

# Curriculum Vitae

Floriana PETRONE, Ph.D.  
Research Scientist  
Lawrence Berkeley National Laboratory  
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## EDUCATION

Ph.D. in Structural Engineering, Sapienza University of Rome, Italy (2013)

M.S. in Construction Engineering (with honors) – Structural Design, Polytechnic University of Bari, Italy (2008) - GPA 29.67 / 30

B.S. in Construction Engineering (with honors), Polytechnic University of Bari, Italy (2006) - GPA 28.02/30

## RESEARCH EXPERIENCE

### Postdoctoral Research Fellow

- Lawrence Berkeley National Laboratory - *Energy Geosciences Division, Berkeley (CA), USA (September 2015 – April 2018)*  
Development of a computational framework for the nonlinear seismic analysis of nuclear facilities and systems for the U.S. Department of Energy. Analyst for the development of a Finite Element code for Soil Structure Interaction analysis.
- University of California, Davis - *Department of Civil and Environmental Engineering, Davis (CA), USA (August 2014 – July 2015)*  
Analysis and modeling of reinforced concrete and composite structures; development of numerical models for nonlinear large deformation analysis of reinforced concrete and hybrid systems; Finite Element Modeling (LS-Dyna, Abaqus, OpenSees) for nonlinear dynamic analyses of reinforced concrete and steel structures.
- University of California, Davis - *Department of Civil and Environmental Engineering Davis (CA), USA (August 2013 – July 2014)*, Sapienza University of Rome - *Department of Structural and Geotechnical Engineering, Rome, Italy (November 2013 – October 2014)* – joint appointment.  
Analysis and modeling of composite structures; planning and management of an experimental campaign on composite beams; development of analytical models for composite beams in shear. Parallel research on Seismic Isolation Systems, focused on the study of Friction Pendulum bearings and calibration methods and stochastic analysis for structural safety assessment.

### Visiting Scholar

Transatlantic Partnership for Excellence in Engineering - Department of Civil and Environmental Engineering, University of California at Davis, Davis (CA), USA (August 2012 – February 2013)

## **Professional Consulting as P.E.**

Sapienza, University of Rome - Department of Structural and Geotechnical Engineering (April 2011 – January 2012) - "Analysis and Retrofitting of Precast Industrial Buildings"; Polytechnic University of Bari, Department of Environmental Engineering and Sustainable Development, Taranto, Italy (May 2011 – September 2011) - "Development of Mechanics-Based Models for Composite Truss Beams in Shear and Structural Joints"; Polytechnic University of Bari, Department of Environmental Engineering and Sustainable Development, Taranto, Italy (July 2010 – January 2011) - "Analysis of the Mechanical Behavior of Steel-Concrete Composite Systems for Developing Mechanics-Based Models and Code Compliant Capacity Equations"; Polytechnic University of Bari, Department of Science of Civil Engineering and Architecture – ICAR, Bari, Italy (January 2010 – February 2010)

## **Participation on Research Projects**

Member of the following research units:

- RELUIS-DPC 2017: "Implicit Risk for Reinforced Concrete Structures". Scientific Coordinator: E. Spacone.
- RELUIS-DPC 2014-2016: "Design and Safety Assessment of Reinforced Concrete and Composite Infrastructures". Scientific Coordinators: G. Monti, A. Prota, E. Spacone.
- RELUIS-DPC 2010-2013: "Reinforced Concrete and Composite Structures" (Area 1, Line 1.1, Task 1.1.2). Scientific Coordinators: G. Manfredi, G. Monti, E. Spacone.
- RELUIS-DPC 2010-2013: "Development and Analysis of New Materials for Structural Seismic Retrofitting" (Area 2, Line 2.3, Task 2.3.1). Scientific Coordinators: L. Ascione, A. Prota.

## **RESEARCH INTERESTS**

Analysis and advanced numerical modeling of reinforced concrete and composite structures; high-performance computing applied to civil engineering problems; calibration methods and stochastic analysis for structural safety assessment; finite element modeling (LS-Dyna, OpenSees, Abaqus, RealESSI) for nonlinear dynamic analyses; seismic isolation systems.

## **RESEARCH GRANTS**

- Research Grant (Co-PI): U.S. Department of Energy 2016-2017: "An optical sensor for monitoring earthquake induced building drift" (\$289,950)
- Fellowship: Transatlantic Partnership for Excellence in Engineering (TEE), 2012, (9,000 EUR)
- Research Grant (Co-PI): POR Puglia, European grant (code 2007IT051PO005) 2011, "Innovative Structural Element for the Industrialization of the Construction Process" (19,000 EUR)

## **PUBLICATIONS**

### **Journal papers (published)**

- McCallen, D., **Petrone F.**, Coates, J., Repanich, N., (2017), "A Laser-Based Optical Sensor for Broad-Band Measurements of Building Earthquake Drift", *Earthquake Spectra*: November 2017, Vol. 33, No. 4, pp. 1573-1598. <https://doi.org/10.1193/041417EQS071M>

