

Prefab concrete envelopes between the fifties and sixties. The Italian experience of Gregotti, Meneghetti and Stoppino

*Original*

Prefab concrete envelopes between the fifties and sixties. The Italian experience of Gregotti, Meneghetti and Stoppino / Barelli, Maria. - ELETTRONICO. - (2024), pp. 276-283. (Intervento presentato al convegno 8th International Congress on Construction History (8ICCH) tenutosi a Zürich (CH) nel 24-28 June 2024).

*Availability:*

This version is available at: 11583/2993649 since: 2024-11-06T15:53:16Z

*Publisher:*

ETH Zürich

*Published*

DOI:

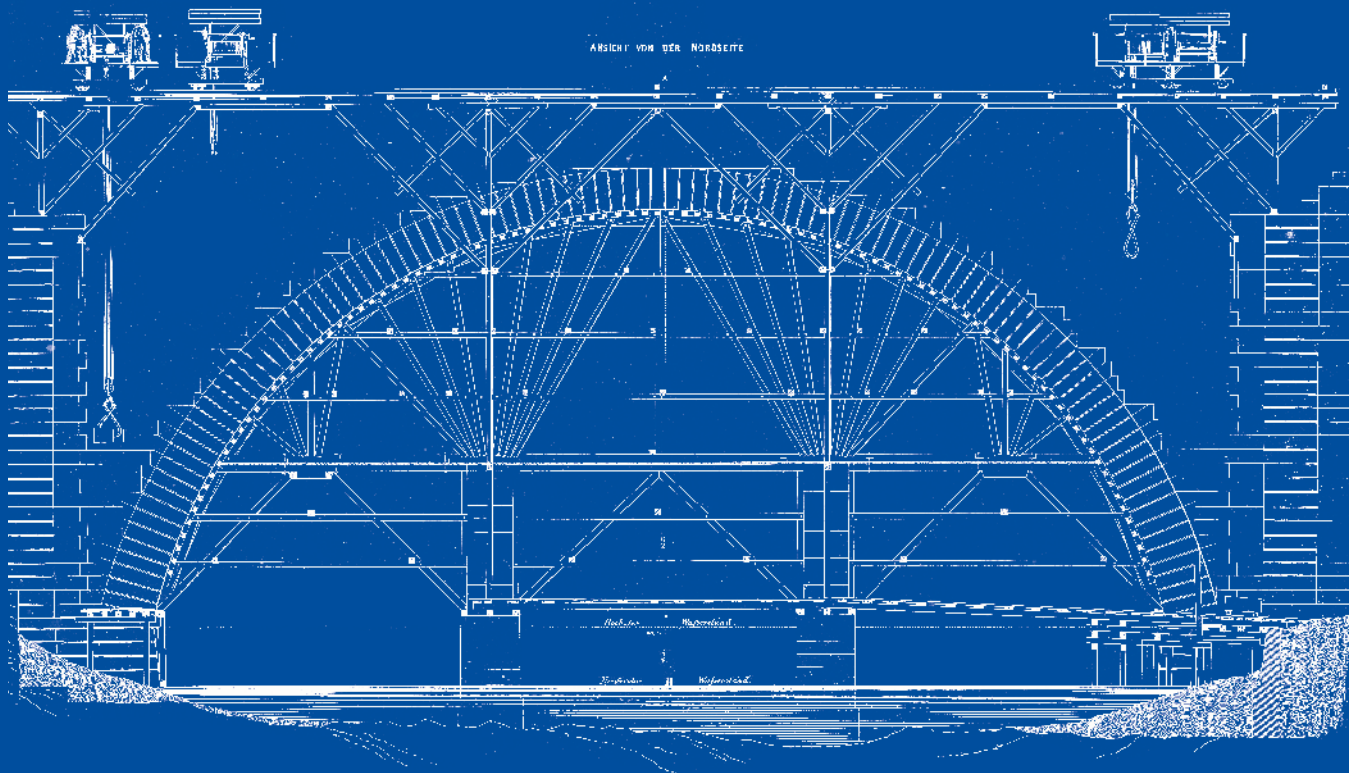
*Terms of use:*

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

*Publisher copyright*

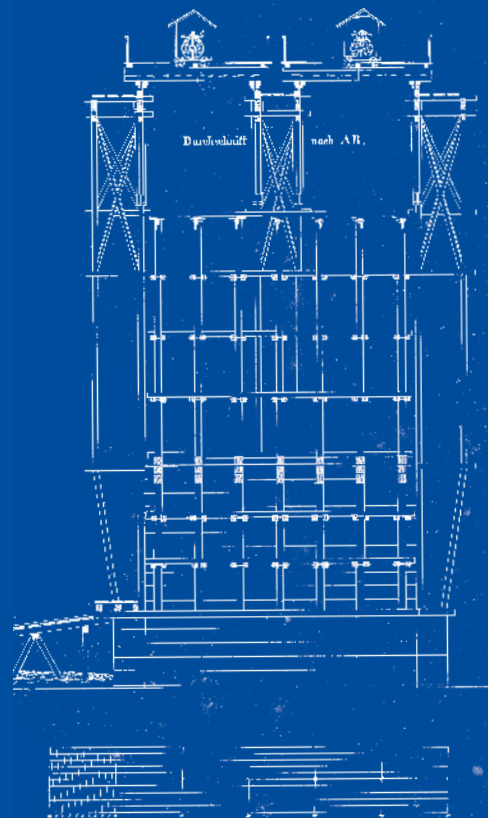
(Article begins on next page)

Proceedings of the 8th International Congress on Construction History  
Stefan Holzer, Silke Langenberg, Clemens Knobling, Orkun Kasap (Eds.)



# Construction

# Matters



Stefan Holzer, Silke Langenberg,  
Clemens Knobling, Orkun Kasap (Eds.)

# **Construction Matters**

Proceedings of the 8th International Congress on Construction History

**ETH** zürich

**DARCH**  
Department of Architecture

Konstruktionserbe  
Konstruktionsgeschichte  
und  
Bauforschung  
Denkmalpflege



Gesellschaft für **BAU  
TECHNIK  
GESCHICHTE**

**CHS**  
THE CONSTRUCTION  
HISTORY SOCIETY



Sociedad  
Española de  
Historia de la  
Construcción

*spehc.* Sociedade Portuguesa  
de Estudos de História  
da Construção

**CHSA**  
Construction History  
Society of America



Association Francophone d'Histoire de la Construction

Associazione Edoardo Benvenuto  
*per la ricerca  
sulla Scienza e l'Arte del Costruire  
nel loro sviluppo storico*

### **Bibliographic information published by the Deutsche Nationalbibliothek**

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at <http://dnb.dnb.de>.

This work is licensed under creative commons licence CC BY 4.0.



Download open access:

ISBN 978-3-7281-4166-8 / DOI 10.3218/4166-8

[www.vdf.ch](http://www.vdf.ch)  
[verlag@vdf.ch](mailto:verlag@vdf.ch)

© 2024, vdf Hochschulverlag AG and the editors

All rights reserved. Nothing from this publication may be reproduced, stored in computerised systems or published in any form or in any manner, including electronic, mechanical, reprographic or photographic, without prior written permission from the publishers and editors.

## Contents

Scientific Committee .....	11
The Eighth International Congress on Construction History .....	13
<i>Stefan M. Holzer, Silke Langenberg</i>	
The strange history of the bridge over the Adda in Trezzo: from Late Middle Ages Chronicles to Structural Medievalism .....	16
<i>Tullia Iori</i>	
The architectural and structural works of S.A. John Cockerill (1842–1955): balancing between craftsmanship and mass production .....	24
<i>Ine Wouters</i>	
<b>1. Construction History of the 20th and 21st centuries .....</b>	<b>41</b>
Construction History of the second half of the 20th and early 21st century .....	43
<i>Silke Langenberg, Orkun Kasap</i>	
The arrival of the information model, 1969. The new international building industrialization frontier and Italy’s “Electronic Challenge” .....	48
<i>Francesco Maranelli</i>	
Slipforming: From Manual to Robotic Slipforming .....	56
<i>Ena Lloret-Fritschi, Selen Ercan Jenny, Francesco Tucci</i>	
Innovative envelope design: Theo Hotz’ High-Tech construction for Zurich .....	66
<i>Matthias Brenner</i>	
Modern Construction in Italy: the Institute of Mathematics in Bologna .....	74
<i>Angelo Massafra, Carlo Costantino, Giorgia Predari, Riccardo Gulli</i>	
Types and families: A genealogical approach to standardized type structures in the GDR 1960–1990 .....	82
<i>Konrad M. Frommelt</i>	
Construction during the transition from on-site construction to factory production in the former Nippon Telegraph and Telephone Public Corporation Headquarters Building .....	90
<i>Ryohei Kumagai, Sho Kanazawa, Asa Kondo</i>	
Central Park in Lugano. A massive construction between prefabrication and craftsmanship .....	98
<i>Giacinta Jean, Cristina Mosca, Lorenzo Roberto Pini</i>	
New research results on the history of an icon of Italian-style engineering. The Velasca Tower in the BBPR archive .....	105
<i>Gianluca Capurso, Tullia Fidelbo</i>	
The importance of patents in the development of building structures in the 19th century .....	113
<i>Francisco Domouso de Alba</i>	
Building Paper 1869 to 1919—a hidden material revealed by patents .....	116
<i>Nigel Isaacs</i>	
The innovation of reinforced concrete in the automotive factories in the early 1900s: Patents, technologies and constructive experimentation .....	123
<i>Rossella Maspoli, Giulio Saponaro</i>	
New techniques, ancient forms. Deneux’s patents for reinforced concrete frameworks .....	131
<i>Maria Rosaria Vitale</i>	
Between Rationalism and “Engenhosidade”, and why not a little Empiricism: the introduction of Portland cement and reinforced concrete in Brazil .....	139
<i>Maria Luiza Macedo, Xavier de Freitas</i>	
From Bricks to Homes: Affordable Vaulted Housing in the 20th Century .....	146
<i>Wesam Al Asali, Alejandra Albuérne Rodríguez</i>	
The vault, a controversial shape .....	154
<i>Nadya Rouizem</i>	

