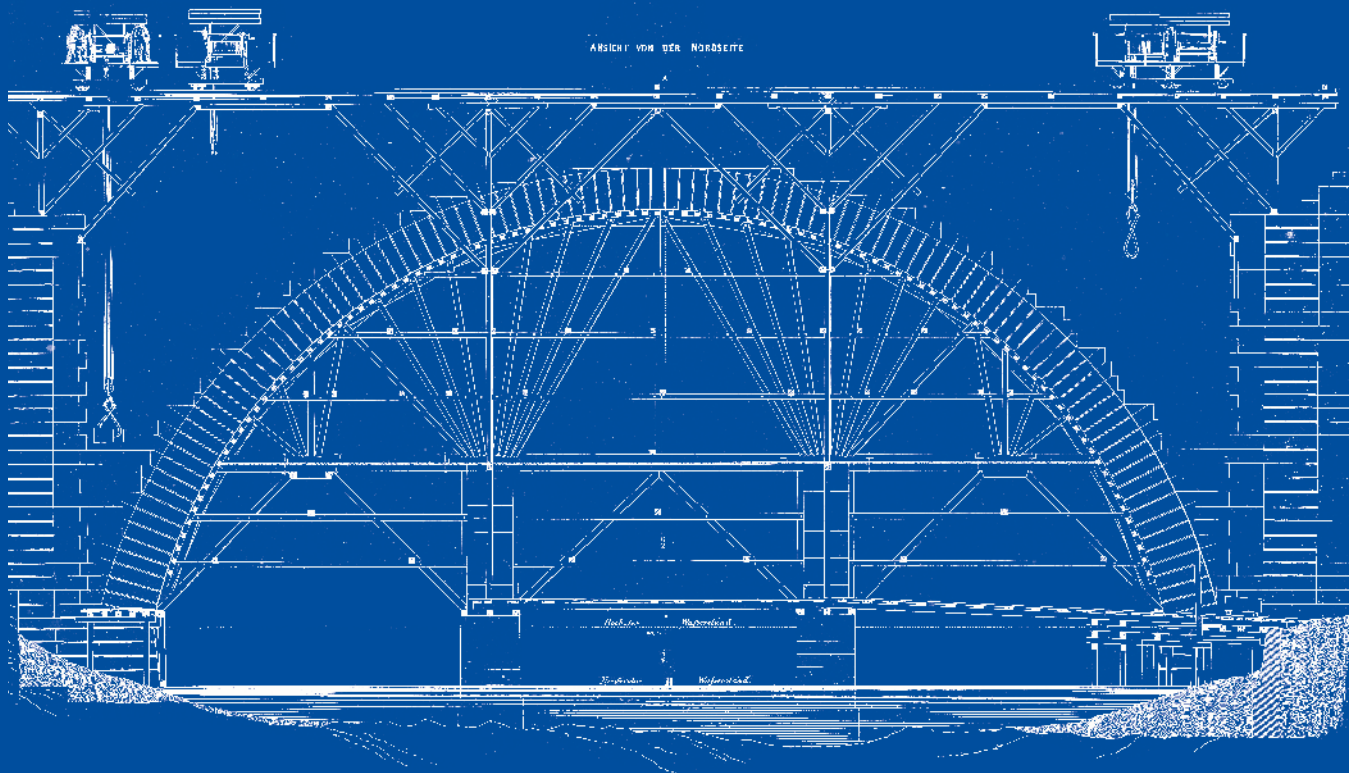
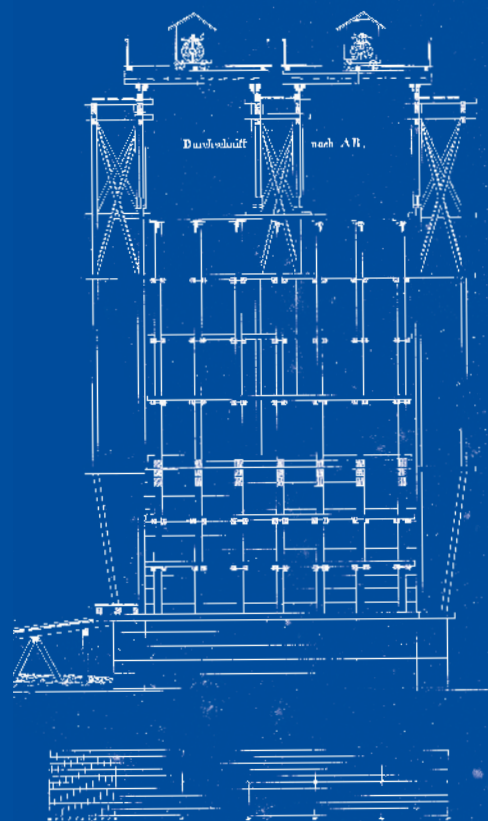


Proceedings of the 8th International Congress on Construction History
Stefan Holzer, Silke Langenberg, Clemens Knobling, Orkun Kasap (Eds.)



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
Denkmalpflege
Bauforschung



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 Construire
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
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>	
1. Construction History of the 20th and 21st centuries	41
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>	
2. Lectures on 19th and early 20th century topics	381
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 Kurrer², Eberhard Pelke³</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>	

3. Construction History topics relating to Antiquity, the Middle Ages, and the Early Modern period	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>	
4. Diachronic and more general topics	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 th to early 20 th 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>	

Scientific Committee

The scientific committee of the 8ICCH consists of distinguished international experts in specific fields and topics within the discipline of construction history. It is responsible for the selection and review of submitted abstracts and papers.

