photo 15. An interesting reflection of the royal box.

m² of internal and external screeds made from TOPCEM normal-setting, fast-drying hydraulic binder and TOPCEM PRONTO mortar applied on both the floor slabs installed after the fire and in the areas where the old floor and substrate had been removed. The most suitable, specific adhesive was selected for each type of floor and/or covering material:

- The agglomerate marble in the bathrooms, boxes and dressing rooms was laid using white ELASTORAPID highly deformable, two-component, fast-setting, improved cementitious adhesive with no vertical slip and extended open time (classified as C2FTES2 according to EN 12004 standard).
- The system selected to lay the large-size slabs of recomposed marble on the stairways, landings and stage-front stairs and the natural stone on the doorsteps, stairs leading to the dressing rooms and the stairs to the proscenium was KERAQUICK+LATEX PLUS.
- ADESILEX P9 adhesive with no vertical slip and extended open time (classified as C2TE according to EN 12004 standard) was used to lay the single-fired ceramic tiles in the dressmakers' quarters, the dressing rooms and club rooms.

- The porcelain tiles in the dressmakers' quarters and in the dressing rooms, as with the red and white hexagonal terrazzo tiles for the walkways and the boxes, were laid using KERAFLEX MAXI S1 deformable cementitious adhesive with no vertical slip and extended open time (classified as C2TES1 according to EN 12004 standard).
- The pre-finished Iroko wooden floors in the dressing rooms and corridors were laid on the screeds with ULTRABOND P990 1K one-component, solvent-free, ready-to-use, elastic polyurethane adhesive for all types of parquet and laminates after applying a layer of ECO PRIM PU 1K primer.
- The pre-finished Iroko wooden floor for the whole of the stalls area was also laid using ULTRABOND P990 1K.
- The red-coloured fabric used to cover the walls in the boxes was applied with



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ADESILEX MT32 adhesive in water dispersion for laying wall coverings.

Mapei's consultancy activities also included other areas of the building industry which are of fundamental importance. In fact, the strengthening and waterproofing of structures and various types of elements are prerogative for Mapei.

- The reinforced concrete beams and the concrete pediment featuring statues on the main façade of the theatre were repaired and renovated using MAPEFER mortar to protect the reinforcement rods, MAPEGROUT T40 medium-strength (40 MPa) thixotropic mortar to repair the concrete and MAPEFINISH two-component cementitious mortar for the final coating on the concrete. The statues were also consolidated with fabric from the MAPEWRAP C range (mono-directional, bi-directional and quadri-directional carbon fibre fabric in various weights per square metre) applied using special products and epoxy resins from the MAPEWRAP range.

- The girders for the galleries in the stage tower were fixed in place with STABILCEM SCC and GRAVEL 0-15.

- The wooden beams which support the ceiling of the club rooms were consolidated using MAPEWOOD technology, comprising MAPEWOOD PRIMER 100 epoxy primer in water dispersion for consolidating and priming timber structures and MAPEWOOD PASTE 140 thixotropic epoxy adhesive for strengthening wooden structures, by bonding new wooden support structures.

The external squares and terraces were waterproofed with elastoplastomeric membranes (POLYSHIELD TS4) produced by Polyglass, a subsidiary of the Mapei Group, while all the coverings of the attic walls were waterproofed with MAPELASTIC, the renowned two-component, flexible cementitious mortar used to form protective waterproof coverings on concrete, masonry, screeds, etc.

Then came the part which required the most technical commitment from Mapei: the coating operations. Coatings



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are that part of an architectural masterpiece that everybody, both experts and laymen, immediately notice and for which everybody feels they have the right to express an opinion, to criticise or praise. The coating operations inside the theatre were also supervised by Mapei.

- All the ceilings were treated with SILANCOLOR PAINT, a highly vapour permeable and water-repellent silicone based paint in water dispersion, after applying a coat of SILANCOLOR PRIMER silicon resin based paint in water dispersion which penetrates deep down into the substrate.

- All the seating areas were finished off with SILEXCOLOR MARMORINO highly decorative, silicate based mineral paste



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with a “stucco veneziano” effect, after applying a coat of SILEXCOLOR PRIMER made from modified potassium silicate in water dispersion.