VECA System: brickwork and social housing in Uruguay and Brazil .....	159
<i>Juliana H. Suzuki, Hugo Segawa</i>	
Domes, vaults, and mud bricks: form and construction in the work of Hassan Fathy .....	165
<i>Viola Bertini</i>	
Rebuilding Traditions: Tile Vaults in Spain after the Civil War (1940–1956) .....	173
<i>Javier Madero, Wesam Al-Asali</i>	
Hong Kong Granite in the Construction of Modern Shanghai, 1900s–1930s .....	181
<i>Jingliang Du</i>	
Brick industry of Hiroshima Prefecture in modern Japan .....	189
<i>Chunyao Sun, Susumu Mizuta</i>	
Reconsidering PVC window frames (1975–2000). Technological advancements and commercial strategies .....	197
<i>Marylise Parein, Ine Wouters and Stephanie Van de Voorde</i>	
Geometry, strength, and efficiency: Tracing the standardization of North American structural steel, 1888–present ...	205
<i>Keith J. Lee, Natasha Hirt, Caitlin T. Mueller</i>	
Construction innovation for factory roofs in the second half of the 20th century. Two Italian cases of thin shed vaults .....	213
<i>Francesco Spada, Laura Greco</i>	
An “audacious technical object”: the Saint Vincent city hall suspended building (1959–1965) .....	221
<i>Giuseppe Galbiati, Franz Graf, Giulia Marino</i>	
Economy of Means and Structural Experimentation for a Renewed Liturgy. The Church of the Immaculate Heart by Giuseppe Vaccaro in Borgo Panigale .....	228
<i>Giorgio Azzariti</i>	
The Swiss modern churches of Ferdinand Pfammatter and Walter Rieger .....	236
<i>Louis Vandenabeele, Clemens Knobling, Stefan M. Holzer</i>	
Friedrich Bleich (1878–1950)—life, work, and emigration .....	244
<i>Eberhard Pelke, Karl-Eugen Kurrer</i>	
Hidden joints: Emil Mörsch’s Reinforced Concrete Factory and Le Corbusier’s Maison Dom-ino .....	252
<i>Federico Perugini</i>	
The rise of do-it-yourself in Belgium (1965–1985) and the mutual entanglement between construction history and planning history: an exploration .....	260
<i>Tom Broes</i>	
Precast thin shells for industrial buildings. The international journey of the Silberkuhl system (1950–1970) .....	268
<i>Ilaria Giannetti, Martina Russo</i>	
Prefab concrete envelopes between the fifties and sixties. The Italian experience of Gregotti, Meneghetti and Stoppino .....	276
<i>Maria Luisa Barelli</i>	
An Imperfect Industrialization. Prefabrication Cultures in Post-War Italy Between Liberalism and Public Planning (1943–1949) .....	284
<i>Angelo Bertolazzi, Ilaria Giannetti</i>	
Silvio Galizia’s reinforced concrete shell roofs. An experience of cross-pollination between the ETH Zurich and Italian structural engineering after World War II .....	292
<i>Giuseppe Canestrino, Chiara Corinna Galizia, C. Giovanni Galizia, Roberta Lucente</i>	
POLYNORM. Dutch modular construction of the 1950s entirely made of steel sheet .....	300
<i>Nicolas Grandjean, Agnès Collaud, André Jeker, Reto Mosimann and Séréna Vanbutsele</i>	
Labor or Work? Remembering operations in the construction of the Golconde dormitory, Pondicherry (1935–c.48) .....	308
<i>Saptarshi Sanyal</i>	
The supporting scaffolding for the foundation restoration of the Strasbourg Cathedral and its remaining model fragments .....	316
<i>Benjamin Schmid</i>	
“Crossroads of the Air:” The Evolution of Chicago’s O’Hare Airport .....	324
<i>Thomas Leslie, FAIA</i>	
Knowledge transfer and tacit knowledge in collaborative historic building projects: the case study of the Ghent University building campaign in the 1930s .....	331
<i>Laurens Bulckaen, Rika Devos</i>	

The technics of elegance: Negotiating efficiency and standardization in three prestressed concrete systems by Aldo Favini and Angelo Mangiarotti .....	339
<i>J. Schnitzler, I. Donovan, M.A. Ismail, C.T. Mueller</i>	
Constructing lightness. Local and foreign influences in the work of Yuri Plaksiev in post-war Soviet Ukraine .....	347
<i>Giulia Boller, Federico Bertagna</i>	
The preservation of Heinz Isler’s structures made of glass-fiber reinforced plastics .....	355
<i>Pamela Voigt</i>	
Interactions between the experimental integration of solar thermal systems and building construction technologies: trends identified from a comparative analysis of selected buildings in Europe and the United States (1940s–80s) .....	363
<i>Elena Poma, Franz Graf</i>	
Emerging building technologies and their impact on facade design .....	371
<i>Ina Cheibas, Ena Lloret-Fritschi, Cara Rachele, Maarten Delbeke, Romana Rust, Fabio Gramazio, Matthias Kohler</i>	
<b>2. Lectures on 19th and early 20th century topics .....</b>	<b>381</b>
Construction contractors. New perspectives on the culture of construction from the 18th to the late 20th century .....	383
<i>Inge Bertels, Mike Chrimes</i>	
Louis Joseph Vicat’s synthesis of analysis and experimentation, the invention of the tremie, and the development of hydraulic engineering expertise in France .....	390
<i>Tom F. Peters</i>	
Avant-gardists sunken into oblivion—The Berlin steel construction company Breest & Co. and its ingenious engineer Hans Schmuckler .....	399
<i>Roland May</i>	
Early reinforced concrete contractors in Germany—A history of expert knowledge, courage and an open mindset ..	407
<i>Geraldine Buchenau, Sabine Kuban</i>	
Building the face of modern architecture. Facade and window manufacturers as contractors .....	415
<i>Rouven S. Grom, Andreas W. Putz</i>	
Liquid innovators. Company advertisements of sanitary installers in Paris, London, and Brussels (1850–1940) .....	423
<i>Matthijs Degraeve</i>	
“Dare, persevere, succeed.” De Coene’s venture into glulam in the 1950s and 1960s .....	431
<i>Kaj-Wolf Depuydt, Sven Sterken, Stephanie Van de Voorde</i>	
Large construction companies in the widespread of modern housing. A comparative analysis between Lisbon and Luanda .....	439
<i>Inês Lima Rodrigues, Francesca Vita</i>	
Contractors Shaping Den Brandt in Antwerp (1910–1925) .....	447
<i>Yonca Erkan</i>	
Foreign and local construction practices and the formation of Ottoman engineering in the Hejaz railway construction (1900–1908) .....	455
<i>Habibe Tuba Bölük, Mario Rinke, João Mascarenhas Mateus</i>	
Collaboration in historical buildings: self-evident but intangible .....	463
<i>Rika Devos, Laurens Bulckaen</i>	
The National Theater of Panama: a collaborative process .....	471
<i>Silvia Arroyo Duarte</i>	
Collaboration in building with plastic-coated steel in West Germany in the 1960s: the “Hoesch-bungalow” .....	479
<i>Silke Haps</i>	
Architects and engineers: design authorship between synergies and disagreements .....	487
<i>Simona Talenti</i>	
The Concrete Collaborations of Carmen Portinho and Affonso Reidy: Structural innovation in Brazilian Modernism through public service .....	495
<i>Alexander Curth, Caitlin Mueller, Mohamed Ismail</i>	
Transnational Bridges: Construction History through the Eyes of Migrants .....	503
<i>Jana Keck, Karl-Eugen Kurrer<sup>2</sup>, Eberhard Pelke<sup>3</sup></i>	
Jules Röthlisberger (1851–1911), Swiss expatriate, chief engineer at the Società Nazionale delle Officine di Savigliano in Turin (1884–1910) .....	510
<i>Vincent Krayenbühl</i>	