- Monti, G. and **Petrone, F.** (2016). "Test-Based Calibration of Safety Factors for Capacity Models", *J. Struct. Eng.*, 142(11). DOI: [https://doi.org/10.1061/\(ASCE\)ST.1943-541X.0001571](https://doi.org/10.1061/(ASCE)ST.1943-541X.0001571)
- **Petrone, F.**, Bissonnette, N., Higgins, P., Kanvinde, A., (2016), "The Cross-aisle Seismic Performance of Storage Rack Base Connections", *Journal of Constructional Steel Research*, V. 122, pp. 520-531. DOI: <http://dx.doi.org/10.1016/j.jcsr.2016.04.014>
- **Petrone, F.**, Li, S., Kunnath, S., (2016) "Modeling of RC Frame Buildings for Progressive Collapse Analysis", *International Journal of Concrete Structures and Materials*, 10(1), pp. 1-13, DOI: 10.1007/s40069-016-0126-y
- Monti, G., **Petrone F.**, (2016). "Analytical Thermo-mechanics 3D Model of Friction Pendulum Bearings", *Earthquake Engineering & Structural Dynamics*, 45(6), pp. 957-977. DOI: 10.1002/eqe.2693
- Monti, G. and **Petrone, F.** (2015). "Yield and Ultimate Moment and Curvature Closed-Form Equations for Reinforced Concrete Sections." *ACI Structural Journal*, V. 112, No. 4, pp. 463-474.
- Monti, G. and **Petrone, F.** (2015). "Shear Resisting Mechanisms and Capacity Equations for Composite Truss Beams", *J. Struct. Eng.*, V. 141, No. 12. DOI: [http://dx.doi.org/10.1061/\(ASCE\)ST.1943-541X.0001266#sthash.PLcbozCK.dpuf](http://dx.doi.org/10.1061/(ASCE)ST.1943-541X.0001266#sthash.PLcbozCK.dpuf)
- **Petrone, F.**, Monti G., (2014). "FRP-RC beam in shear: mechanical model and assessment procedure for pseudo-ductile behavior". *Polymers*, V. 6, No.7, 2051-2064. DOI:10.3390/polym6072051
- Trentadue, F., Mastromarino, E., Quaranta, G., **Petrone F.**, Monti, G., Marano G.C., (2014) "Bending Stiffness of Truss-Reinforced Steel-Concrete Composite Beams", *Open Journal of Civil Engineering*, V. 4, No. 3, 285-300. DOI: <http://dx.doi.org/10.4236/ojce.2014.43024>
- Marano G.C., Trentadue F., **Petrone F.**, (2014) "Optimal arch shape solution under static vertical loads", *Acta Mech* 225(3), 679–686. DOI:10.1007/s00707-013-0985-0
- Quaranta G., **Petrone F.**, Marano G.C., Trentadue, F., and Monti G., (2011). "Structural design of composite concrete-steel beams with spatial truss reinforcement elements", *Asian journal of civil and engineering (building and housing)* V. 12, No. 2, 155-178.

### Journal Papers (submitted)

- **Petrone, F.**, Monti, G., 2017, "Closed-form Equations for Bending Capacity of Full and Hollow RC Sections", *Engineering Structures*.
- **Petrone, F.**, McCallen, D., Wu, S., Buckle, I., Coates, J., "Direct Measurement of Building Transient and Residual Drift Using an Optical Sensor System", *Engineering Structures*.

### Journal Papers (in preparation)

- **Petrone, F.**, Do, T., McKenna, F., "A Numerical Modeling Approach for Nonlinear In-Plane RC Shear Walls"
- Shan, L., **Petrone, F.**, Kunnath, S.K., "Robustness of RC Buildings to Progressive Collapse: Influence of Building Height "
- Shan, L., **Petrone, F.**, Kunnath, S.K., "Energy-based method for Structural Robustness Assessment"

### Patents

- **Petrone F.** et al., (2011), "Structural node for steel-concrete composite truss joint" Application No.11425262.0, European Patent No.1255 October 28  
<http://google.com/patents/EP2586925A1?cl=en&hl=en>
- **Petrone F.** et al., (2011), "Non-self-supporting steel truss for mixed steel-concrete truss systems" Application No.11425264.6, European Patent No.1255 October 28  
<http://google.com/patents/EP2586927A1?cl=en&hl=en>

- **Petrone F.** et al., (2011), "Self-supporting steel truss for mixed steel-concrete truss systems" Application No.11425263.8, European Patent No.1255 October 28  
<http://www.google.com.ar/patents/EP2586924B1?cl=en>