- The stairways, bathrooms, service rooms, dressing rooms and club rooms were decorated with COLORITE PERFORMANCE acrylic resin-based paint in water dispersion used to protect and decorate internal and external surfaces after applying a coat of MALECH micronized acrylic based primer in water dispersion.

But the most complex phase was the external coatings. The choice for the colour of the main front face was the subject of a heated debate. Once the “Petruzzelli White or Petruzzelli Red” argument had been settled, the first problem was to create the exact shade of red expected by the Superintendent for Fine Arts. The Superintendent had

Photos 16, 17 and 18. The concrete statues, part of the pediment of the Petruzzelli Theatre, were renovated using MAPEFER, MAPEGROUT T40 and MAPEFINISH and consolidated with carbon fibre fabric from the MAPEWRAP range.

Photo 19. Part of the strengthening process of the wooden trusses in the club rooms using technology from the MAPEWOOD system.

Photo 20. The external surfaces were waterproofed with elastoplastomeric membrane produced by Polyglass. Also in the photo, Fiorella Rodio surveys the site.



Photos 21 and 22. From its original colour to the new “Petruzzelli Red”, created by Mapei with a dedicated research project which united diagnostics, research and technology.

Photo 23. The external masonry facing wall before repair operations.

Photo 24. The Kartens test used on site to check the absorption of various types of substrate.

Photo 25. The new Mapei colour range for coatings now includes “Petruzzelli Red”, the shade specially developed for this prestigious project.

Photo 26. One of the numerous test areas used to make a final choice for the external coatings.

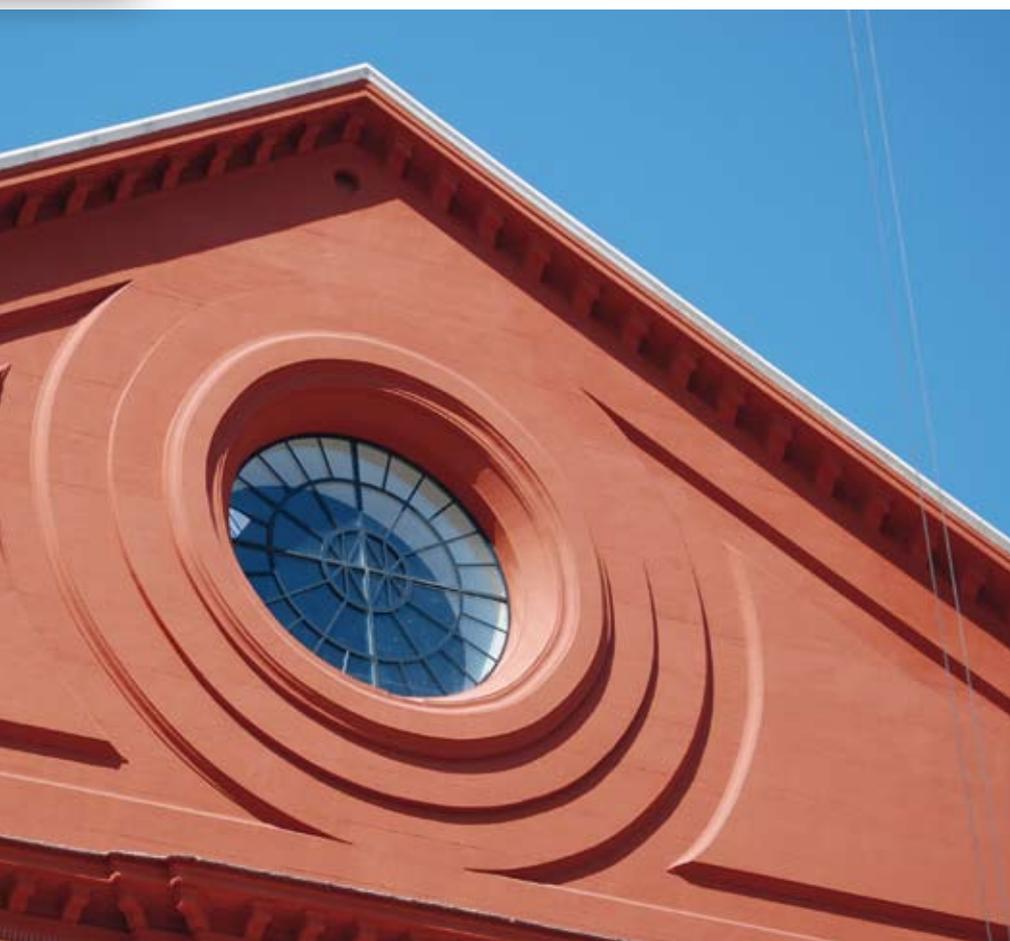
Photos 27 and 28. Application and a close up of the final coating.





