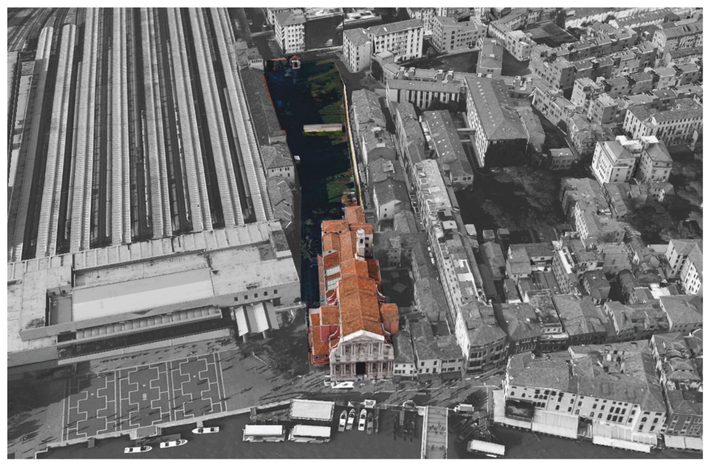
Il restauro della facciata della chiesa di Santa Maria di Nazareth a Venezia

Criteri di analisi, rilievo, diagnostica e sperimentazione nel cantiere di restauro



The restoration project

The facade of the Church of Santa Maria di Nazareth is unique in the context of the city of Venice as it is entirely made of Carrara marble, a lithotype rarely used in the Venetian environment. This limestone with a saccharoid structure proved to be unsuitable in particular due to its outside location which subjected it to the aggressive lagoon climate as well as to dramatic thermal shocks due to both solar radiation and frost. The need for restoration of the facade, designed by Giuseppe Sardi in seventeenth century, arose following the collapse of an acanthus leaf of a column's capital in July 2013. The complexity of this work consisted, first of all, in intertwining of an in-depth historical and archive research with the various stages of progress of the restoration site, starting from survey and diagnostics up to the testing of various materials, from cleaning agents to consolidating and protective ones. The first diagnostic investigations brought to light a vast degenerative phenomenon: all the marble decorative apparatus appeared very degraded, characterized by the dissolution and pulverization of matter beneath an apparently compact cortical surface, for a depth varying from 6 to 12 cm. Experimental research was therefore undertaken as this dramatic condition of the marble was not reflected in specialized literature. Polymeric products such as acrylics or acrylic-silicones, although widely used in the consolidation of crystalline marbles, would have created further problems, as the impossibility of treating again the surfaces following the restoration. With the intent to carry out a reversible intervention that would allow to treat again the surface in the future the attention was therefore turned towards the range of inorganic products and nanotechnologies. The guiding line of the restoration project has therefore been oriented towards the use of traditional materials and technologies with the combination of innovative synthetic and inorganic materials widely supported by exhaustive experimentation.

Restauro della facciata della Chiesa di Santa Maria di Nazareth (vulgo degli Scalzi) in Venezia

Clients:
Provincia veneta dell'Ordine dei Carmelitani Scalzi

ITER
Project: Investigations, survey, preliminary project from July 2013 to March 2014, final project from April 2014 to January 2016, executive project from January 2016 to December 2016.
The executive project was linked to the results of the experimentation for stone consolidation, the research lasted about two years with cycles of aging of the treatments studied.
Realization:
Start of work April 3, 2014 end of the main facade August 31, 2018, (end of the work on the side facades, plaster and ordinary maintenance coverage November 30, 2018).
Based on the authorizations of Soprintendenza per i Beni Architettonici e per il Paesaggio of Venice general authorization works 2651/2014there are also several specific permits for each operation) and of the Municipality of Venice C.I.L. 142881 del 03/04/2014 e C.I.L. 209445/2017 del 03/05/2017 - Notifica ai sensi dell'art. 99 c. 1b del D.L. 81/08 in data 27/05/2014.

DESIGNERS
Coordination and architectural design:
Giorgio Forti and Ilaria Forti Achitects
Construction supervisior: **Giorgio Forti Architect (until May 2016) and Ilaria Forti Architect from May 2016 to completion of work)**
Scientific responsible for experimentation and research for the consolidation of stone material:
Consiglio Nazionale delle Ricerche, Istituto di Geoscienze e Georisorse sede di Firenze, represented by Mara Camaiti
Designer of the structural consolidation works:
Mario Pagan de Paganis Engineer
Design and execution safety coordinator:
Nicola Picco Architect

SURVEYS AND INVESTIGATIONS
Diagnostic and detection surveys:

• Istituto di Geoscienze e Georisorse e CNR scientific manager Dott.ssa Mara Camaiti.
• R&C Art s.r.l scientific manager Dott.ssa Mirella Baldan.
• CO.M. Sigma scientific manager Alessandro Battisti Engineer.
• Laboratorio LAR-Università Iuav di Venezia scientific manager Giuseppe D'Acunto Architect and Professor, coordinator Ilaria Forti.Architect.