Albert Fink and the U.S. transition to statically determinate railroad truss bridges .....	518
<i>David Simmons, Dario Gasparini</i>	
Immigrant Engineers In New York .....	524
<i>Donald Friedman</i>	
The Roeblings: migration, knowledge transfer, and tacit knowledge .....	532
<i>Andreas Kahlow</i>	
Sugar and Technology. Manuel Querino and the Role of Drawing in the 19th Century Brazil's Building Culture .....	540
<i>Adalberto Vilela, Sylvia Fischer</i>	
Designing and assessing riveted lattice girders in metallic roof structures: from Navier to Eurocode 3 .....	547
<i>Hannah Franz, Mario Rinke, Emilie Leprêtre, Lamine Dieng</i>	
From iron to reinforced concrete: revisiting the interwar oeuvre of Victor Horta in light of his wartime sojourn in the US .....	555
<i>Tom Packet, Stephanie Van de Voorde</i>	
The research and patents of Dalmine Company: Seamless pipes for the design of building structures .....	563
<i>Matteo Abita, Renato Morganti</i>	
Arched rafters with diagonal ties: On the history of lightweight truss system in the Russian Empire at the turn of the nineteenth and twentieth centuries .....	571
<i>Daria Kovaleva</i>	
Construction techniques at Linz Cathedral (1862–1924/36) or how to build an old-fashioned church in a modern way .....	579
<i>Iris Pfeiffer, Christiane Weber</i>	
How Surveying Kept Tunnel Builders on the Straight and Narrow – The Albula Tunnel .....	587
<i>Philip S. C. Caston</i>	
Robert Mills' Rotunda Annex at the University of Virginia, 1851–1895 .....	595
<i>Benjamin Hays, PE</i>	
Bridges over the Mittellandkanal in Hanover from 1905–1916 .....	603
<i>Moritz Reinäcker, Johanna Monka-Birkner, Christina Krafczyk, Steffen Marx</i>	
Joseph Cordier (1775–1849)—a liberal engineer between the two Napoléons .....	611
<i>Stefan M. Holzer</i>	
Slag, Norms, and Patents. Circulating Knowledge and Experimental Laboratory Construction at the Swiss Federal Polytechnic School 1880–1900 .....	619
<i>Sarah M. Schlachetzki</i>	
Between practice and rule: codification, testing and use of plain concrete in Dutch military architecture (1870's–1910's) .....	627
<i>Federica Marulo, Jeroen van der Werf</i>	
Iron wires. The Seguin brothers and suspension bridges in the Grand Duchy of Tuscany and the Kingdom of Sardinia .....	635
<i>Danilo Di Donato, Alessandra Tosone</i>	
The Hackerbrücke in Munich: a landmark of iron and concrete engineering from the late nineteenth century .....	643
<i>Clemens Voigts</i>	
“Un pont sur arbalétriers”: Building a three-hinged arch over the Faux-Namti Gorge in Yunnan (1908) .....	651
<i>Di Zhao, Bernard Espion</i>	
The Garabit viaduct as the apogee of classical French railway overpass design, 1880–1884 .....	659
<i>Matteo Porrino</i>	
The Eglisau Bridge Competition of 1805–10: a Kaleidoscope of Early Modern Construction Techniques .....	667
<i>Jasmin Schäfer</i>	
Postconstruction problems with the 85 m span timber arch bridge over the Kokra River in Kranj, Slovenia .....	675
<i>Lara Slivnik</i>	
The combination of timber and iron in roof structures of nineteenth-century railway stations in Switzerland .....	683
<i>Kylie Russnaik, Stefan Holzer</i>	



<b>3. Construction History topics relating to Antiquity, the Middle Ages, and the Early Modern period</b> .....	693
Building Services and Living Comfort in Medieval Residences and Places of Leisure in the Mediterranean Region ....	695
<i>Kai Kappel, Klaus Tragbar</i>	
Latrine towers. Models, uses and diffusion in Mediterranean architecture from the 12th to the 14th century .....	698
<i>Maria Teresa Gigliozi</i>	
Between privy and throne. Building facilities as an expression of sophistication at the court of the Western Umayyad Caliphate (tenth century, Spain) .....	706
<i>Heike Lehmann</i>	
A late-Hohenstaufen castle and its living comforts: the Palas of Gravina in Puglia .....	714
<i>Judith Dreiling, Giulia Pollini</i>	
Wooden floors versus coffered ceilings: structural improvement and decorative complexity in the palaces of Cremona (1490–1540) .....	722
<i>Alberto Grimoldi, Angelo Giuseppe Landi</i>	
Thin Timber Domes in Restoration England (c. 1670–1680) .....	730
<i>Luka Pajovic</i>	
The Building History of a Medieval Bridge: The Pont du Diable in Saint-Jean-de-Fos (Hérault, France) .....	738
<i>Grazia Cione, Jasmin Schäfer, Clemens Voigts</i>	
An Insight into the Building Process of Pont Valentré in Cahors (XIV Century) .....	746
<i>Laura Carmona-López, Clemens Knobling, Jasmin Schäfer</i>	
Temporary structures as part of the constructive process: a centering system proposal for the oval dome of San Carlo alle Quattro Fontane .....	754
<i>María del Pilar Pastor Altaba</i>	
Vaulting Techniques in Romanesque Burgundy: Advanced Large-span Groin Vaults at Sainte-Trinité in Anzy-le-Duc (1001–1120) .....	762
<i>Marius Pfister, Louis Vandenabeele</i>	
The revolution in vault construction before the Gothic: Speyer Cathedral, some related examples, and the development of wide spanned vaults in the 11th and 12th centuries .....	771
<i>David Wendland, Mark Gielen</i>	
The cathedral of St. Pierre in Lisieux: A laboratory of vaults from the twelfth to the sixteenth centuries .....	780
<i>Mathias Häcki, Louis Vandenabeele, Clemens Voigts, Stefan Holzer</i>	
Transformation of a Temporary Mold to a Permanent Structural Member: A Strategy for without-Centering Vaulting in the Iranian Traditional Architecture .....	788
<i>Hadi Safaeipour, Mahsa Pour-Ahmad</i>	
Construction Technique of the Dome of Nizām al-Mulk in the Friday Mosque of Isfahan .....	796
<i>Soheil Nazari</i>	
<i>Department of Construction History, Brandenburgische Technische Universität, Germany</i>	
Experimental assessment of existing ideas on brick vaults by slices building process .....	804
<i>Enrique Rabasa-Díaz, Ana López-Mozo, Miguel Á. Alonso-Rodríguez, Rafael Marín-Sánchez, Alberto Sanjurjo-Álvarez</i>	
Brick vaults without centering in the church of Calatrava la Nueva: geometry and construction .....	810
<i>Ignacio Gil-Crespo, Pau Natividad-Vivó, José Calvo-López</i>	
The vaults of St. Nicholas in the Lesser Town of Prague (1703–1711, 1737–1760s): the Dientzenhofers' magnum opus .....	818
<i>Rebecca Erika Schmitt</i>	
Tegula cumularia. Life Cycles of Brick and Tile in Pompeii .....	826
<i>Julian Bauch, Pia Kastenmeier</i>	
Building service solutions in the first half of the 13th century CE. —Variations of the same tasks in the two towers of the Margraves of Baden in Besigheim .....	833
<i>Jonas Lengenfeld</i>	
The spiral staircase attached to the so-called Gothic Wall of the Cathedral of Jaen (Andalusia, Spain) and its relationship with Mediterranean cases .....	841
<i>Alberto Sanjurjo Álvarez, Rocío Carvajal Alcaide</i>	
Building the international baroque: stone in a brick city, and the pronaos at Superga .....	849
<i>Edoardo Piccoli, Cesare Tocci, Elisabetta Culla</i>	

Construction Materials, Building Costs, and the Emergence of Building Estimates in 18th Century Germany – Building and the ‘cameralistic economy of resources’ .....	857
<i>Torsten Meyer</i>	
When Patronage Undermines Construction. Negotiating the Uniate Architecture in Eighteenth-Century Poland-Lithuania .....	865
<i>Melchior Jakubowski</i>	
Administration in the mid 17th century court of Savoy .....	873
<i>Valentina Burgassi</i>	
What competences were required of Paris building experts in the early modern era? .....	881
<i>Robert Carvais</i>	
Building Art: the decorative terracotta of Palazzo Fodri in Cremona (IT) .....	889
<i>Angelo Giuseppe Landi, Martina Adami</i>	
Contribution to the history of roofing slate in Southern Brabant: a methodological approach from the Brussels case study (Belgium) .....	897
<i>Paulo Charruadas, Eric Goemaere, Philippe Sosnowska</i>	
The Introduction and Manufacture of Cast Iron Water Supply Pipes, 1600–1850 .....	905
<i>Lei Song, James W. P. Campbell</i>	
The construction of <i>gaiola pombalina</i> in pictures: Historical photographs and the timber seismic reinforcement system in Lisbon, 1870–1910 .....	912
<i>João Mascarenhas-Mateus, Caio Rodrigues de Castro</i>	
Anonymous stucco workers behind great architects: stucco decorations as choral creations in the late Baroque Naples (17th–18th centuries) .....	920
<i>Damiana Treccozi</i>	
Design and construction of provisional works for the maintenance of extra-ordinary buildings in the eighteenth century: the wooden scaffolding for the main nave of St. Peter’s Basilica in the Vatican .....	928
<i>Nicoletta Marconi, Ilaria Giannetti</i>	
<b>4. Diachronic and more general topics</b> .....	937
How might prosopography help construction history? .....	939
<i>Michela Barbot, Robert Carvais, Emmanuel Château-Dutier, Valérie Nègre</i>	
Building Parliament: the masons of the Palace of Westminster c.1839–c.1860 .....	947
<i>Alexandrina Buchanan</i>	
How prosopography serves construction history-working with the lives of civil engineers .....	955
<i>Mike Chrimes</i>	
Military engineers as thought collective—Understanding governmental building projects in the Habsburg monarchy around 1850 .....	963
<i>Frank Rochow</i>	
Mind make the shape. The shell construction in the middle of the 20th century—approach via prosopography .....	971
<i>Elke Genzel</i>	
Construction history of nailed board trusses in correlation with German engineering biographies in the middle of the 20th century .....	975
<i>Iris Engelmann</i>	
Defining the Teaching of Construction to Architects. Construction Teachers at Architecture Departments of the Ecole des Beaux-Arts in Paris and the Technische Hochschule in Munich between 1920 and 1968 .....	983
<i>Gabriel Bernard Guelle</i>	
Architects as researchers. The first doctor-engineers (Dr.-Ing.) in architecture .....	990
<i>Andreas W. Putz</i>	
How construction shaped globalization: The nineteenth and twentieth century Eurasian cases .....	998
<i>Chang-Xue Shu</i>	
Reinforced concrete Catholic churches in Republican China (1912–1949) .....	1006
<i>Thomas Coomans, Yitao Xu, Jianwei Zhang</i>	
From Timber to Globalization: Exploring the Construction History of Fraser Mills in Coquitlam, British Columbia, Canada .....	1014
<i>Yiting Pan, Jasmine Moore</i>	