- Bill Addis** (United Kingdom)
Wesam Al Asali (IE University, Spain)
Alejandra Albuerne (IE University, Spain)
Michela Barbot (Université Paris-Saclay, France)
Antonio Becchi (MPIWG, Germany)
Matthias Beckh (TUDresden, Germany)
Nick Beech (University of Westminster, United Kingdom)
Philippe Bernardi (UP I Panthéon-Sorbonne, France)
Inge Bertels (Universiteit Antwerpen, Belgium)
Eugen Brühwiler (EPF Lausanne, Switzerland)
Tobias Büchi (ETH Zürich, Switzerland)
Laurens Bulckaen (UL Bruxelles, Belgium)
Valentina Burgassi (Politecnico di Torino, Italy)
James W.P. Campbell (University of Cambridge, UK)
Robert Carvais (CNRS, France)
Emmanuel Château-Dutier (UdeM Montreal, Canada)
Yunlian Chen (Gunma University, Japan)
Mike Chrimes (United Kingdom)
Linda Clarke (University of Westminster, UK)
Thomas Coomans (KU Leuven, Belgium)
Krista De Jonge (KU Leuven, Belgium)
Rika Devos (Université Libre de Bruxelles, Belgium)
Francisco Domouso de Alba (UE de Madrid, Spain)
Alexandra Druzynski von Boetticher (BTUCottbus, Germany)
Bernard Espion (Université Libre de Bruxelles, Belgium)
Robert Flatt (ETH Zürich, Switzerland)
Donald Friedman (Old Structures Engineering, NY, USA)
Paula Fuentes González (Universidad de Alcalá, Spain)
Franz Graf (EPF Lausanne, Switzerland)
Benjamin Hays (UVA, Charlottesville, USA)
Regine Hess (ETH Zürich, Switzerland)
Stefan M. Holzer (ETH Zürich, Switzerland)
Santiago Huerta (UP Madrid, Spain)
Merlijn Hurx (Katholieke Universiteit Leuven, Belgium)
Tullia Iori (Università di Roma 2 Tor Vergata, Italy)
Andreas Kahlow (Fachhochschule Potsdam, Germany)
Kai Kappel (Humboldt-Universität zu Berlin, Germany)
Orkun Kasap (ETH Zürich, Switzerland)
Jana Keck (GHI, Washington, USA)
Alexander von Kienlin (TU München, Germany)
Clemens Knobling (ETH Zürich, Switzerland)
Karl-Eugen Kurrer (Hochschule Coburg, Germany)
Maxime L'Héritier (UP1 Panthéon-Sorbonne, France)
Massimo Laffranchi (GfI, Switzerland)
Guy Lambert (ENSA Paris-Belleville, France)
Silke Langenberg (ETH Zürich, Switzerland)
Thomas Leslie (Iowa State University, USA)
Werner Lorenz (BTU Cottbus, Germany)
Nicoletta Marconi (Università di Roma 2 Tor Vergata, Italy)
Rafael Marín-Sánchez (UP València, Spain)
João Mascarenhas-Mateus (ULisboa, Portugal)
Torsten Meyer (Deutsches Bergbau-Museum Bochum, Germany)
Nathalie Montel (École des Ponts ParisTech, France)
Beatriz Mugayar Kühl (Universidade de SãoPaul, Brazil)
Valérie Nègre (UP I Panthéon-Sorbonne, France)
John A. Ochsendorf (MIT, Cambridge, USA)
Yiting Pan (Soochow University, Suzhou, China)
Eberhard Pelke (Germany)
Uta Pottgiesser (TU Delft, Netherlands)
Wido Quist (Technische Universiteit Delft, Netherlands)
Enrique Rabasa Díaz (UP Madrid, Spain)
Christoph Rauhut (Landesdenkmalamt Berlin, Germany)
Mario Rinke (Universiteit Antwerpen, Belgium)
Jasmin Schäfer (ETH Zürich, Switzerland)
Sarah M. Schlachetzki (ETH Zürich, Switzerland)
Hermann Schlimme † (TU Berlin, Germany)
Rainer Schützeichel (FH Potsdam, Germany)
Chang-Xue Shu (KU Leuven, Belgium)
Philippe Sosnowska (Université de Liège, Belgium)
Amit Srivastava (University of Adelaide, Australia)
Laurent Stalder (ETH Zürich, Switzerland)
Iva Stoyanova (Bulgaria)
Klaus Tragbar (ZI für Kunstgeschichte, Germany)
Louis Vandenabeele (ETH Zürich, Switzerland)
Stephanie Vande Voorde (VU Brussel, Belgium)
Gabri van Tussenbroek (UvAmsterdam, Netherlands)
Clemens Voigts (ETH Zürich, Switzerland)
Christine Wall (University of Westminster, London, UK)
Christiane Weber (Universität Stuttgart, Germany)
David Wendland (BTU Cottbus, Germany)
Ine Wouters (Vrije Universiteit Brussel, Belgium)

Shaping a new building culture in Soviet Union: Soviet engineers in Italy

Christian Toson

¹*Department of Architecture, Iuav University, Venice, Italy*

Abstract: This article explores the process of technological transfer regarding structural engineering and building systems from Europe to the Soviet Union between 1954 and 1963. Travel reports held in Russian archives allow to reconstruct the strategies and the trajectories chosen by Soviet engineers to catch up with their western colleagues and enhance a building revolution in the USSR. The specialists needed to acquire knowledge in the field of concrete technology, and in particular in prestressed and precast concrete structures, fundamental for the development of industrialized construction in the USSR. Besides this, it was necessary to reform the research and administrative system: new calculation methods, research facilities, design offices and the definition of standard and regulations. An important role was played by Italian engineers, who had numerous exchanges with the Soviets and facilitated their inclusion in the international scientific community, after years of isolation during Stalinism.

Introduction

Soviet engineering, on the eve of the 1954 reforms, faced shortcomings in construction that limited ambitious programs of Nikita Khrushchev. While there were efforts in modernizing building techniques during Stalin's reconstruction campaigns, they mainly focused on monumental buildings. In the field of traditional concrete construction there were already great capabilities, as can be seen in market halls and theatre coverings (Nevzgodin 2018, Arkhipina 2018), but there was little experience with prestressing and large element prefabrication.

Khrushchev aimed for complete city renovation and mass housing, demanding millions of square meters to be built quickly. To meet these goals, they had to use prefabricated systems and reinforced concrete (See Solopova 2020, 63). Most of prefabrication methods in development in the previous years were based on block construction (*krupnoblochnaja konstrukcija*), that was more traditional in materials and costly. New approaches, involving prestressing and thin shells, allowed savings in material and weight, particularly in public halls and infrastructure. New Soviet urbanization demanded structures like sports facilities, cinemas, houses of culture, markets, train and bus stations, and airports, which required medium to large span structures. Concrete was chosen for its durability, fire resistance, and flexibility in embodying the new Soviet style of life.