TOTAL AMOUNT OF WORKS
€ 1.041.446,13

FINANCING
40% c.a financing of Regione Veneto:
lintervention co-financed by Fondo per lo Sviluppo e la Coesione (FSC), PAR FSC Veneto 2007-2013 D.G.R. n.530 del 21/04/2015. Restauro e conservazione immobili di interesse culturale U.O. Promozione e Valorizzazione Culturale. Direzione Beni Attività Culturali e Sport Area.
50% approximately revenue from the rental of advertising space on the construction scaffolding.
10% approximately Venetian Province of Carmelitani Scalzi.

EXECUTION OF WORKS
Contracting companies:
Company in charge of stone restoration:
Ernesta Vergani Restauro di Opere d'Arte,
with consulting and collaboration of the companies:
Monica Endrizzi Conservative artistic restoration,
Trevi restauri s.r.l.
• Company in charge of setting up the site and architectural works:
Faggion Antonio s.r.l.
• Company entrusted with tasselation works: Daniel Comelato, stonemason and restorer.
• Pintus s.r.l

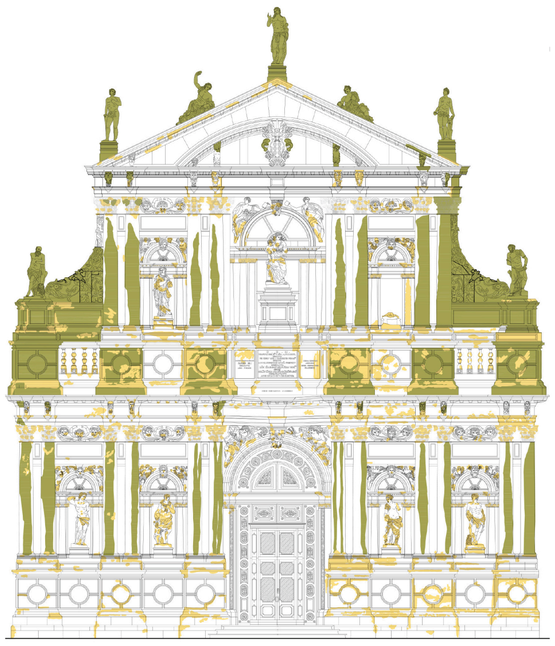
DIMENSIONAL DATA
Approximately 1000 square meters of Carrara marble facade.