Shaping a new building culture in Soviet Union: Soviet engineers in Italy .....	1022
<i>Christian Toson</i>	
Industrial half-timbering in Japan: French technology transfer and Japanization from the late 19 <sup>th</sup> to early 20 <sup>th</sup> century .....	1029
<i>Akio Sassa, Manabu Fujimoto</i>	
Deconstruction, salvage, and reuse in Construction History. Unveiling collective narratives and new perspectives .....	1038
<i>Stephanie Van de Voorde, Ine Wouters, Philippe Bernardi, Maxime L'Héritier</i>	
Building and second-hand materials in times of crisis. Questioning a constraining context on the supply of building sites in the late Middle Ages and early modern period .....	1046
<i>Marion Foucher</i>	
Looking for Construction Process in Early Modern Paris: demolish to build better .....	1054
<i>Léonore Dubois-Losserand</i>	
Spolia Britannica: Aspects of Architectural Salvage in Britain .....	1061
<i>Michael Heaton</i>	
Small but significant. Tracing the emergence and evolution of the demolition profession in Brussels (1860–1970) ..	1069
<i>Lara Reyniers, Stephanie Van de Voorde, Ine Wouters</i>	
Structural component reuse of precast and cast-in-place reinforced concrete in architecture since the late 1960s in Europe .....	1077
<i>Célia Küpfer, Corentin Fivet</i>	
Value through the Ages: An evolving landscape of demolition, salvage, and reuse in North America, 1890s–2010s .	1085
<i>Juliette Cook, Rashmi Sirkar</i>	
(De)constructing gender? Women laborers and building site photography in western India, 1850–1990 .....	1093
<i>Sarah Melsens</i>	
“Unfortunately, the toll is high for some of your blacks”: Moments of Crisis in the Belgian Congo’s Construction Industry .....	1101
<i>Robby Fivez</i>	
From barrack-hut to Ritz: Housing solutions on the construction site of the Grande Dixence dam, 1950–1965 .....	1109
<i>Rune Frandsen</i>	
Crisis or Tradition? Women Construction Laborers in Late Medieval Valencia .....	1117
<i>Shelley E. Roff</i>	
Narratives and Silences in the History of the Industrialization of Construction .....	1124
<i>Gregory Dreicer</i>	
Construction History, Above and Beyond. Setting up a Dialogue with other Historical Disciplines .....	1131
<i>Laurence Heindryckx, Michiel Dehaene, Dave De ruysscher, Rika Devos, Johan Lagae, Ine Wouters, Tom Broes, Simon De Nys-Ketels, Robby Fivez, Igor Bloch, Louis Debersaques, Robrecht Verstraete, Stephanie Van de Voorde</i>	
A History of Highs and Lows. The College of Civil Engineering in Cottbus, GDR, in the 1950s and 1960s .....	1139
<i>Elke Richter</i>	
Learning ‘through’ History: Remaking the Sydney Opera House 50 Years Later .....	1147
<i>Paolo Stracchi, Luciano Cardellicchio, Paolo Tombesi</i>	
The Development and Decay of Traditional Masonry Craftsmen: a Study of the Last Generation of Stone-carving Teams in the North-east of Taiwan .....	1155
<i>En-Jia Li, Nan-Wei Wu</i>	
Constructing Coldscape in Treaty-Port Shanghai .....	1163
<i>Zhengfeng Wang</i>	
A visual approach to structural design: photoelasticity as a collaborative tool in Gengo Matsui’s work .....	1171
<i>Federico Bertagna, Tazuru Harada</i>	
Acceptance and Development of Trocken Montagebau in Japan .....	1179
<i>Ren Sakuragawa, Leo Tanishige, Kohji Takeuchi, Tomoyuki Gondo</i>	
The architectural and building culture of the Benedictines congregation “de Unitate” in the Renaissance. A network of monasteries and building sites .....	1185
<i>Gianmario Guidarelli</i>	
Planning through Distant Geographies: Uncover a GDR-Cuban Collaboration in the Nuevitas Cement Plant Construction .....	1192
<i>Juliane Richter</i>	

Legal expertise in professional construction periodicals: the Belgian building sector shaping and shaped by processes of juridification, 1918–1940 .....	1200
<i>Simon De Nys-Ketels, Rika Devos</i>	
The Tacit Turn? Designing the Silent Laboratory .....	1208
<i>Fiona Smyth</i>	
“Model” Workers’ villages? Company rule and adobe-brick houses in late colonial Africa .....	1216
<i>Beatriz Serrazina</i>	
Système Grévisse. The Lubumbashi post-war housing scheme, between colonial guidelines and reality .....	1223
<i>Igor Bloch, Simon De Nys-Ketels</i>	
The Transformation of Traditional Construction under Ethnic Migration: the Construction Systems of the Bunun Architecture .....	1231
<i>Liang-Ping Yen</i>	
Women, colonialism and building sites. Gender experiences in former African territories ruled by the Portuguese through colonial archives .....	1239
<i>Ana Vaz Milheiro</i>	
Building with limited resources in times of revolution. Construction processes in Social Housing by Álvaro Siza in the early 1970s .....	1245
<i>Clara Pimenta do Vale, Teresa Cunha Ferreira, Tiago Cruz, Joaquim Teixeira, Rui Fernandes Póvoas</i>	
Exploring the Gulag as built heritage: Construction techniques and architecture of the Chtchoutchi camp in Siberia ...	1253
<i>Jérôme André</i>	
Construction works, xibalo and the Maxaquene cove embankment in Lourenço Marques, in Portuguese East Africa ..	1261
<i>Lisandra Franco de Mendonça</i>	
On “Borrowing” and “Othering”. Unpacking the practices, networks, and biases underpinning two manuals on building in the tropics around 1940 .....	1269
<i>Johan Lagae, Monika Motylińska</i>	

## **Prefab concrete envelopes between the fifties and sixties. The Italian experience of Gregotti, Meneghetti and Stoppino**

Maria Luisa Barelli

*Department of Architecture and Design (DAD), Politecnico di Torino, Italy*

**Abstract:** The paper intends to investigate a group of works designed by the architects Vittorio Gregotti, Lodovico Meneghetti and Giotto Stoppino at the beginning of their professional career, between the second half of the 1950s and the 1960s, characterized by the use of prefabricated infill panels made of concrete and grit. If artificial stone was used (as a counterpoint to the exposed brick walls) in the small houses in Cameri (Novara, 1954–56) to make sills, architraves, and a few other prefabricated elements, with a view to evoking a tradition strongly rooted in northern Italy, in the houses built in Novara on the site of the old ice factory (1957–60), in the project for the competition for the Municipal Theater in Alessandria (1959) and in the villa designed for the Mira brothers in Romagnano Sesia (1960–64) prefabrication is extended to all the infill walls of the buildings, looking to the work of Perret and Wright and facing with a still artisanal type of building production. In these works, the relationship between structure and envelope, the modular organization of the project, the rationalization of the building phases and the expressive possibilities linked to the use of a material like concrete, become the themes of a research which the three architects continued to pursue in the 1960s, in a changed context, in the Milanese houses for the “Un Tetto” cooperative. Starting from bibliographic sources and archival investigations (CASVA, Centro di Alti Studi sulle Arti Visive di Milano), and also thanks to some oral testimonies, the contribution aims to reconstruct this history in its technical specificities and declinations, placing it in its cultural and productive framework.

### **Introduction**

In the early fifties in Italy, at a time when a new generation of architects was approaching the professional world, research, and therefore the prospects of an industrialization of the building sector, desired by many, was taking a turn that was destined to relegate it to a marginal role with respect to the debates and above all to the practices of the reconstruction and expansion of cities. The experimentation undertaken as part of the 8th Triennial (1947) with the realization of QT8 (1947–55), a residential complex in which to test the adoption of new construction systems and processes (particularly for load-bearing structures), provided an important phase of reflection but failed to give the desired results on a technical and economic level (Albani 2012). The approval of the Ina Casa Plan (1949) for the construction of affordable housing steered the reconstruction program “in the opposite direction to that of innovation, and of prefabrication in particular” (Poretti 2008, 179): the Plan’s main aim, which was to increase employment, imposed “a way of building houses with low mechanization and high use of labor” destined to influence “the building policy of the country as a whole” (Poretti 2008, 179).

This productive context, which lacks substantial innovations in relation to the building methods typical of the autarkic years, includes a number of design experiences aimed at adopting forms of prefabrication that were still artisanal but extended to the realization of the entire building envelope, conceived as the result of an assembly, by overlapping and/

or placing side by side concrete blocks or panels, which some refer to as “artificial stone”, while others, with a significant lexical shift, use the definition of “concrete and grit”.

These elements could be made in the workshop or, more often, to save on the cost of transportation, on site, following a precise sequence: from the creation of a model, to the use of that model to create one or more molds, usually in plaster but, in the case of simple elements, also in other materials, such as wood or metal; to the casting, in those molds and with the insertion of a steel reinforcement, of a concrete mixture usually consisting of a surface layer, enhanced with stone powders and grits, and an inner layer made of ordinary concrete.