These choices required a complete restructuring of the Soviet building culture, in just a handful of years. Mass scale prefabrication and industrialization of construction intersected all the sectors of economy, from building materials, to infrastructure, industry, to administration of public works and design offices. The atelier-centered design

workflow of Stalin's years was heavily restructured and implemented with numerous engineering offices that heavily determined the final shape of the buildings. New ways of designing, calculating, producing, and building had to be adopted (Fig. 1).

Such a radical change in such a short time required the transfer of know-how from other countries.

Exchange between Soviet and Western specialists, especially European, started to be encouraged by Soviet policymakers, allowing Western technology and culture to enter the USSR during the Thaw period. This was a turning point in the Khrushchevian politics that abandoned to a large degree the terror surrounding any contact with the "cosmopolitan" world.

Soon western patents, such as the Camus prefabricated panel, were adapted for the Soviet use, and so concrete mixtures, ceramics, electrical appliances, piping, building machines, etc. (See Meuser, Zadorin, 2016, 5–20).

The exchange with the West didn't determine only the acquisition of new technologies but spurred the reform of the entire building system. Western examples became the benchmark for resetting the Soviet building organization. Soviet specialists recognized the efficiency, precision, and high level of assembly in Western engineering. They needed to study foreign experiences concerning housing districts, industries, civic-cultural centers, road types, and functional layouts.

This contribution aims to describe the process of technological transfer from the Western world to the USSR. The main sources used to expose the mechanisms of this transfer are the travel reports produced by Soviet specialists abroad. In particular, there will be a focus in the relationship with the Italian engineering community, that seems played an important role in facilitating this transfer.

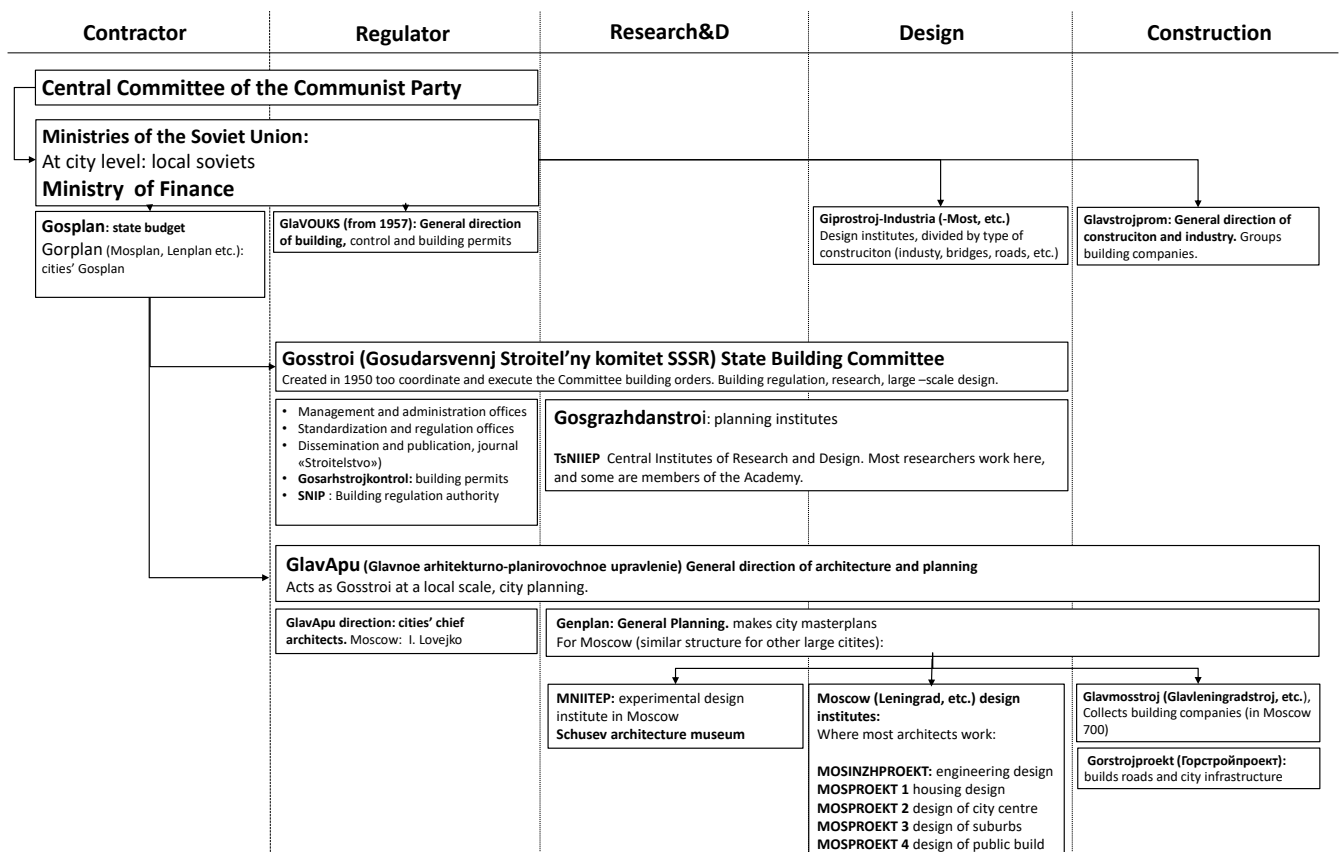


Figure 1. Overview of the structure of the Soviet scientific and technical administration after Khrushchev reforms. (by the author)

1. 1955–1956 developing relations with Italian engineers

The first steps to study Western building systems can be traced back to the 1954 expedition led by Pavel Blohin during a side event at the Geneva Conferences on housing development in Europe. The Soviet group faced initial hostility but gradually improved relations, thanks to an Italian engineer, Giuseppe Rinaldi, who provided them with publications on pre-stressed concrete and prefabrication. This may have been the first encounter with the Italian structural engineering *milieu*, that produced some of the most advanced concrete structures of the world, and counted among its members specialists such as Pierluigi Nervi, Gustavo Colonnetti, Riccardo Morandi, etc. (The so-called Italian School of Structural Engineering. See Iori, Poretti, 2014).

As soon as Soviet engineers came back, they made recommendations for future expeditions in Europe. These recommendations emphasized coordination between different disciplines in the study of foreign building systems, and suggested forming small, agile groups of specialists (RGAE f. 339 op. 2 d. 385 l. 69–74). Delegates had to act as both recipients of knowledge and propagators of Soviet influence.