authorised the use a silicate-based system rather than a more traditional lime-based paint after a convincing case presented by Mapei based on its scientific knowledge and wide experience. The "Petruzzelli Colour" project was thus launched in the Mapei Research & Development laboratories which involved a number of highly professional figures. The singling out of the colour was the object of a number of in-depth studies into the stratification of the old paintwork: which is how the "Petruzzelli Red" version of SILEXCOLOR PAINT was created and which Mapei intends including in its standard colour range for coatings. Once the correct shade had been created, the all but negligible problem of the heterogeneity of the substrate had to be solved. In fact, over the years, the façade had been patched-up a number of times

with various types of render, paint and plaster and there were also the signs of the fire itself and the previous restoration work. The main problem, therefore, was how to obtain a perfectly homogenous coloured finish on an extremely irregular substrate with different levels of absorption. A number of tests were carried out by the Coatings laboratory in Milan. A direct line of contact was created between the laboratory in Milan which developed the samples to be tested on site and the technical team for the south of Italy. Dozens of samples were tested and screened by the building company and the site management team, and the feedback was transmitted back to the Company, which led to excellence. And so a new family of products was born, which includes SILEXCOLOR BASE COAT modified potassium silicate-based primer in





Mapei Products: the products mentioned in this article belong to the "Building Speciality Line", "Products for Ceramic Tiles and Stone Materials", "Products for the Installation of Resilient, Textile and Wood Floor and Wall Coverings" and "Coating Systems" ranges. The technical data sheets are available at the web site: www.mapei.com. Mapei's adhesives for ceramics and stone materials conform to EN 12004 and have been awarded the CE mark in compliance with Annex ZA, standard EN 12004. Mapei grouts for ceramics and stone materials conform to EN 13888. Almost all the Mapei products for laying floors and walls are also GEV-certified and have been awarded the EMICODE EC1 mark, awarded by GEV. Mapei products for the protection and repair of concrete surfaces and structures have been awarded the CE mark in compliance with EN 1504 standards. Mapei levelling and smoothing compounds and pre-blended mortars for screeds conform to EN 13813 standard and have been awarded the CE mark in compliance with annex ZA, standard EN 13813.

Adesilex MT32: adhesive in water dispersion for the installation of wall coverings (PVC, textiles, etc.).

Adesilex PG1: two-component thixotropic epoxy adhesive for structural bonding.

Adesilex P9 (C2TE, EC1 R; CE EN 12004): high performance cementitious adhesive with no vertical slip and extended open time for ceramic tiles.

Colorite Performance (CE EN 1504-2): pure acrylic resin-based paint in water dispersion for protecting and decorating external and internal surfaces.

Elastorapid (C2FTES2, CE EN 12004): two-component, highly flexible, high performance, quick setting and quick hydration cementitious adhesive with extended open time and no vertical slip, for ceramic tiles and stone material.

Eco Prim PU 1K (EC 1R): one component, solvent-free, hygro-hardening polyurethane primer with very low emission of volatile organic compounds (VOC) for consolidating and waterproofing cementitious screeds.

Epojet: two-component epoxy adhesive for monolithic sealing of cracks in screeds.

Eporip: two-component epoxy adhesive for monolithic sealing of cracks in screeds.

Gravel 0-15: gravel graded between 0 and 15 mm to be used mixed with Stabilcem or Stabilcem SCC.