In the 1950s, some young Italian designers in search of a way to break free from the restrictions of late-rationalism, soon to be labeled as neo-liberty architects, saw this technique as a way not only of opening up new opportunities for experimentation, but also of conveying a powerful historical and social dimension to the project: with its ancient roots, stemming from the art of stucco, this technique had enjoyed considerable popularity in eclectic and art nouveau architecture and had been subject to interpretation by masters such as Wright and Perret. These young Italian architects decided to probe it in terms both of expressive freedom, due to the plasticity of the material and the possibility to play with the surface composition of the concrete mixture, and replicability for application in series, with production economies. Similarly to the events that took place in the same years within the scope of some of the most advanced



Figure 1. The VFG buildings, Novara, 1957–60. (CASVA, AA Archive collection, photo by Dino Sala).

experiments in Italian engineering (Iori 2012), these architects knew they could rely on a production fabric that was still very much alive, made up of workshops in which the trades of the plasterer and the concrete layer were often passed down from father to son, and therefore able to meet the specific needs of each individual construction site with the custom production of small series of elements.

In Turin, in the 1950s, architects Sergio Jaretti and Elio Luzi experimented to the fullest extent with the potential of form associated with the use of artificial stone in the so-called Obelisk house (1954–59), an extrovert, ironic and in some ways surreal building, continuing their research in the house in Piazza Statuto (1958–59), where the themes of seriality, economy and rationalization of the construction process related to this technique were investigated, before abandoning it for good (Barelli, Rolfo 2018).

Several works by the so-called *Architetti Associati*, Vittorio Gregotti, Lodovico Meneghetti and Giotto Stoppino, also characterized by the adoption of prefab envelopes in “concrete and grit”, were part of this same productive and cultural context in the Fifties, but with very different accents and directions which became clearer during the Sixties. For the three architects, active in Novara from 1953 and then again in Milan from 1963 to 1969 (when they decided to divide their professional paths), as early as the 1950s the use of prefabrication marked “the emerging of a clear rigorist component that (...) would develop over the decade that followed”, pre-empting “the search for a procedure to stabilize language, which would become one of the connotations of the design methodology of Gregotti Associati” (Morpurgo 2004, 12).

Focusing on this building production, the study made use of bibliographic and archival investigations (CASVA, AA archive collection), with the help of oral testimonies when possible. The archival documentation (design drawings and photos) was rather inconsistent in the various cases, with that on 1960s buildings being somewhat deficient.

The research, as a whole, aims to highlight the roots and evolution of the way of conceiving and using prefabrication,

employed always and only in this case for envelope elements, by a group of educated professionals who were definitely highly influential in the Italian architectural debate of the time: a small but significant segment, little investigated until now, of a history of construction in the second half of the Italian twentieth century.

### 1. Prefabrication and expression

In one of the first works by Gregotti, Meneghetti and Stoppino, the house built in Cameri, near Novara, for the workers of a textile industry (1954–56), as well as in the subsequent houses in Novara for a teachers’ cooperative (1958–59) (Vitale 2011, pp. 31–32) the attention paid to the themes of history and memory is translated, in the production context mentioned above, into a careful and calibrated adoption of artisan construction methods. These include exposed load-bearing brickwork, carefully designed down to the tiniest detail and counterbalanced by concrete and hammered grit elements such as windowsills, architraves and, in the case of the houses in Cameri, the large copings of the French windows of the living rooms. These elements were installed as the brickwork grew, evoking the consolidated building tradition of the plasterers and the concrete layers active between the 19th and 20th centuries in the production of decorative and completion artifacts.

But it was in the project for two rental buildings with flats and offices (1957–60), realized near the railway line in Novara in an area previously occupied by the old ice factory (in Italian “vecchia fabbrica del ghiaccio”, often abbreviated to VFG), that the three architects launched a season of research into the technical, functional and expressive possibilities connected with the use of prefabrication, extended (as in the aforementioned cases in Turin) to the construction of the entire envelope of buildings no longer made of load-bearing brickwork, but characterized by the use of reinforced concrete structures. (Fig. 1)

Reference to the structuralism of Perret (Rosso 2003), along with other suggestions (including some resulting from

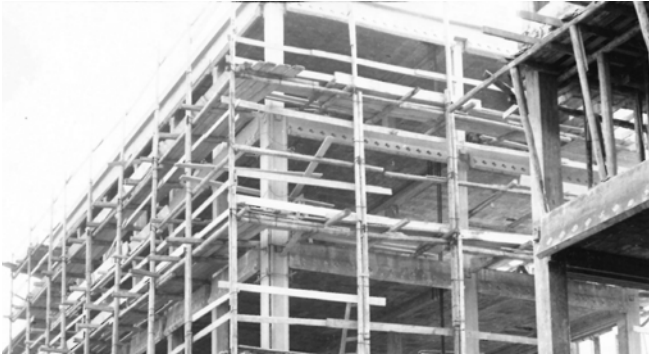


Figure 2. The VFG buildings, Novara, 1957–60. (CASVA, AA archive collection).



Figure 3. The VFG buildings, Novara, 1957–60. (CASVA, AA archive collection).

the comparison and proximity to the greatly appreciated architecture of Alessandro Antonelli from Novara), clearly emerges in these houses. Perret was also the subject of an essay by Gregotti, published at the time in *Casabella-Continuità* (Gregotti 1959), with Gregotti having spent a short time in his studio as an apprentice.

In the two buildings, positioned in line with each other, one measuring eleven meters wide and the other, detached from the first and free at both ends, fourteen meters wide, the decision to adopt a prefabricated façade system, created by assembling modular panels, immediately became the central element of the project, around which to gradually organize the load-bearing structure and elevations. The modularity with which the structural grid is conceived in the plan, as a multiple—in both directions—of the width of the panels (plus the 1 cm width of the joint), is counterpointed by the singular perimeter modeling of the same structure, designed to highlight and represent the different functions it is required to fulfil, in addition to the obvious load-bearing task.

The perimeter pillars are fitted at the level of each floor with small brackets, used as supports for the cladding panels, intended to remain visible and punctuate the surfaces of the elevations. (Figures 1–2) Also on the perimeter, and with a solution that closely resembles that adopted by Ridolfi and Frankl in the Roman towers of *viale Etiopia* (1949–56) (Poretti 2008, 197–207), the edge beams of the floor slabs are cast together with singular canopies covering the roller shutter box, which in this case extend beyond the edge of the pillars and which, given their function, are interrupted each time in

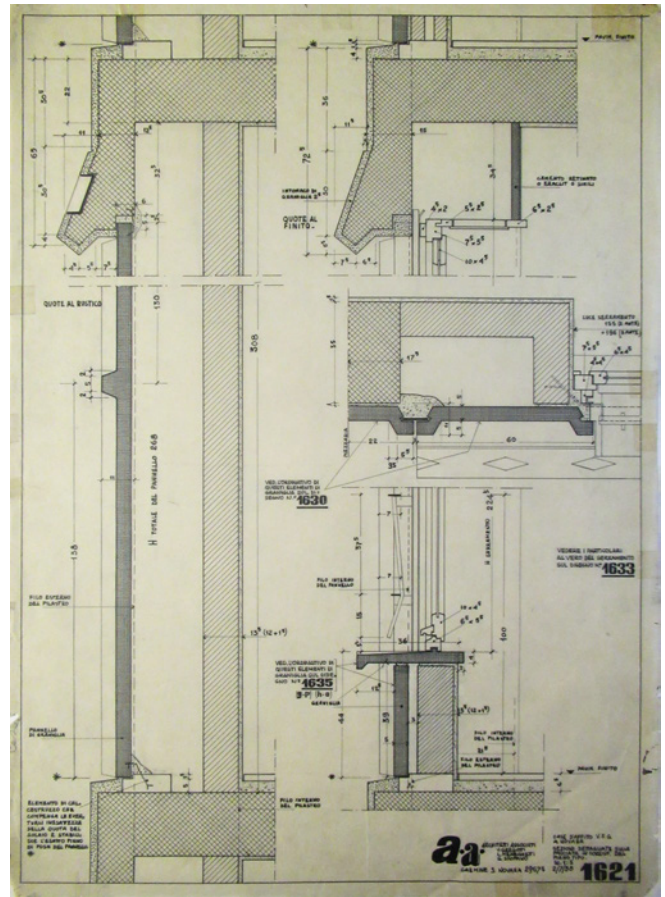


Figure 4. The VFG buildings, Novara, 1957–60. Detailed sections on the façade, 1:5 scale, 2 July 1958. (CASVA, AA archive collection, drawing no. 1621).

correspondence with them (Figures 2–4); their purpose is also to limit the height of the envelope panels, thereby restricting their weight, and to protect their upper connection with the structure. These canopies, with their inclined outside profile emphasizing their role as a watershed, are also characterized by a singular decorative counterpoint, consisting of a series of small square recesses, rotated by 45 degrees, arranged with a distance between centers equal to half the width of the façade panels. These recesses were probably made (as some photos of the construction site seem to highlight) using specific plaster molds, attached to the wooden formwork and then removed when the casting had hardened. (Fig. 2)

Once the casting of this elaborate structure, which was most definitely a complex phase of the construction for the Milan-based company Gadola, was completed, work could proceed with the assembly of the ribbed panels, following the severe design of the elevations, “luministically vibrated through the sensitive accentuation of the profiles” of each construction element (Santini 1969). As pointed out by the designers, the “on-site system of prefabrication of the infill panels (based on classic examples used in France, where building site conditions are very similar to those in Italy) allowed a certain speed of execution and, at the same time, continuity in the design of the façades” (Gregotti, Meneghetti, and Stoppino 1960).

Having overcome an initial proposal that called for some changes in the design of the prefab elements, only three types of panels, measuring 5 cm thick, were used: the pillar covering panels (45 cm wide) and, for the spans between the pillars, solid



Figure 5. The competition project for the Theater of Alessandria, 1959. A photo of the model. (CASVA, AA archive collection).