The strategy of Gosstroj, the office in charge of the building sector in USSR, was to refine the tool of travelling abroad to transform it in a data collection system. Single experiences were collected and systematized, summarized, compared, elaborated and transformed in operational guidelines for the development of the Soviet building systems.

Hundreds of reports in the Gosstroj archives document the extensive effort to study the West. Gathered information was processed into detailed dossiers, with different grades

of secrecy, that covered various aspects of the building sector in the West and compared them to the Soviet. These dossiers were essential for internal use and for sharing data within the building community. For example, the Dossier about the 1956 travels was divided in the following topics: General data on foreign building, Residential, Cultural, Civil building, Industrial building, Agricultural building, Construction materials, Reinforced concrete and Factory production, Research work, Training of specialists, Technical and scientific information services, Mechanization of industry. (RGAE f. 293 op. 5 d. 14, l. 54). Information was then selected, integrated with data from foreign publications, and elaborated in documents for the general professional use, such as handbooks, guidelines, etc.

In 1955, the USSR was witnessing radical changes in its building industry, marked by legislative reforms, congresses, and the appointment of new directors. By then, Soviet specialists traveling abroad became a routine endeavor rather than an exception. One of the openers of this season was Vladimir Kucherenko, who had assumed the dual role of technician and diplomat, being both an engineer and vice-president of USSR, led a high-profile delegation on a two-month journey across Europe, visiting thirty-two cities in the Netherlands, Great Britain, France, and Italy. This delegation included notable figures from various fields such as architecture, engineering, and building management. Among the participants there were Vladimir A. Kucherenko (1909–1963), President of Gosstroj, Iosif I. Lovejko (1906–1996), chief architect of Moscow from 1955 to 1960, Sergei S. Davidov (1902–1991), vice-president of the Academy of Construction and Architecture of USSR, Valentin M. Gushin,

vice-minister of Building in 1954–57, Boris G. Skramtaev (1905–1966), important scholar with over 440 publications on reinforced concrete science, founder of the research institute NII Tsement, Aleksei A. Gvozdiev, member of the Academy, prominent scholar of the research institute NII Zhelezobeton (RGAE f. 293 op. 5 d. 14). This delegation, as the ones following, combined engineers-representatives that functioned as a *liason* with politics and administration (i. e. Kucherenko, Gushin), and members of the scientific community that had leading roles in research facilities in USSR (i.e. Skramtaev, Gvozdiev).

The journey commenced in Amsterdam at the II FIP Congress (Fédération Internationale de la Précontrainte), an organization dedicated to advancing concrete building techniques. It was founded as an extension of the CEB (Comité Européen du Béton) and aimed to foster collaboration among European structural engineers. In this exclusive committee, figures like Gustavo Colonnetti and Pier Luigi Nervi represented Italy. The FIP was crucial for the Soviets, as it granted access to advanced structural engineering studies, scientific literature, and expertise. Moreover, it allowed them to integrate themselves, after years of isolation, in the global community of construction sciences.

In Amsterdam, the Soviets encountered Franco Levi, an engineer who had studied under Gustavo Colonnetti, belonging to the same engineering school of Rinaldi.

Levi was prominent academic, who was well-known for having published *Fluage. Plasticité, Précontrainte* (Levi 1951), a great contribution within the Theory of Restraint formulated by his mentor. The work focused on impressed deformations and added an entire class of actions in the calculation of concrete structures. These actions had an immediate application in the understanding and development of pre-stressed structures. Moreover, he was sympathetic to communist ideals. These reasons made him an ideal contact for the Soviet engineers, that, as the Italian engineer recalls, “In Amsterdam the Russian interpreters were restless. Everything interested the new guests: the development of prestressing and of the materials, design achievements, and nonetheless, the organization between research centers, designers, and builders.” (Levi, 2002, 88).

Levi recognized that the Soviet delegation was not just interested in technology but also in the building system, focusing on the interactions between research, technology development, industries, policy makers, and design offices. The encounter was only the first of a long series.

After Amsterdam, Soviet delegates traveled through the UK, assessing urban planning, and visiting research institutes and prefabrication plants. France offered similar experiences, including visits to residential areas, industrial complexes, and meetings with high-ranking officials. In both countries, the delegation’s visit often led to preliminary agreements and contracts with private companies in the building sector (Solopova, 2020, fourth chapter).

Italy was the final stop, where the delegation met with Prime Minister Antonio Segni and other officials. This visit showcased the intricate economic-diplomatic dynamics at play between the Soviets and European nations, driven by the desire to expand business opportunities and foster international relations (Fig. 2).

Kucherenko and his delegation visited numerous factories and buildings, gaining insights into construction materials and equipment. In Torino, Soviets re-encountered Franco Levi at his research laboratories. His willingness to share knowledge led to the introduction of many prominent Italian engineers, such as Riccardo Morandi, who was collaborating with Levi since 1948. This led to the publication of several Italian engineering essays in the Soviet Union, such as Morandi’s *Strutture di calcestruzzo armato e di calcestruzzo precompresso*, published in Rome two years before.

Franco Levi and Riccardo Morandi were invited to the USSR in 1956, where they conducted conferences. Levi talked at the Ministry of Construction to 150 specialists, while Morandi held a lecture at the Academy of Construction and Architecture in front of 200 architects and engineers. They were guests at the Gosstroil laboratories, such as the Research Centre for Reinforced Concrete (TzNII Zhelezobeton), and the Centre for Construction Sciences (TzNIIPS). The theme of discussion was mostly prestressed concrete. They were asked tents of questions, transcribed in detail in the Gosstroil’s reports (RGAE f. 339 op. 3 d. 189, and RGAE f. 339 op. 3 d. 187. See also Levi, 2002, 89). Beside theory of construction, questions where focused on the properties of steel, in particular relaxation and sensitivity to local flaws, that were at the time the main limit to the application of prestressing technology. Other related questions involved hyperstatic effects of prestressing, rheology of concrete conglomerates, systems of differential prestressing and monitoring procedures for tension and effectiveness of the coating of cables, durability issues. Furthermore, Morandi shared his own systems of pre-tensioning, and provided some economic insight on the optimal dimensions for the use in buildings and the norms that were developed in Italy.

