

PERE ROCA

Biographical note

Family Name: Pere **First Name:** Roca **Date of Birth:** 10 August 1961 **Nationality:** Spanish
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Education: Graduation in Civil Engineering (1985). Ph. D. in Civil Engineering (1988).

Present Position:

Full Professor (since 2000) of Universitat Politècnica de Catalunya (UPC), Barcelona, Spain. He carries out his research and teaching activity in the Department of Construction Engineering.

Expertise

Pere Roca develops his consultant, teaching and research activity in the field of structural conservation of monuments and historical constructions. He is experienced in non-destructive techniques of inspection, in-situ and laboratory experimental analysis, structural analysis by means of classical and advanced computational methods and strengthening techniques.

Membership of Professional bodies:

- Spanish Institution of Civil Engineers
- ICOMOS – International Council on Monuments and Sites (member of the ISCARSAH committee)
- ACHE- Spanish Association for Structural Concrete
- SEMNI- Spanish Society for Numerical Methods in Engineering
- IACM – International Association for Computational Mechanics
- IEC – Institute of Catalan Studies (Section of Science and Technology)
- IABSE – International Association for Bridge and Structural Engineering
- FIB – Fédération Internationale du Béton

Academic and scientific activity

Pere Roca has been responsible of several research projects funded by the Spanish Ministry of Science and Education, including “*Mechanical characterisation of traditional or historical brick, ashlar and rubble masonries*”, ARQ2002-04659, and “*Strength response and strengthening of masonry constructions subject to cyclic and dynamic actions*” [2003-2006], while also having collaborated in 5 other national projects. He has also participated in 5 different European research projects [Craf-1999-70420, “*Industrialised solutions for formworkless construction of reinforced brick masonry shell roofs*” [2002-2003], Ecoléader – Lis 3 “*Rocking motion and impact of historical constructions*” [2003-2005], ALA/95/23/2003/077-122 “*Seismic resistance of cultural heritage buildings*” [2004-2006], TIP3-CT-2003-001653 “*Sustainable bridges – Assessment for future traffic demands and longer lives*” [2003-2007], NIKER 244123-2009 “*New integrated knowledge based approaches to the protection of cultural heritage from earthquake-induced risk*” [2010-2013].

His current research activity is devoted to numerical and experimental analysis of masonry traditional and historical structures of the architectural heritage.

Pere Roca is co-editor of the International Journal of Architectural Heritage, published by Taylor&Francis since 2007. He has been contributing as reviewer to different international journals, including Journal of Structural ASCE, Engineering Structural Engineering, Journal on Solid and Structures, Journal of Cultural Heritage and Structure and Infrastructure Engineering.

He has been a member of different international scientific Committees, including *Structural Analysis of Ancient Constructions* (WP-17) from IASS (International Association for Shell and Spatial Structures) and *ISCARSAH Analysis and Restoration of Structures of Architectural Heritage* from ICOMOS (international Council for Sites and Monuments). He has been invited as expert member of ISO TC98 / SC2 / WG6 to develop an Annex on Heritage Structures for ISO code 138622. He was president of ICOMOS / ISCARSAH committee from 2005 to 2008.

He has been organizer or co-organizer of 1st, 2nd International Seminar on Structural Analysis of Historical Structures (Barcelona, 1995, 1998), the 3rd, 4th and 5th International Seminar on Structural Analysis of Historical Constructions (Guimarães, 2001, Padova, 2004, New Delhi, 2006), the 4th Arch Bridge Conference (Barcelona, 2004) and the 1st Seminar on Evaluation and Restoration of Architectural Heritage (Barcelona, 2005), among other events.

Pere Roca has been invited for lectures and seminars in different countries, including master and Ph. D. courses in University of Padova (2003, 2008), University of Venice (2004), Czech Technical University (2008, 2009) and Catholic University of Leuven (2008, 2009, 2010). He has contributed as invited lecturer in conferences and seminars organized in Padova (2004), New Delhi (2005), Roorkee (2005), Nicosia (2006), Tasullo (2006), Lisbon (2006), Santander (2006), Klicow-Wroclaw (2007), Antalya (2007), Prague (2007), Guimaraes (2007), Varenna (2008), Ferrara (2009), Bologna (2009), Milano (2009), Mostar (2009), Bilbao (2010).