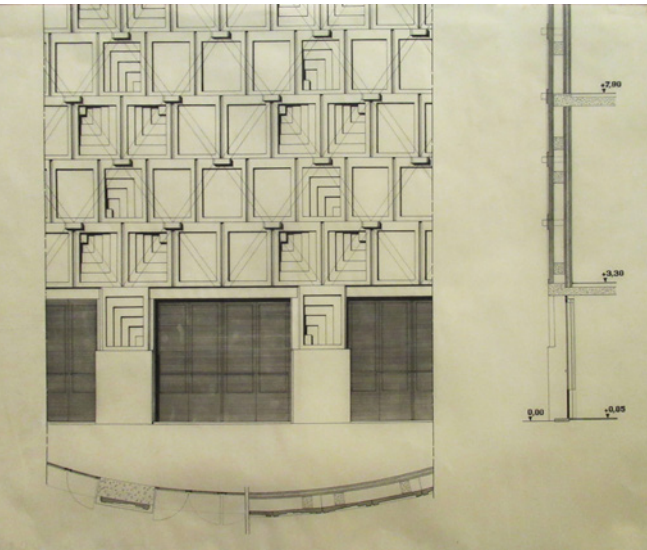


Figure 6. The competition project for the Theater of Alessandria, 1959. Detail of the external wall, 1:20 scale. (CASVA, AA archive collection, drawing no. 1819).

or perforated panels (both 60 cm wide), the latter intended to screen the balconies outside the kitchens and bathrooms. All the panels, made by a concrete layer (named Calcaterra) who was very active in Novara at the time, are characterized by a surface hammering aimed at exposing the grit, created first by machine and then, for some finishes, by hand (now concealed by rough renovation work that involved painting all the surfaces). As some site photographs highlight, on the back of each element, at the top and bottom along the vertical edges, the concrete layers left protruding reinforcement bars useful for ensuring the connection of the panels to each other and to the structure. (Fig. 3) At the base, the design envisages the adoption of a concrete element capable of offsetting casting inaccuracies and establishing the precise level for the laying of the panels. In fact, as the designer highlighted, the greatest difficulties were encountered “in the different tolerances of the measurements between the panels and the cast structure, especially with regard to the slabs and the relative canopies” (Gregotti, Meneghetti, and Stoppino 1960, 18).

Particular attention is also paid to the design of the joint between the panels, in which technical and figurative problems converge. The idea that the designers seem to have wanted to convey is that of a dry assembly, with no external

grouting, so that the panels can be perceived as independent units, parts of a system. The vertical ends of the panels are shaped to stiffen them and to create a continuous rib at the connection. Here, with a solution similar in some ways to that shown by Pol Abraham with regard to the Croizat-Angeli system in his book *Architecture préfabriquée*, the Italian edition of which was published in 1953 (Abraham 1953), a small internal dovetail notch is designed to house and retain a continuous layer (the exact nature of which is not specified in the drawings) to prevent water from entering; a subsequent layer of cement mortar protects, in the upper and lower part of the ribs, the rudimentary metal connections to the load-bearing structure and it can be extended along the entire height of the ribs to stabilize the façade system. The cavity walls are then completed with an air cavity, which hosts a very thin layer of insulation (1 cm-thick “Peralit”, according to the presentation of the project in *Casabella-Continuità*, which is not, however, confirmed in the drawings), and an inner wall made of bricks (Gregotti, Meneghetti, and Stoppino 1960, 18).

After this project, which marked an important stage of experimentation with the possibilities and difficulties of using prefab envelope systems for Gregotti, Meneghetti and Stoppino, the same research—albeit with different accents—continued in competition designs for the Theater in Alessandria (1959), the Law Courts in Verbania (1960) and the new premises of the Dominioni College in Novara (1961), none of which however won first prize, meaning that none of them actually progressed to the construction phase. The eccentricity of the envelope solution used in the design for the Theater contrasts with the progressive technical and formal simplification of the other two designs, in a direction that seems to herald a new professional season for the three architects.

In the design for the Theater, unlike in the VFG houses in Novara, the load-bearing structure no longer constitutes the organizing element for the arrangement of the elevations (Figures 5–6). The large volumes with plastic forms, which preempt Gregotti’s studies on expressionist architecture (Morpurgo 2004, 13), are characterized by the adoption of an infill and cladding system that runs continuously in front of the slab structure, with panels of concrete and hammered grit all of the same size (120 x 153 cm). The design of the panels, ribbed at the edges and characterized, in some base and upper crowning bands, and at other points of the envelope, by bas-relief decoration, constitutes a rather explicit citation of the formal patterns used by Wright in the Californian houses built with the textile-block system in the early 1920s. For the support of the panels, the designers envisioned a solution that was as ingenious as it was complex, imagining the adoption of a singular backing structure, woven—like the stitching of a quilt—to form a diagonal mesh in reinforced concrete: each node of the mesh corresponded to a bracket that had the task of supporting the prefabricated panels arranged, as a normal masonry, with staggered vertical joints, to exploit the mutual support of the “ashlars”.

The expressive and formal possibilities connected with the use of a plastic material like concrete, continued to be probed by the three architects in the large villa built for the Mira brothers in Romagnano Sesia (1960–64). (Fig. 7) Once the overall layout of the building, with its references to Wright, had been defined (after four proposals), the initial solution



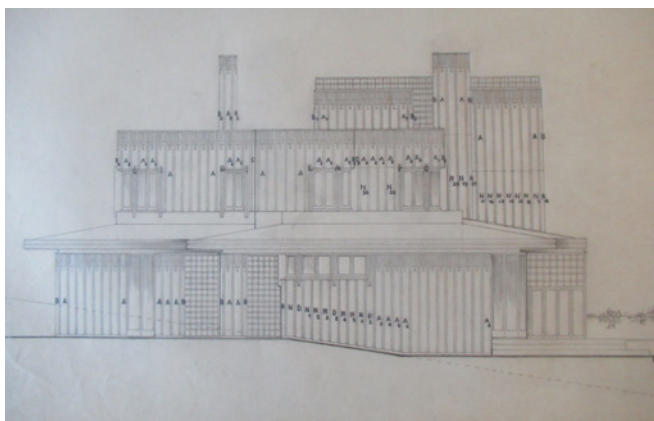


Figure 7. The villa for the Mira brothers, Romagnano Sesia, 1960–64. Prospect, 1:50 scale. (CASVA, AA archive collection, drawing no. 2568/1).

characterized by an exposed brick face was abandoned and remodeled around the adoption of hammered grit and concrete panel cladding, in an earthy-pink shade, cadenced over a 30-cm distance between centers. This cladding, which also turns up in the interior spaces at times, was connected to the structure in the traditional way, using a layer of bedding mortar (and, though not specified in the design drawings, probably metal anchors).

The panels used, only as cladding this time, are tall and narrow and characterized at the top by a decorative motif forming a long crowning frieze. For some large openings, the designers also investigated the adoption of an elaborate cladding element for the reinforced concrete pillars delimiting and subdividing them, repeating the decorative pattern of the crowning. The desire to experiment with the formal possibilities implicit in the use of artificial stone prevails, in this case, over goals of simplification and economy, as is also evident in the large number of types of elements, with their equally numerous variations, represented in the “abacus of grit panels to be cast by the concrete layer from Romagnano” (CASVA, AA archive collection, drawing n. 2734/1).

## 2. Prefabrication and measure

In the 1960s, the interest of Architeti Associati in the use of prefabrication and in a general process of technological renewal of construction, already clearly present in the VFG houses built in Novara, was reiterated particularly in three residential interventions carried out in Milan, in different areas of the city, for a cooperative of municipal employees belonging to the ACLI (Associazioni Cristiane dei Lavoratori Italiani), named “Un Tetto”.

The context in which these initiatives took place was characterized by the launch of building policies aimed no longer at curbing the industrialization of the construction process, but at promoting it: first and foremost, we can recall the establishment of the Gescal plan, Gestione Case per i Lavoratori, in 1963; the adoption of heavy prefabrication techniques, imported from France, for the building of some residential districts in Milan; and then the refined research conducted by designers such as Marco Zanuso and Angelo Mangiarotti on prefabrication of the load-bearing structure and industrialization of the building process. (Albani 2012)



Figure 8. The building complex in via Palmanova, Milan, 1962–67. (CASVA, AA archive collection).

In this context, the interventions carried out by Architeti Associati highlight first of all the constancy of a technological research which, explored with subsequent variations and updates, continued to foresee the adoption of reinforced

concrete structures casted in situ and of cavity walls characterized by an external leaf built by assembling prefab panels, the shape and combination of which, as in the previous cases, were designed ad hoc by the architects, always sticking to a spacing of about 60 cm in width, and with heights (and therefore problems of site handling and anchoring) differing in the three cases.

In these interventions, Gregotti, Meneghetti and Stoppino, seem to see the adoption of a module as a starting point from which to define and measure the project, over which they were accustomed to exerting the strictest control, even in the detailed drawings. Their choice of prefabrication was also accompanied by the faith placed in technological innovation, and in this case in a fabric of small and medium-sized firms, with roots sometimes firmly anchored in the past, but by then projected into a dimension of updating their production structure, considered capable of contributing to the realization of a building product that was well recognizable, durable and as cost-effective as possible.

In the houses built along via Palmanova (1962–67), the connection with the earlier VFG houses in Novara seems evident. (Fig. 8) The design aim, in this new case, was to introduce a principle of order into the city’s chaotic suburban landscape. The building complex is divided into three bodies arranged in a line, served by two detached elevator towers. The vertical structure in exposed reinforced concrete, finished with a grooved plaster surface to conceal the irregularities of the on-site casting, delimits the façade infills organized with alternating solid bands of prefab concrete and hammered grit panels in a light ochre color and black metal bands containing the openings.