Beside technical aspects, the engineers had the possibility to compare the Soviet and the Italian systems, especially in the relationship between research centers and building companies. Among these, a particular interest was shown towards the ISMES laboratories in Bergamo (Istituto Sperimentale di Modelli e Strutture), founded in 1951 for the calculation of concrete structures, where were tested some of

Pag. 2 — Martedì 25 ottobre 1955

IL SOGGIORNO ITALIANO DELLA DELEGAZIONE SOVIETICA

Kucherenko in visita alla città di Milano

Sopraluoghi nei più grandi complessi edilizi - Un giudizio sul grattacielo - Invito agli italiani a visitare l'U.R.S.S.

DALLA NOSTRA REDAZIONE
MILANO, 24. — La delegazione sovietica di tecnici edili, che ha già visitato Roma e altre città italiane, è giunta stamane a Milano, accompagnata dal vice presidente del governo sovietico Kucherenko. Insieme agli ospiti era anche l'ambasciatore sovietico a Roma, Bogomolov. Ha fatto gli onori di casa, nella città, il presidente della Provincia Casati.

Nel pomeriggio, alle 17, la delegazione è stata ricevuta dal Sindaco, prof. Ferrari, presenti la giunta comunale, parecchi consiglieri ed altri rappresentanti cittadini. Il colloquio degli ingegneri ha offerto in serata un gran ricicamento negli uffici. I saloni

buono per i popoli. Importante è invece lavorare per l'amicizia fra popoli e per la pace.

Un o.d.g. Banti-Donini sulla scuola post-elementare

Nella seduta di sabato al Senato fu discusso un ordine del giorno presentato dai compagni Banti, Donini, Pucci, Rossi e Salvatore Russo sul problema dell'istruzione obbligatoria. Per un errore, nel resoconto pubblicato sul numero di domenica, apparve che tale ordine del giorno era stato preso in considerazione, mentre in realtà esso fu respinto dalla maggioranza governativa. Per documentare l'importanza dell'ordine del giorno

considerato che la disposizione emanata dal Ministero della P.I., estendendo a tutte le province l'istituzione delle classi 6, 7 e 8 elementare pur costituendo una saggia innovazione nell'ordinamento scolastico non fu respinto, secondo il progetto di legge, a precedente esame del Consiglio superiore;

che essa non risolve il problema della scuola dell'obbligo, anzi lo elude e lo pregiudica, contrastando allo spirito democratico del progetto costituzionale e che d'altra parte esso danneggia l'insegnamento elementare imponendo ad esso nuovi contenimenti di classi e nuovi turni. Invita il Ministero della P.I. a sospendere l'applicazione di tale provvedimento, ed a fronteggiare, purché sia sottoposta al giudizio

La compagnia
asso'ta con form

Denunciata per la
stata anche sospes-
metà dalla carica d

MASSA FERMANA
compagnia on. Ada
compagnia Nicola P.
Ruffino Berrettini,
dal questore di Asti
per avere sciolto il
pace, sono stati ass
ché il fatto non cost
lo e dal prefetto di M
che ha accolto, con
di giustizia la test
colto difensore on. I
scattato anche dal
Romanello.

La sentenza ha
vittima, soddisfazio
ba Ferrana e nei
zona, anche perché
po, in seguito a tale
la compagnia Ada
stata sospesa per tre
la carica di Sindaco

Ricevuti da Gi
i delegati del Cc
per la lotta contro

Il Presidente della

Figure 2. News about the visit of Kucherenko in Milan (“L’Unità”, 25 October 1955).

the most iconic structures designed by Pierluigi Nervi, such as the Pirelli skyscraper (1954) (Neri, 2014, 69–73).

Italian engineers were asked to evaluate both the laboratories of the Academy of Construction and Architecture and the quality of the productions they were shown, and, for example, they indicate as best the concrete panels coming from the DSK n.5 factory in Leningrad.

Beside technical transfer, Italian engineers discussed with the Soviets about the connection of economic conditions and building solutions, and somehow encouraged the development of large panels. Italy had great engineers, and a good part of the iconic structures designed by Nervi and Morandi had the ambition of being types to be reproduced serially (the Sports Hall, the M patent bridges). Nevertheless, prefabrication had always a minor role in Italian building culture, and was limited to very small elements, mostly employed in industrial architecture. It may be that USSR would have been a better ground for further development of Italian experimentations.

2. 1957–1960: entering the international community of structural engineers

After the first presence at FIP's conference in Amsterdam, Soviets intensified their participation at international engineering congresses. Engineers were present in 1957 at Geneva's IBCC conferences (RGAE f. 293 op. 5 d. 165 see also RGAE f. 203 op. 5 d. 58) and especially at the II Oslo FIP conference, devoted to thin shells, where the delegation was led by Gvozdiev and other prominent soviet engineers (1–3 July 1957, participants: T.K. Avdeev, V.S. Vlasov, A.A. Gvozdiev, S.S. Davidov, A.D. Efimov, O.D. Oniashvili, I. A. Rybin. RGAE f. 203 op. 5 d. 58).

At the conference they could meet with the best specialists in the world, coming from different nations, such as Arup and Esquillan, the latter being co-author with Franco Levi of the Palazzo Vela in Turin, an important application of bi-directional prestressing (see FIP 1955). Gvozdiev was able to delivery to this high-level auditory a presentation on different kinds of large and medium span thin shells already built in USSR, mostly coming from the Leningrad institute of Construction Sciences.

At the III FIP Congress, 1958, in Berlin, the main theme of discussion was construction steel, and Soviet delegates were officially accepted by president Torroja as official members of FIP. This was an important step: by statute, any member could submit a scientific question and therefore obtain any relevant documentation, published or unpublished, shared by the other members. In practice, Soviet specialists, by 1958, had direct access to scientific production by the best researchers in the world concerning reinforced concrete technology. By this point, Soviet integration in the international scientific community proceeded fast. The following FIP conference was held in the same year in Moscow: discussion was about semi-probabilistic methods, an “epochal” turning point (according to Levi's words) on methods of calculation and building regulation. Semi-probabilistic methods were developed thanks the teamwork of both western engineers (Prot, Robert, Levi, Freudenthal), and Soviet (Gvozdiev, Strelezki).