Representative images of the different states of degradation



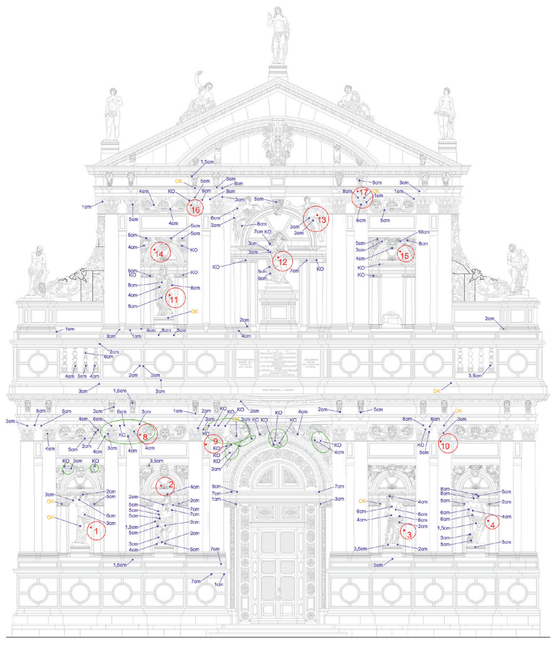



DIAGNOSTICS AND CONSOLIDATION OF THE MATERIAL



Erosion
De-cohesion with loss of stone material

Mapping of degradation phenomena: erosion and de-cohesion



Mapping of driling

State of degradation

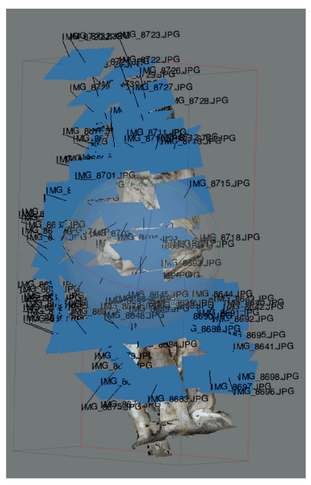
Driling

Since the marble was so compromised that it could barely bear the minimum mechanical stress, a careful chemical and physical diagnostic campaign was undertaken.
A series of drilling tests were performed to identify the depth of the degradation, mapping the entire area of the facade. In fact, it emerged that in some points the material was compromised up to 12 cm.
Furthermore, the dust returned by the drilling tests was used to obtain different samples for chemical diagnostic analysis.

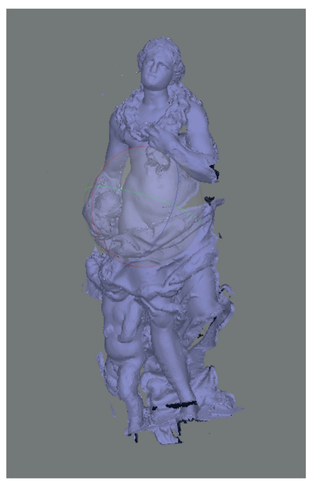


Consolidation methodology

The choice of the consolidating agent, the application method and the verification of the performance was supported by experimentation both on site, choosing the sample area to be treated, and in the laboratory. The application of materials based on nanoparticles has been tested because the small size of the particles allows a good penetration of the consolidating agent.

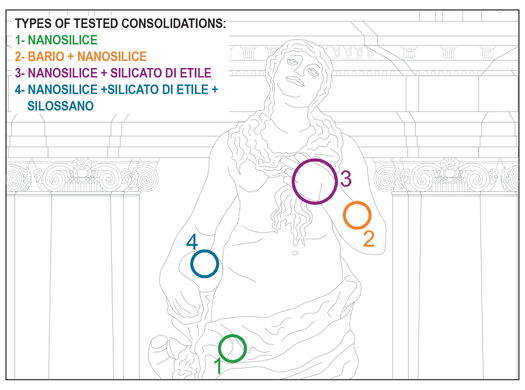
One of case study:
The statue of Maria Maddalena





Elements treated with experimentation consolidation

Ten test areas have been identified to carry out the treatments to be tested. The areas were chosen on the basis of two criteria: the degree of exposure of the marble on the facade and the representativeness of all types of degradation present.
The consolidating agents that have proved to be the most suitable are the nanosilica –which has the advantage of being compatible with the marble– and the combined use of ethyl silicate, a product traditionally and widely used for the



The quantities of products applied by direct imbibition and compresses were noted during processing and collected in 80 sheets. These cards correspond to all the treated areas of the facade: the data were returned in tables and at the same time each operational passage was documented through photography. The formulation of the cards was produced by the designers and will act both as a reference tool for future maintenance as well as being a timely verification of the durability of the intervention in relation to the quantity of product applied.

NANOSILICE + SILICATO DI ETILE

Punto intervento	IMBIBIZIONE Data	Ora	T/UR	Soluzione applicata (ml)		IMPACCO Data	Ora	T/UR	Reidratazioni (ml)	
Parte alta (1)	03/08/2017	11.10	34.7°/39%	Umidificata		03/08/2017	12.15	34.7°/39%	Inizio impacco	
					145	04/08/2017	9.30	32.8°/56		210
							13.20	34°/40%		190
			Totale		145			Totale		400
Parte centrale (2)	03/08/2017	14.10	34.3°/46%	Umidificata		03/08/2017	14.45	33.6°/44%	Inizio impacco	
					360	04/08/2017	10.10	34.5°/51%		210
							15.45	34.3°/36%		135
			Totale		360			Totale		345
Parte bassa (3)	03/08/2017	15.45	33.5°/45%	Umidificata		03/08/2017	16.05	33.5°/45%	Inizio impacco	
					145	04/08/2017	11.00	35.4°/49		375
							16.10	34.3°/36%		280
			Totale		145			Totale		655
BASAMENTO	28/11/2017	11.22	7°/64%	30ml		28/11/2017	11.39	5°/63%		
						29/11/2017	9.52	5°/69%	45ml	
	01/12/2017	11.56	6°/71%	20ml						
	05/12/2017	10.47	6°/54%	15ml						

Before and after the intervention of experimental consolidation