The panels, no longer made on site, but in the factory, are ribbed and configured along the edges with step joints carefully designed to guarantee the stability of the system, providing continuous support on the floors and mutual locking, waterproofing and protection from atmospheric agents, in particular for the edge beams of the slabs. (Figures 9–10) Special prefab elements are designed for the parapets of the loggias, which protrude slightly from the façade. Close attention is also paid to the study of doors and windows, made

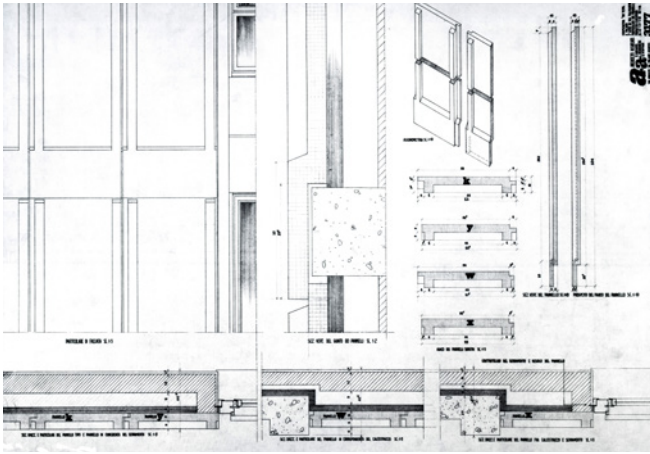


Figure 9. The building complex in via Palmanova, Milan, 1962–67. Detail drawing of the prefab panels. 1:2, 1:5, 1:20 scale. (CASVA, AA archive collection, drawing no. 3177).

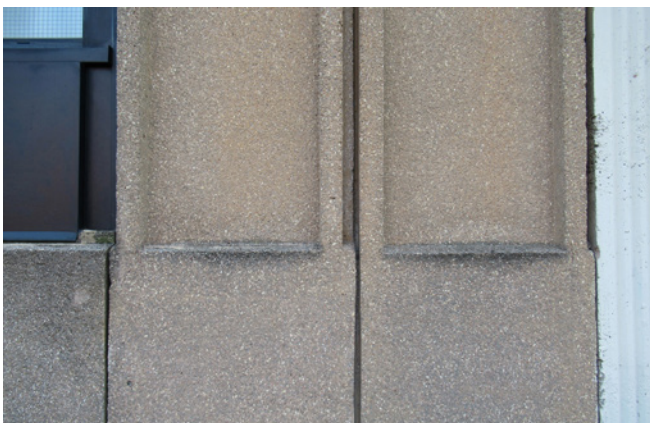


Figure 10. The building complex in via Palmanova, Milan, 1962–67. Detail of the façade. (Photo of the author).

of stove-enameled, tubular metal profiles, with roller shutter boxes housed inside the slab and cladding bands, covering the string courses, made of sheet metal painted the same color.

In the big complex in via Cassoni (1963–1969), work on which was long and troubled, the design is organized around three buildings, each consisting of the assembly of four or five square modules and served by circular external staircases. Again, the adoption of an envelope made of prefabricated elements was aimed at keeping construction costs down and ensuring that the building quality was acceptable. The concrete and grit panels (manufactured by Celerval, a company based in Gallarate, near Milan), devoid in this case of any surface characterization, have different heights, reaching up to a maximum of ten meters. (Meneghetti 1972)

In the house in via Desiderio da Settignano (1964–68), the last to be designed but the second to be realized, the completion of the building curtain in a semicentral area of the city was accomplished in a refined, almost virtuosic way. Solid vertical bands, made up by assembling prefabricated artificial stone panels, alternate once again, like the building in via Palmanova, with metal bands, this time white in color containing the openings (Fig. 11). Some of the bands with the openings are recessed and others advance so that they are flush with the street, creating small 45-degree folds and reinterpreting the bow-window theme.

In this case we know the name and history of the company that manufactured the panels used to make the outer leaf of the

cavity wall. They are “Silipol” panels, clearly recognizable by their speckled surface coloring and precisely named in the design drawings, produced by Fulget, a company based in Bergamo. (Barelli 2023) After achieving recognition in its own right due to the production of “Fulget” facings (concrete and grit plasters or “bricks” made with the same composition), this firm, established in 1929, had perfected a new material called “Silipol” for the cladding of Franco Albini and Franca Helg’s *Rinascite* in Rome (1957–61): a “material that is infinitely flexible in its chromatic possibilities” (according to a commercial catalogue, 1972) and which, observed from a historical perspective, seems to constitute the outcome of an actualization of those processes already used in the early decades of the twentieth century to produce artificial marble and granite.

The haloed, speckled surface was obtained by juxtaposing and pressing concrete beads of different colors, compositions and sizes, produced by dry-mixing white cement (initially French Lafarge, later replaced by a high-strength cement produced by Italcementi), granite powders (sometimes also porphyry or serizzo stone), and coloring oxides. These mixtures, placed inside rotating inclined cylinders and sprayed with a limited quantity of water, would clump together in the form of rounded elements and gradually gain the desired size. The colored “beads” from the different mixtures, in set quantities and different sizes—in order to achieve the individual effects required by the designers—placed in the mold and vibrated to favor a random arrangement, were pressed, before inserting the metal reinforcement and pouring a layer of concrete, then carefully levelled and filled. Once curing was complete and the elements were extracted from the molds, they were processed to remove the veil of surface concrete, undergoing bush-hammering, trimming, fine grinding or polishing operations. The name of the product, “Silipol”, was an acronym chosen to evoke the adoption of powders, in Italian “polveri” (ground from rock processing waste), and the siliceous nature of these aggregates, which, partly due to the use of a low water/cement ratio, reduced absorption almost completely and gave the product special qualities of impermeability, further improved by chemical surface treatment. These qualities were accompanied by strength, determined by the use of selected aggregates and heavy-duty cement.

In the house in via Desiderio da Settignano, Gregotti, Meneghetti and Stoppino decided to use red and orange Silipol panels (with smaller white and gray speckles). The panels are tall (up to a maximum of about 5 m) and narrow (57 cm), turned inwards at the sides of every opaque vertical band, in keeping with the refined design mentioned earlier. They are 6 cm thick, smooth on the front and ribbed on the back, separated by 4 cm shades (closed on the back with other, less thick Silipol panels) and arranged alternately, in pairs of two panels, aligning and then staggering the horizontal joints. As can be seen in the very few drawings that seem to have been preserved at the Casva, among the many that appear in the archive catalogue, the panels, together with the window and door frames, create a curtain wall that runs continuously along the outer edge of the slabs. (Fig. 12) At the time, the Fulget company was studying and experimenting with connection systems (of which there is no trace in the drawings consulted, however) capable of absorbing the movements of the structures and the various thermal expansions of the

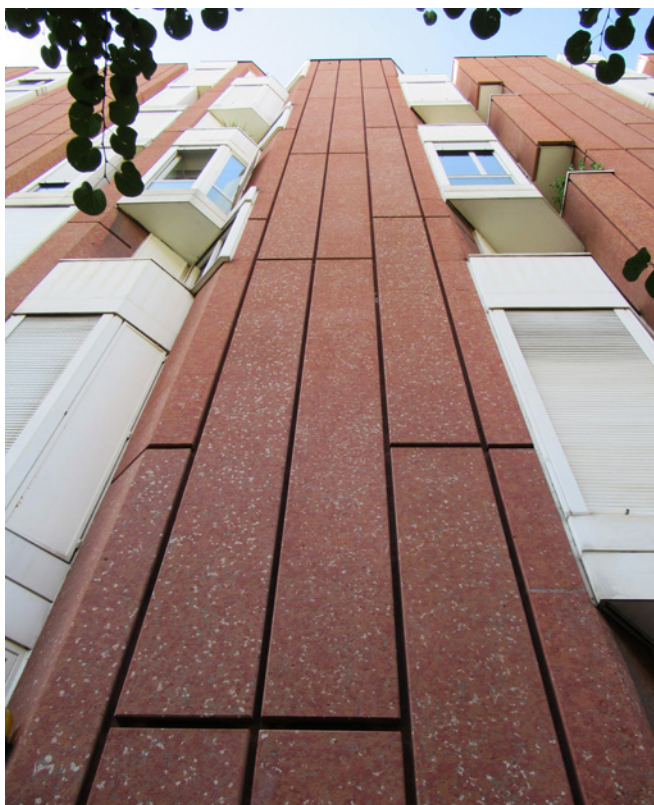


Figure 11. The house in via Desiderio da Settignano, Milan, 1964–68. A detail of the façade. (Photo of the author).

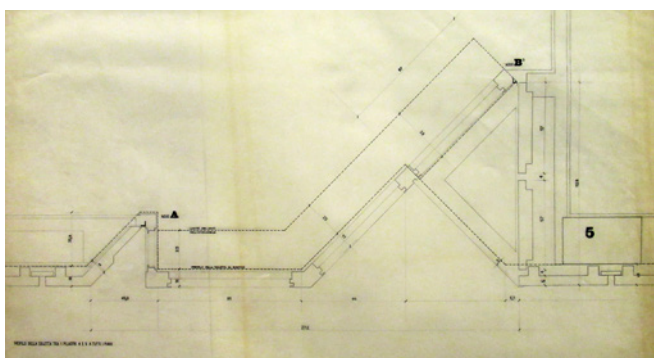


Figure 12. Profile of the floor between pillars 4 and 5, with the “Silipol” panels on both the sides of the openings, 1:5 scale. (CASVA, AA archive collection, drawing no. 3776).

elements of the building system. In this case (as in others), according to the company’s former technical director, the panels were made with teeth at the top (where necessary for connection to the slab), fitted with metal plates used to attach them to the slabs and to realize a fixed support; at the bottom, in line with the slab below, the panels and slabs had to be fitted with plates capable of creating a vertical roller support guaranteeing the movement of the panels. This was the type of fastening generally used but lots of special solutions, which we know nothing about, had to be designed, such as those for the panels that intercept a single slab on the façade.