Keraflex Maxi S1 (C2TES1, CE EN 12004): high performance, deformable cementitious adhesive, with extended open time and no vertical slip for ceramic tiles and stone material, with Low Dust technology. Especially suitable for the installation of large-size porcelain tiles and natural stone.

Keraquick (C2FTS1, mixed with Latex Plus it becomes S2; CE EN 12004, EC1): high performance, deformable, fast setting cementitious adhesive with no vertical slip for ceramic tiles and stone material.

Latex Plus: latex admixture inducing elasticity to be mixed with Keraquick.

Malech: micronised acrylic resin based primer in water dispersion.

Mapefer: two-component corrosion-inhibiting cementitious mortar for reinforcing rods.

Mapefinish (CE EN 1504-2, coating (c), principles PI, MC and IR, CE EN 1504-3, R2 EN 1504-3): two-component cementitious mortar for finishing concrete surfaces.

Mapegrout T40 (CE EN 1504-3, R3 EN 1504-3): medium strength (40 MPa) shrinkage-compensated fibre-reinforced thixotropic mortar for the repair of concrete.

Mapelastix (CE EN 1504-2, coating (c), principles PI, MC and IR): two-component flexible cementitious mortar for waterproofing balconies, terraces and bathrooms.

Mapetex System: completely removable system for the installation of ceramic tiles and stone material. Can also be used as an anti-fracture layer.

Mapewood Paste 140: thixotropic epoxy adhesive for the restoration of timber structural elements.

Mapewood Primer 100: fluid epoxy primer in water dispersion for consolidating and priming timber structures.

MapeWrap C UNI-AX, BI-AX and QUADRI-AX: high strength uni/bi/quadri-directional carbon fibre fabric.

Polyshield TS4 (CE EN 1370): high performance elastoplastomeric waterproofing membrane produced and distributed by Polyglass, subsidiary of the Mapei Group.

Silancolor Paint: high vapour-permeability and water repellent silicone resin based paint in water dispersion for exterior and interior applications.

Silancolor Primer: silicone-resin based insulating primer in water dispersion.

Silexcolor Base Coat: coloured, modified potassium silicate-based primer paint in water dispersion with high filling properties for evening out surfaces, complies with DIN 18363 standard.

Silexcolor Marmorino: trowelable highly decorative, fine finished vapour-permeable, silicate mineral paste coating, for interior and exterior applications, complies with DIN 18363 standard.

Silexcolor Paint: modified potassium-silicate based, vapour-permeable paint for the decoration of cement- or lime-based renders, for exterior and interior applications, complies with DIN 18363 standard.

Silexcolor Primer: silicate-based base, specific for levelling the absorption of the substrate.

Stabilcem SCC: superfluid expanding cementitious binder for injection slurries, mortars and concrete.

Topcem: special hydraulic binder normal-setting, fast drying (4 days) and controlled shrinkage screeds.

Topcem Pronto (CT-C30-F6-A1_{fr}, CE EN 13813, EC1 R): ready-to-use, pre-blended, normal-setting mortar with controlled shrinkage for fast-drying screeds (4 days).

Ultrabond P990 1K (EC1 R): ready-to-use polyurethane one-component, solvent-free, elastic adhesive with very low VOC content for all types of wooden flooring.



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Photo 29. The craftsmen, technicians and suppliers who all worked side by side to rebuild the Petruzzelli Theatre.

Photo 30. Mapei sales representative Achille Carcagni with the Site Manager Giuseppe Festa.

Photo 31. G. Vincenti with Giorgio Squinzi during their visit to the Theatre.

TECHNICAL DATA

Petruzzelli Theatre, Bari (Italy)

Period of Construction: 1898 - 1903

Period of the Intervention: date of handing over of work site: 18th June 2007

date of completion of site work: 8th January 2009

Intervention by Mapei: restoration and functional renovation of the theatre

Project Financed by: Italian Government, Puglia Regional Government, Bari Province Government and Bari City Council

Overall Cost of Renovation Project: 24,303,812.51 Euro

Project Tender by: office of the Delegated Commissioner for the rebuilding of the Bari Petruzzelli Theatre (Delegated Commissioner: Angelo Balducci)