He is the local coordinator at UPC of the Erasmus Mundus Advanced Masters on Structural Analysis of Monuments and Historical Constructions (SAHC). He is also coordinating a post-graduate degree on *Architectural Restoration* and Ph. D and master courses on *Inspection, Analysis and Restoration of Historical Structures*.

He has supervised 20 Ph.D. dissertations in the fields of experimental and numerical analysis of masonry structures, conservation and restoration of historical construction and non-destructive techniques.

Professional experience record on monuments and historical construction

He has been Consultant in over 100 case studies on new, existing and historical buildings and civil engineering works, including 6 Unesco World Heritage properties. Has been responsible or has cooperated in structural studies on

- ancient Roman structures (Roman Aqueduct of Tarragona, World Heritage),
- churches and Gothic cathedrals (Tarazona Cathedral, Majorca Cathedral, Castelló d'Empúries Cathedral, Barcelona Cathedral, Santa Maria del Mar and Santa Maria del Pi churches in Barcelona, Church of Sant Pere in Rubí, Barcelona, Church del Roses in Ciutadella, Menorca),
- Medieval monasteries and palaces (Poblet Monastery [World Heritage], Yuso Monastery [World Heritage], Sant Ramon de Penyafort Castle and Monastery in Spain, Lió and Nadal Palaces in Barcelona),
- Medieval masonry bridges (more than 10 arch bridges)
- modernist 20th c. heritage buildings (church of Güell Colony [World Heritage] and Casa Botines by Arch. A. Gaudí, Hospital of Sant Pau [World Heritage] by Arch. Domènech i Muntaner and casa Sansalvador by Arch. Josep M. Jujol in Barcelona).
- Medieval minaret of Qutub Minar, in New Deli, India (World Heritage).

Selected activity as consultant in heritage structures during the last 5 years

- Inspection, analysis and restoration proposal for the façade and cimborio of Barcelona Cathedral (since 2004)
- Structural analysis of the structure of the Castle of Castelldefels (14th c. Spain, 2004, 2010)
- Inspection, diagnosis and proposal for the restoration of the Castle-Monastery of Penyafort (15th c., Spain, 2004)
- Investigation on the partial collapse of the walls of the Castle of "La Suda" in Tortosa (Spain, 2003)
- Strengthening of the domes of the church of LLoret de Mar (Spain, 2005)
- Report on the condition of the church of Santo Tomás (15th c. 2005, Arnedo, Spain)
- Structural assessment of the remains of the Roman Termæ of Caldas de Malavella (Caldes de Malavella, 2005)
- Study of the stability of the underground structures of Casa Sansalvador, designed by Arch. Jujol (Barcelona, 2005)
- Study of the load bearing capacity of the ancient dormitory building of the Monastery of Poblet (13th c., Word Heritage, Spain, 2005)
- Study of the structure of Palau Lió in Montcada street (14 c.), committed by the City of Barcelona (2007)
- Inspection of a block of traditional buildings ("Escodines") in Manresa, Spain (2007)
- Inspection, monitoring and analysis of the structure of Mallorca Cathedral (13-15th c., 2004-2008), committed by the Spanish Ministry of Culture
- Inspection and structural assessment of the Civil War shelter in Plaça del Diamant in Barcelona (2000, 2006)
- Inspection and structural assessment of the Civil War refuge in Torre Barrina (L'Hospitalet, 2007)
- Structural analysis and strengthening to stabilize and increase the height of the masonry chimney of Ca l'Aranyó in Barcelona (20th c., 2007-actuality).