1958 was the year when USSR actively engaged in international activities, beside FIP, Moscow hosted the International Union of Architects' Congress (UIA), involving

several thousand of architects from all over the world, and participated for the first time since the end of the war at the Bruxelles Expo.

Soviet integration in the European engineering community continued in the following congresses, and after Tel-Aviv, Madrid, Johannesburg 1959, USA and Oslo 1960, at Rome's FIP congress in 1960 professor Sergei Davidov, thanks to the support of the Italians Franco Levi, Guido Oberti, Cestelli Guidi, Piero Pozzati, is admitted at the CEB, the office from where originated building regulations for the whole Europe (see FIP 1953–1994).

Italian engineers played an important role in involving the Soviets and shared other information on the most recent developments of harmonic steel and prestressing terminals.

The first important result of the CEB-FIP commissions was the publication of the *Recommendations*, after Monaco 1961 and Luxemburg 1962 meetings, that constitute the backbone of the Eurocodes that up to today are the basis of EU safety building regulations (Levi 2002, p.75).

Connection with the Soviet world can be seen in the parallel publication of the USSR's SNIP regulations, elaborated by TsNII Zhelezobeton Institute (SNIP II-B.1–62, *Betonnnye i Zhelezobetonnye konstruksii. Normi proektirovaniya*. Substituting norm SN 10–57 of 1957). The members of this institute were the same that participated at the international engineering meetings.

Both documents are divided in “General Principles”, and “Rules of application”. Both didn't only list requisites for structures but tried to integrate the building experience of the best engineers with recent calculation methods, so to provide a useful tool for design, and underline critical points in the design of structures and use of materials.

As the 1960s begun, ties between Italian and Soviet engineers became increasingly frequent, and the Soviets were in fact fully accepted into the scientific community. Numerous trips followed, even outside the conferences. The Soviets by now could make real contributions to construction science, as evidenced by reports of later meetings such as in Rome 1962, in which Davidov presented the latest experiments on fatigue behavior of prestressing (RGAE f. 339 op. 2 d. 782, and RGAE f. 339 op. 9 d. 214). In these years Soviet scholars also begun to occupy important positions within these institutes, joining committees, as in the case of Skramtaev who in 1964 became president of RILEM after a Czechoslovak and a Polish president. From this time on we can considered completed the phase of alignment of Soviet structural engineering, on the Western standards.

Italian engineers were instrumental in this process, especially Franco Levi, who held the chairmanship of the CEB throughout the critical decade of 1957–68 and favored in many ways the entry of the Soviets into the international circuit, at least from what emerges from the documents reviewed, on the basis of personal convictions and friendly relations, rather than pressure from political forces.

In 1965, at Bellagio, Gvozdiev was welcomed by the Italians as a long-time acquaintance, and information sharing took place on a two-way basis. Soviet regulations were compared with Italian ones, and the differences and advantages of one and the other openly discussed. Gvozdiev, as guest at the Milan Polytechnic, noted how the experiments conducted on steels were similar to theirs, just as certain

prestressed structures, such as the thin vaults of Cinecittà, were very similar to the vaults designed by the Institute of Structures in Kiev. What Soviets considered innovative and interesting, such as the study of stresses on plexiglass models using photographic optical apparatus, got immediately absorbed and replicated. The organizational structure of Italian research, as Gvozdiev pointed out in his reports, was replicated as well, with a new prestress study program involving all major institutes (TsNII Zhelesobeton, TsNII SK etc.) (RGAE f. 339 op. 3 d. 213).

3. Italian journeys

Beside international engineering associations, Soviets travelled often in Italy. In 1956, engineer I. A. Levin led a Soviet delegation to Italy following Vladimir Kucherenko's 1955 journey. Levin's team, primarily composed of engineers, focused on electrification, and reinforced concrete technology. Their journey spanned two weeks (RGAE f. 339 op. 9 d. 14).

The primary objective was to attend the XX Bologna Fair, featuring over 800 Italian and European companies in energy and construction sectors. The fair showcased the latest Italian electrical industry advancements, including engines, cables, transformers, and concrete precast elements. The Soviets likely explored ENI's exhibit, crucial for forming economic ties with the USSR.

Post-fair, the delegation visited various Italian factories, possibly arranged during the event. They explored SCAC, known for centrifugated precast elements, and equipment manufacturers like Sabiem, Ceat, Savigliano, Brown Boveri, and Aturia.

A pivotal moment was the visit to Genova's Ansaldo-San Giorgio factory, a major player in electrical and mechanical industries. They received valuable information on production processes, equipment, and costs, creating a "shopping wish-list" of Italian industrial products.

These expeditions laid the groundwork for the trading of know-how for large orders between the USSR and Italy, a pattern that gained prominence in the mid-1960s. These journeys also helped establish a network of exchanges between the USSR and Italian companies, with the tacit consent of the Italian government.

Additionally, Soviet engineers gathered data relevant to builders, visiting INA houses, bridges, and railways. They also explored the ISMES research center in Bergamo, that was, as seen, a point of interest. The visit to ISMES provided insights into physical model preparation for testing, influencing later Soviet engineering practices.

In the years following Levin's 1956 expedition, the exchange of knowledge between Italy and the Soviet Union through high-level delegations became increasingly common. Italy remained a preferred destination, hosting multiple major delegations each year.

During 1960, Khrushchev's reforms and the New Seven-Year Plan were transforming the Soviet Union, with a focus on large-scale industrialization, particularly in construction. Iconic projects such as the Brussels Expo Pavillion, the Palace of Congresses in the Kremlin, and the Palace of Pioneers in Moscow were either completed or underway. International relations between the USSR and the western world were

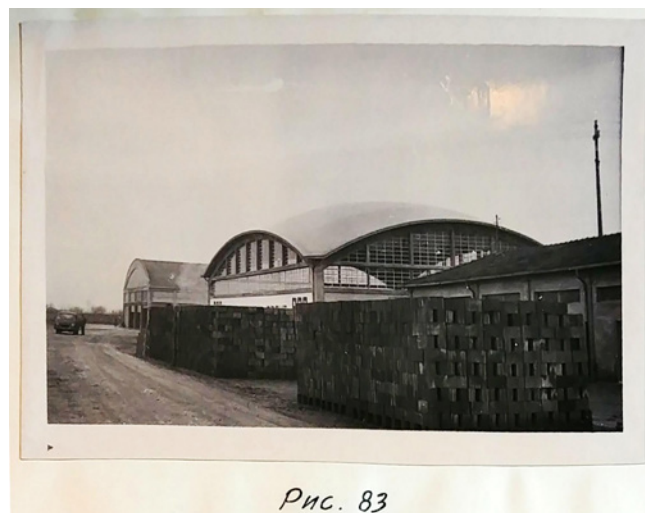


Figure 3. Thin shell coverings of the PRECEM laboratories in Italy, from Promyslov's travel report (RGAE f. 339 op. 9 d. 14).

improving, as evident in various cultural exchanges and exhibitions.