## Conclusion

The study carried out highlights the singular case of an early but prolonged Italian experimentation with the possibilities of using concrete prefabrication in the construction of the

building envelope. The origin of this research and, generally speaking, of a way of thinking design, lies in the idea of a technique capable of conveying multiple functional, formal, historical and social meanings: a technique, as Vittorio Gregotti would later write, understood as an element “bearing the meaning of its own historical constitution as an instrument”. (Gregotti 1991)

In their initial use of artificial stone elements, and then of entire prefab envelopes, Architetti Associati, along with some of their colleagues in Turin, were seeking a renewed relationship with history, rereading and reinterpreting the experiences of the great proto-rationalist architects, asserting their right to experiment with the potential, in terms of form and expression, connected to the use of materials and techniques. In doing so, they dealt with a production context that was still largely artisanal and, as far as the techniques for the fabrication of artificial stone elements were concerned, with workshops of plasterers and concrete layers who, in many cases, had inherited their activities. While these beginnings of a discourse on prefabrication were often little considered in the subsequent publicity of their production (and, in particular, that of Vittorio Gregotti), it is interesting to reconstruct their specificities, rooted definitely but not exclusively in the quest for greater expressiveness in architecture. The adhesion of the three architects to a principle of order and rigor and the aspiration to acquire innovative technological elements and incorporate them into their designs emerge clearly as essential components of these early works.

In the 1960s, these aspirations would find a way to express themselves in a renewed form. Fundamental in this sense is the comparison with producers who had begun to pursue goals of modernization and industrialization of building production and who commit themselves, often with great inventiveness, to proposing new materials and products and to adapting or innovating production plants and equipment. These producers were still willing to accept the designers’ requests: in the three cases examined, Gregotti, Meneghetti and Stoppino continued each time, as in the Fifties, to design prefabricated façade elements and to develop their combinatorial rules. In the design of the building in via Desiderio da Settignano, for example, the relationship with Fulget highlights, in a significant and perhaps not so anomalous way, the coexistence of a willingness to customize products and a desire for constant technological updates, which allowed the architects to implement architectural and technical solutions that are both sophisticated and innovative.

But what seems to emerge most clearly from this research is the confidence with which the topic of prefabrication is addressed from the beginning, as well as the steadiness in the method and (with some exceptions and the necessary updates) in the technological solutions adopted. This theme, first explored by Architetti Associati, will continue to play a central role in the production of Vittorio Gregotti, who was the only one of the three architects to continue designing and constructing buildings (Meneghetti went on to teach at university while Stoppino switched to the design of objects).

## Acknowledgements

I would like to thank, for their testimonies, engineer Vincenzo Borasi, designer of the reinforced concrete structure of the

VFG houses in Novara, and Franco Allegri, technical director of the Fulget company, producer of the Silipol envelope panels for the house in via Desiderio da Settignano in Milan.

## Bibliography

- Abraham, Pol. 1953. *La casa prefabbricata*. Genova: Vitali e Ghianda (ed. or. 1946. *Architecture préfabriquée*. Paris: Dunod)
- Albani, Francesca. 2012. "Post-War Experimentation in Italy: the QT8 Housing Estate in Milan. Construction, Episodes, Perspectives." In Graf, Franz and Yvan Delemontey (eds.). *Architecture industrialisée et préfabriquée: connaissance et sauvegarde / Understanding and Conserving Industrialised and Prefabricated Architecture*. Lausanne: Presses polytechniques et universitaires romandes: 260–271.
- Albani, Francesca. 2015. "Prefabrication in Italy after world war II: Zanuso versus Camus." In Bowen, Brian, Donald Friedman, Thomas Leslie and John Ochsendorf (eds.). *Construction History*. Chicago: Construction History Society of America: pp. 39–46.
- Barelli, Maria Luisa and Davide Rolfo. 2018. *Il palazzo dell'Obelisco di Jaretti e Luzi. Progetto e costruzione*. Roma: Gangemi Editore International.
- Barelli, Maria Luisa. 2023. "Tutti i tipi di marmi, leganti di ogni colore, permettono infinite combinazioni." In Barelli, Maria Luisa, Valentina Burgassi and Mauro Volpiano (eds.). *Produrre per costruire*. Quaderni di Storia della Costruzione 3. Construction History Group – Politecnico di Torino DAD.
- Bosia, Daniela (ed.). 2013. *L'opera di Giuseppe Ciribini*. Milano: Franco Angeli.
- Delemontey, Yvan. 2015. *Reconstruire la France. L'aventure du béton assemblé, 1940–1955*. Paris: éditions de la Villette.
- Fanelli, Giovanni and Roberto Gargiani. 1994. *Il principio del rivestimento*. Roma-Bari: Laterza.
- Gregotti, Vittorio, Lodovico Meneghetti and Giotto Stoppino. 1958. "Tre appartamenti in duplex." *Casabella-Continuità*, no. 219 (May): 27–31.
- Gregotti, Vittorio. 1959. "Classicità e razionalismo di Auguste Perret." *Casabella-Continuità*, no. 229 (July): 6–11.
- Gregotti, Vittorio, Lodovico Meneghetti and Giotto Stoppino. 1960. "Case d'affitto a Novara." *Casabella-Continuità*, no. 241 (July): 26–31.
- Gregotti, Vittorio, Lodovico Meneghetti and Giotto Stoppino. 1968. "Milano." *Domus*, no. 461 (April): 16–17.
- Gregotti, Vittorio. 1986. "Perret: 25bis rue Franklin." *Rassegna*, no. 4 (December): 6–7.
- Gregotti, Vittorio. 1991. *Dentro l'architettura*. Torino: Bollati Boringhieri: 55.
- Iori, Tullia. 2012. "Prefabrication and Industrialization made in Italy." In Graf, Franz and Delemontey, Yvan (eds.). *Architecture industrialisée et préfabriquée: connaissance et sauvegardée / Understanding and Conserving Industrialised and Prefabricated Architecture*. Lausanne: Presses polytechniques et universitaires romandes: 73–85.
- Meneghetti, Lodovico. 1972. "Civile abitazione." *Casabella*, no. 364 (April): 20–25.
- Morpurgo, Guido. 2004. *Gregotti Associati 1953–2003*. Ginevra-Milano: Skira.
- Poretti, Sergio. 2008. *Modernismi italiani. Architettura e costruzione nel Novecento*. Roma: Gangemi Editore.
- Rosso, Michela. 2003. "La ricerca della preistoria del moderno. Perret e la cultura architettonica italiana del II dopoguerra." In: Pace, Sergio and Michela Rosso (eds.). *Un maestro difficile. Auguste Perret e la cultura architettonica italiana*. Torino: Galleria civica d'arte moderna e contemporanea: 66–105.
- Santini, Pier Carlo. 1969. "Gregotti Meneghetti Stoppino architetture 1957–1968." *Ottagono*, No. 13 (April): 81–87.
- Tentori, Francesco. 1962. "Nel clima italiano: lo Studio Architetti Associati di Novara." *Casabella-Continuità*, no. 259 (January): 28–41.
- Vercelloni, Virgilio. 1969. "In attesa della città dei servizi." *Controspazio*, no. 4–5 (September–October): 10–25.
- Vitale, Daniele (ed.). 2011. *Le stagioni delle scelte. Lodovico Meneghetti, architettura e scuola*. Padova: Il Poligrafo.

## Archival sources

CASVA, AA archive collection: CASVA. Centro di Alti Studi sulle Arti Visive di Milano. Fondo Architetti Associati.

Construction History is still a fairly new and small but quickly evolving field. The current trends in Construction History are well reflected in the papers of the present conference. Construction History has strong roots in the historiography of the 19th century and the evolution of industrialization, but the focus of our research field has meanwhile shifted notably to include more recent and also more distant histories as well. This is reflected in these conference proceedings, where 65 out of 148 contributed papers deal with the built heritage or building actors of the 20th or 21st century. The conference also mirrors the wide spectrum of documentary and analytical approaches comprised within the discipline of Construction History. Papers dealing with the technical and functional analysis of specific buildings or building types are complemented by other studies focusing on the lives and formation of building actors, from laborers to architects and engineers, from economical aspects to social and political implications, on legal aspects and the strong ties between the history of construction and the history of engineering sciences.

The conference integrates perfectly into the daily work at the Institute for Preservation and Construction History at ETH Zurich. Its two chairs – the Chair for Building Archaeology and Construction History and the Chair for Construction Heritage and Preservation – endeavor to cover the entire field and to bridge the gaps between the different approaches, methodologies and disciplines, between various centuries as well as technologies – learning together and from each other. The proceedings of 8ICCH give a representative picture of the state of the art in the field, and will serve as a reference point for future studies.

Prof. Dr. Ing. Stefan M. Holzer, Chair of Building Archaeology and Construction History, [holzer.arch.ethz.ch](mailto:holzer.arch.ethz.ch)  
Prof. Dr. Ing. Silke Langenberg, Chair of Construction Heritage and Preservation, [langenberg.arch.ethz.ch](mailto:langenberg.arch.ethz.ch)  
Dr. Clemens Knobling, Chair of Building Archaeology and Construction History, IDB, ETH Zurich  
Orkun Kasap, Chair of Construction Heritage and Preservation, IDB, ETH Zurich