Sub Commissioners: Ruggiero Martines and Salvatore Nastasi

Head of Procedures: Fabio de Santis

Architectural and Structural Design: temporary design consortium including S.M.N. Studio di Architettura G.L. Sylos Labini and Partners, Gianluigi Sylos Labini, E. Capodacqua, V & A Studio Vitone & Associates (Vitantonio Vitone as group leader), F. Bonaduce, V. Giannuzzi, L. Maggi, A. Giglio, A. Pizzini, G. A. Spinelli, Comes Studio Associato (Carlo Blasi as group leader), S. Carfagni and F. Blasi

Historical Aspects and Decorative Works: M. Civita (consultant), G. Berardi and G. Giannini

Design of Plant Fittings: temporary design consortium including U. Ruggero (group leader), M. Strada and M. Cisternino

Acoustics Design: Teatroprogetti E. Strada and U. Perut

Design of Fire and Safety Systems: temporary design consortium including Piero Masini (group leader), N. De Venuto and F. Spadafora, in collaboration with M. Bellini and R. Masini

Site Design and Improvements: general coordination, inter-disciplinary integration

and works scheduling by S.A.C. Società Appalti Costruzioni SpA – Rome; Adriano Draghini

Architectural Design: A. Restucci – Venice; E. Fabbri – Venice; G. Vincenti – Bari
Collaborators: G. Baffo and L. Vecchina

Structural Design: S.A.C. Società Appalti Costruzioni SpA – Rome; F. Bertozzi

Plant and Fire Prevention Design: Itaca SpA Servizi di Ingegneria – Naples; R. Bellucci Sessa and E. Errico

History and Music Research: Lorenzo Arruga

Stage Procedures: Mauro Carosi

Acoustics Enhancement: Mauro Facondini - Tanacoustics Studio

General Works Manager: Enrico Bentivoglio

Restoration Work Director and Safety

Coordinator: Nunzio Tomaioli

Operations Manager: Fabrizio Ciotti

Site Inspectors: Giovanni Prisco and Eligio Gioia

Main Contractors: temporary construction consortium including Conscoop Consorzio – Forlì; S.A.C. Società Appalti Costruzioni SpA – Rome

Main Contractor: Società Consortile Ricostruzione Teatro Petruzzelli Scarl

Project Managers: Vito Matteo Barozzi and Vito Giuseppe Giustino

Architectural Technical Directors: Giovanni Vincenti and Giovanni Simone (assistant)

Operational Techniques Directors: Giuseppe Festa and Paolo Lorusso

Technical-Administrative Staff: Michele Casanova, Antonio Fiore, Antonio Forte, Giorgio Pisculli, Leonardo Santoro and Mario Simone
Technical Director – Structures: Vito Lanzone
Technical Directors – Plant Systems: Michele Pisculli and Giovanni Pisculli

Diagnostic Research: Mapei SpA Research & Development Laboratory - Milan

Mapei Co-ordinators: Achille Carcagni, Fiorella Rodio, Giammario Dispoto, Luca Carcagni, Arianna Colella, Michelangelo Sorrenti, Paolo Sala and Angelo Giangliullo (Mapei SpA)

water dispersion used to even out and fill surfaces according to DIN 18363 standard, which allows a substrate to be primed by applying a first coat in the form of a thick, coloured layer. The problem of the lack of homogeneity in the substrate was thus overcome by applying a layer of SILEXCOLOR PAINT in "Petruzzelli Red", a one-component, modified potassium silicate-based coating with selected fillers and light-resistant pigments according to DIN 18363 standard. The result was fantastic and received applause from technicians and the local public alike.

Today...

Today, all site work has been completed and the people of Bari have a theatre again! For all those, like Mapei, who have had the honour and privilege of contributing to the execution of the Petruzzelli project, it is a very moving experience to wander between the boxes and stalls, the dressing rooms and on stage, which are now overflowing once again with artists and spectators, music and odours, cartwheels and song.

An incredible feeling which makes the heart beat faster, and faster...!

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Photo 32. The Mayor of Bari Michele Emiliano surrounded by Mapei staff on the re-opening day devoted to the workmanship involved in the restoration. From left: Luca Carcagni, Giammario Dispoto, Arianna Colella and Anna Di Leo.