The USSR's relationship with Italy was particularly positive, culminating in the signing of the first Italy-USSR cultural agreement in 1960. This agreement facilitated institutionalized knowledge exchange in various fields. Additionally, as seen, the fourth FIP congress in Rome saw Soviet engineer Sergei Davidov admitted to the CEB.

In 1960, Vladimir Promyslov led a significant Soviet delegation, marking a pivotal moment in these exchanges and offering insights into the Italy-USSR technological transfer.

Promyslov's high-level delegation included prominent figures like Pavel Krasilnikov and Viktor Abramenko (RGAE f. 339 op. 9 d. 133). Their journey commenced with a visit to Riccardo Morandi and Cestelli Guidi in Rome. Morandi, well known to them, generously shared information on bridge projects, including the Maracaibo bridge and the Catanzaro-Sant'Eufemia overpass. The Soviets also explored other types of structures less known in Italy at the time, like the Santa Barbara electric station and the 3000-seat cinema Maestoso.

Despite initial refusal by Pierluigi Nervi to meet them, the engineers visited his Palazzo dello Sport in Rome and examined it in detail. Later, they met with Franco Levi in Turin, who offered insights into his own projects, including the Palazzo Vela and the Palazzo del Lavoro. The delegation also visited Piero Locatelli in Milan to explore a bridge constructed with prestressed beams on the river Po.

In Naples, the Soviet engineers were guests of professors Luigi Cosenza, Elio Giangreco, and Michel Pagano. While they were not impressed by some of the recent buildings, they were enthusiastic about the Olivetti factory in Pozzuoli, designed by Cosenza. This factory served as an example of innovative industrial building design.

Like previous Soviet expeditions to Italy, these visits to professionals alternated with tours of related companies and production facilities. The engineers explored various northern Italian companies, such as PRECEM in Verona (fig. 3), which produced thin curved prestressed concrete slabs, and SACAIM in Venice, which showcased its projects and products. They were shown finished products but not always allowed to view the production process.

This journey revealed a shift in the attitude of Soviet engineers toward Western and Italian building culture. They became more selective, critical, and engaged in challenging discussions. The interactions were no longer superficial, and the information collected was more detailed.

The Soviets increasingly focused on specific problem-solving details. They sought an independent path and practical operational guidelines based on Italian engineering experiences.

In Italy there has been a Standards Commission since 1955, while in USSR since 1957–56. Standards developed in parallel, but in the USSR, being more recent, innovations were integrated earlier. In fact, in 1960 in the USSR semi-probabilistic limit state methods were already used, while in Italy prevailed still allowable stresses and load at failure. USSR regulations were very assertive on construction and design methods, while Italian were less prescriptive, following the different degree of freedom of the engineer's practice. The close comparison of standards resulted in some cases in tests, in which the same designs were designed and calculated according to both Italian and Soviet standards, in order to understand the implications and advantages.

The 1960 travel report concluded with a seventeen-point recommendation list, condensing the Italian engineering experiences into a usable form for the Gosstroj (RGAE f. 339 op. 9 d. 133 l. 56–59).

They deal with construction elements, vaults, beams, cements, asphalts, but also with knowledge: methods of simulation with physical scaled models, calculation methods, books to be translated, firms to visit and people to meet. From the conclusions of the report, we understand the way different research and design institutes in Gosstroj were coordinated. Development of new technologies were assigned to existing laboratories or new ones to be created. Innovation in technologies was encouraged through standards that changed the ways materials were used. For example, it was suggested to forbid steel in small and medium spanned structures, so that engineers and companies would have been forced to learn how to use prestressed concrete: i.e. attempts were made to artificially re-propose those conditions that favored the development of this material technology in Italy.

4. Conclusions

Expeditions in Italy between 1955 and 1962 played a significant role in knowledge exchanges between Soviet and Western engineering, fostering a deeper understanding of Italian engineering practices and inspiring reflection on the future of Soviet construction.

Continual comparisons made during the journeys, between materials, regulations, structural types, production processes, construction techniques, research, draw a map of references for the development of USSR's systems. The Soviets gained experience at international congresses, thoroughly understood the Italian organizational and administrative system, and translated their observations in operational guidelines that could be applied in the Soviet environment. They also discussed with the Italians why prefabrication wasn't developed in Italy. This highlighted the difference of technical-economic conditions and allowed criticism of the Italian capitalist model.



Figure 4. Experimental prefabricated bottom-up concrete shells 40x40 m span, 5 cm thickness. Developed by the LISI laboratories in Leningrad. (Davidov 1958).

At the same time, the comparison with Italian builders underlined the issues of the total prefabrication system, which was taking its final shape in the USSR by the beginning 1960s. With construction industry well underway, many Soviet engineers and architects began to raise questions about the possibility of effective technological advancement and improvement of buildings, and above all, about their architectural quality. The conflict and series of compromises that developed between the seriality of construction and the individuality of designs underlie Soviet architectural dialectic from the beginning of the Khrushchev era (1954) to the end of the Soviet economic system in the 1990s.

While prefabrication was the norm for residential and serial construction, mixed or monolithic solutions was sought for as a solution for buildings of special importance, for multiple reasons, among which the fact that they often involved large and medium spans, which were considered uneconomical to factory produce. And it was precisely on these medium to large spans that Italian engineers and architects had found solutions, which garnered admiration among the Soviets and worldwide.