- Study of the seismic capacity of Qutub Minar in New Deli (done in cooperation with the universities of Minho, Portugal, and Padova, Italy, and the CBRI of India, 13th c., 2005-2007).
- Inspection, structural analysis, diagnosis and restoration proposal for the Basilica of Sta. Maria del Mar (14th. c.) in Barcelona, committed by the Generalitat de Catalunya (2007)
- Inspection, structural analysis, diagnosis and restoration proposal for the church of Sta. Maria del Pi (14th c.) in Barcelona, committed by the Generalitat de Catalunya (2007-2009)
- Assessment of the dynamic response of the clock-tower of the church of Manlleu, committed by the Local Government (Diputació) of the Province of Barcelona (Spain, 2007)
- Structural analysis and rehabilitation proposal of a Medieval palace in Monistrol de Montserrat (Spain, 13th c., 2007-2008).
- Structural analysis of the cathedral of Castelló d'Empúries (14th c., Spain, 2008)
- Structural analysis and strengthening proposal of the Church of Sant Pere de Rubí (Spain, 11th c. 2008),
- Inspection and analysis of the structure of the Roser Church in Ciutadella, Menorca (Spain, 2009).
- Structural analysis and restoration proposal of Casa de la Sang in Barcelona (14th c. 2009).
- Structural analysis of the Roman Aqueduct of Tarragona (Spain, 2010).
- Cooperation in the structural analysis and restoration proposal of the Sant Manuel pavillion of the Hospital de Sant Pau in Barcelona (20th c. World Heritage, 2010)
- Cooperation in the preparation of a proposal for the restoration of the Administration pavillion's structure of the Hospital de Sant Pau in Barcelona (20th c. World Heritage, 2010).

Selected Publications (most relevant in the last five years):

- Roca, P., Araiza, G. Shear response of brick masonry small assemblages strengthened with bonded FRP laminates for in-plane reinforcement. *Construction and Building Materials* 24, 1372-1384 (2010).
- Roca, P., Cervera, M., Gariup, G., Pela', L. Structural Analysis of Masonry historical Constructions. *Classical and Advanced Approaches. Archives of Computational Methods in Engineering* (in press, 2010).
- Roca, P. Contribution of numerical modeling to the study of historical structures. *Conservation News* 26/2009, 207-217 (2009)
- Sima, P., Roca, P., Molins, C., Cyclic constitutive model for concrete. *Engineering Structures*, 30 (3) 695-706 (2008)
- Roca, P. Le comportement sismique des constructions traditionnelles de murs de maçonnerie. *Méthode RehabiMed. Architecture Traditionnelle Méditerranéenne*, CAATTB, Barcelona (2008)
- Andreu, A., Gil, P., Roca, P., Computational analysis of masonry structures with a funicular model. *Journal of Engineering Mechanics ASCE* 133 (4), 473-480 (2007)
- Roca, P., Casarin, F., Modena, C., Rodríguez, I., Garay, A., Damage monitoring of long-span historical structures. *Learning from failure. Long term behaviour of heavy masonry structures*. WIT Press, Southampton (2008)
- Roca, P., López-Almansa, F., Miquel, J., Hanganu, A., Limit analysis of reinforced masonry vaults. *Engineering Structures* 29 (3) 431-439 (2007)
- Andreu, A., Gil, L., Roca, P., A new deformable catenary element for the analysis of cable net structures, *Computers & Structures*, 84 (29-30), 1882-1890 (2006)
- Oliveira, D. V., Lourenço, P. B., Roca, P., Cyclic behaviour of stone and brick uniaxial compressive loading. *Materials and Structures*, 39 (2), 219-227 (2006)
- Lourenço, P.B., Roca, P., Modena, C., Agrawal, S. (Editors), *Structural analysis of historical constructions: Possibilities of numerical and experimental techniques*, McMillan India, New Delhi, 2083 pp (2006)
- Roca, P. Simplified models for the assessment of masonry shear walls. *Construction and Building Materials* 20, 229-238 (2005)
- Lourenço, P.B., Oliveira, D.V., Roca, P., Orduña, A., Dry joint stone masonry walls subjected to in-plane combined loading, *Journal of Structural Engineering, ASCE*, 131(11), pp. 1665-1673 (2005)
- Roca, P. Molins, C. Mari. A. R., Strength capacity of masonry wall structures by the equivalent frame method. *Journal of Structural Engineering ASCE* 131(10), pp. 1601- 1609 (2005)