The structural form of prestressed concrete became a building element that carried communicative purposes beyond simple technical requirements. The Soviets' admiration for Italian ingenuity reflected an attempt on the Soviet side to seek a new architectural-constructive concept in which concrete was to become the symbolic material of realized socialism. In a period that came to be called the "golden age" of the search for structural forms, the Soviets wanted to show themselves at the forefront (De Magistris 2013). Following these journeys, research laboratories developed advanced concrete structures (Fig. 4). The publication of updated SNIP regulations in 1962 ended a phase of orientation and research by Soviet engineers and ushered in the grandiose construction season that would lead, in the following decade, to the construction of such symbolic structures as the Kalinin Prospect (now New Arbat), the Kremlin Congress Palace, the Ostankino Tower, and many other achievements, which would define the characters of the relationship between concrete structure and architecture and which would remain unchanged in fundamentals until the early 1990s.

Acknowledgements

Special thanks to prof. Vadim Bass and prof. Anna Bronovitskaya for the useful insights they gave me for this research.

Bibliography

- Abrosimov, Pavel. 1958. "La construction et la reconstruction des villes 1945–1957". *Resolution du V congrès de l'UIA*. Moscow.
- Arkhipikina, Olga. "Wooden shells in pre-war Soviet Union (1925–39)." In *Building Knowledge, Constructing Histories*, edited by Wouters, Van de Voorde, Bertels et al., 221–228. Brussel: 6ICCH, 2018.
- Bagnato, Bruna. 2003. *Prove di Ostpolitik. Politica ed economia nella strategia italiana verso l'Unione Sovietica 1958–1963*. Olschki. Firenze.
- Bocharnikova, Daria. "Inventing Socialist Modern: A History of the Architectural Profession in the USSR, 1954–1971." PhD diss., European University Institute, Florence, 2014.
- Bronovitskaya, Anna, Malinin, Nikolaj, Palmin, Yuri. 2019. *Moskva: arhitektura sovetkovo modernizma 1955–1991 [Moscow: architecture of the Soviet Modernism]*. Garage, Moscow.
- CEB. "Compte-rendu des Activités des Commissions de Travail du CEB." *Bullettin d'information*, no. 5 (1958): 13–14.
- CEB. "Conclusions Techniques de la 5ème Session du CEB FIP." *Bullettin d'information*, no. 19 (1959): 12–25.
- Cohen Jean-Louis. 2012. "Architecture and Modernity in the Soviet Union 1900–1937—part 4 Late Constructivism and 'Socialist' Realism 1930–37." *A+U-Architecture and Urbanism*, August 2012: 11–22.
- Davidov, Sergej. 1958. "Zhelezobetonnye obolochki-pokrytiya" [Concrete shell coverings]. *Arhitektura SSSR*, September 1958: 32–37.
- De Magistris, Alessandro. 2013. "Circostanze e fortune internazionali dell'ingegneria italiana". In P. Desideri, A. De Magistris, C. Olmo, M. Pogacnik, S. Sorace (eds.). *La concezione strutturale. Ingegneria e architettura in Italia negli anni cinquanta e sessanta*. Torino.
- Dremaite, Marija. 2010. "The (post-) soviet-built environment: Soviet—Western relations in the industrial mass housing and its reflections in Soviet Lithuania". *Lithuanian historical studies*, n. 15: 17–28.
- Fedorov, Sergej. 2005. "Construction History in the Soviet Union—Russia: 1930–2005 Emergence, Development and Disappearance of a Technical Discipline". *Construction History*, June 2005, Vol. 21 (2005–6): 81–97.
- FIP. *Proceedings of the congress of the Fédération Internationale de la Précontrainte, 1953–1994*. Cement and Concrete association, 1953–94.
- FIP. 1955. *Proceedings of the congress of the Fédération Internationale de la Précontrainte, Amsterdam 1955*. Cement and Concrete association.
- FIP. 1962. *Proceedings of the congress of the Fédération Internationale de la Précontrainte. Fourth Congress of the Federation Internationale de la Précontrainte: Roma-Napoles, 1962*. Cement and Concrete association.
- Gvozdiev, Aleksej, Turkin, V. S., Kudriashev, I. T. 1956. *Zarubezhnaya praktika primineniya sbornovo zhelezobetona [Foreign practice of prefabricated reinforced concrete]*. Gosstrojzdat, Moscow.
- Iori, Tullia, Poretti, Sergio. 2014–2020. *SIXXI 1–5. Storia dell'ingegneria strutturale in Italia*. Gangemi, Roma.
- Kazakova, Olga. 2013. "Ponyatie 'sovremennost' v arhitekture 'ottepeli'—ot etiki k estetike" [The conception of 'modernity' in the architecture of the Thaw era—from Ethics to Aesthetics]. In Kazakova, Olga (ed.). *Estetika Ottepeli*, Moscow: 161–174.
- Levi, Franco. 1951. *Fluage. Plasticité, Précontrainte*. Paris.
- Levi, Franco. 2002. *Cinquant'anni dopo. Il cemento armato, dai primordi alla maturità*. Torino.
- Marandola, Marzia. 2009. *La costruzione in precompresso: conoscere per recuperare il patrimonio italiano, con un'intervista a Franco Levi*. Milano.
- Meuser, Philipp, Zadorin Dimitry. 2016. *Towards a typology of Soviet mass housing: prefabrication in the USSR, 1955–1991*. Dom Publishers, Berlin 2016.
- Neri, Gabriele. 2014. *Capolavori in miniatura. Pier Luigi Nervi e la modellazione strutturale*. Mendrisio Academy Press, Mendrisio.
- Nevzgodin, Ivan. "A great achievement of the Soviet construction technology in Siberia: The reinforced concrete cupola of the Novosibirsk Theatre". In Wouters, Van de Voorde, Bertels et al. (Eds), *Building Knowledge, Constructing Histories*, 215–220. Brussels 6ICCH, 2018.
- Solopova, Natalia. 2020. *La préfabrication en URSS: concept technique et dispositifs architecturaux*. Dom Publisher, Berlin.
- Stanek, Łukasz. 2020. *Architecture in Global Socialism Eastern Europe, West Africa, and the Middle East in the Cold War*. Manchester.

Archival sources

Russian Economy State Archive (Rossisky Gosudarsvenny Arhiv Ekonomiky: RGAE). Fund 339, concerning Gosstroj.

Archival documents are cited in the footnotes using the standard Russian notation, i.e. f. for *fond* (collection), op. for *opis* (section), d. for *delo* (folder), and l. for *list* (page).