### Book chapters (published)

- Monti G., **Petrone F.** (2018) "Strengthening of RC Buildings with Composites." In: Costa A., Arêde A., Varum H. (eds) *Strengthening and Retrofitting of Existing Structures. Building Pathology and Rehabilitation*, vol 9. Springer, Singapore. [https://doi.org/10.1007/978-981-10-5858-5\\_7](https://doi.org/10.1007/978-981-10-5858-5_7)
- **Petrone, F.**, et al. (2016), "Design by Testing and Statistical Determination of Capacity Models" (Chapter 2) in C. Pellegrino and J. Sena-Cruz (eds.) *Design Procedures for the Use of Composites in Strengthening of Reinforced Concrete Structures*, RILEM State-of-the-Art Reports 19, pp. 5-38, Springer, Netherlands.
- **Petrone, F.**, et al. (2016), "Shear Strengthening of RC Elements by Means of EBR FRP Systems" (Chapter 4) in C. Pellegrino and J. Sena-Cruz (eds.) *Design Procedures for the Use of Composites in Strengthening of Reinforced Concrete Structures*, RILEM State-of-the-Art Reports 19, pp.97-130, Springer, Netherlands.

### Book chapters (submitted)

- McCallen, D., **Petrone, F.**, "An Optical Technique for Measuring Transient and Residual Interstory Drift as Seismic Structural Health Monitoring (S2HM) Observables", *Seismic Structural Health Monitoring (S2HM)*. Springer, Netherlands.

### Contributions to national/international conferences

- **Petrone, F.**, McCallen, D., (2018) "An Optically-based Sensor System for Critical Facilities Post-Event Seismic Structural Assessment", 2018 NPH meeting, Rockville, Maryland, October 23-25.
- McCallen, D., Buckle, I., Jeremic, B., **Petrone, F.**, Laplace, P., Elfass, S., (2018) "A Modern Computational Framework for the Nonlinear Seismic Analysis of Nuclear Facilities and Systems", 2018 NPH meeting, Rockville, Maryland, October 23-25.
- Miah, M., **Petrone, F.**, Wong, J., and McCallen, D., (2018) "Regional Scale Earthquake Risk Estimation Based on Broadband Ground Motion Simulations", Eleventh U.S. National Conference on Earthquake Engineering Integrating Science, Engineering & Policy June 25-29, Los Angeles, California, USA. Submitted
- Miah, M., Rodgers, A., McCallen, D., Petersson, N.A., Pitarka, A., **Petrone, F.**, (2017) "Hazard-to-Risk: High-Performance Computing Simulations of Large Earthquake Ground Motions and Structural Risk", Poster presentation, AGU Fall Meeting, New Orleans, USA, 11-15 December
- **Petrone, F.**, Wong, J., McCallen, D., McKenna, F., (2017) "Implementation and Validation of 3D RC and Steel Structural Elements in a Numerical Tool for SSI Seismic Analysis", ASCE, 2017 International Workshop on Computing in Civil Engineering, June 25-27, Seattle (WA), USA.
- **Petrone, F.**, Wong, J., Miah, M., Rodgers, A., Petersson, A., McCallen, D., (2017) "High Performance-Multidisciplinary Simulation for Regional Scale Earthquake Hazard and Risk Assessments", 2017 ANS Annual Meeting, American Nuclear Society, June 11-15, 2017, San Francisco, California, USA.
- Wong, J., **Petrone, F.**, Miah, M., McCallen, D., Rodgers, A., Petersson, A. (2017) "High Performance, Multidisciplinary Simulation for Regional Scale Earthquake Hazard and Risk Assessments", Poster Presentation, 69th EERI Annual Meeting, March 7-10, Portland (OR), USA.

- Wong, J., **Petrone, F.**, McCallen, D., McKenna, F., (2016) “Nonlinear computational simulations for the earthquake response of nuclear systems” 10th Nuclear Plants Current Issues Symposium, December 11-14, Charlotte, North Carolina, USA.
- **Petrone, F.**, Wong, J., McCallen, D., McKenna, F., (2016) " Development of Advanced Numerical Tools for the Nonlinear Seismic Analysis of Nuclear Systems", 2016 ANS Winter Meeting and Nuclear Technology Expo, American Nuclear Society, November 6-10, Las Vegas (NV), USA.
- Kunnath, S., Shan, L., **Petrone, F.**, (2016) "Robustness Assessment of RC Buildings Against Progressive Collapse", Symposium, Seoul, Korea.
- **Petrone, F.**, Wong, J. and Abell, J., (2016) "A Modern Computational Framework for Nonlinear Seismic Analysis of Nuclear Facilities and Systems", Poster Presentation, 2016 PEER Annual Meeting, January 28-29, Berkeley (CA), USA.
- Monti, G., **Petrone, F.**, Biondi, B., (2015) "Effects of Friction Pendulum Modeling on the Seismic Performance of Isolated Buildings", SNU-HNU Bi-lateral Workshop on Structural Behavior under Extreme Loads (SBEL 2015) - Sep. 27-30, Changsha, Hunan, China.
- Shan, L., **Petrone, F.**, Kunnath, S., (2015) "Energy-Based Damage Index for Progressive Collapse Evaluation of RC Structures under Extreme Loads", SNU-HNU Bi-lateral Workshop on Structural Behavior under Extreme Loads (SBEL 2015) - Sep. 27-30, Changsha, Hunan, China.
- Kareemi, M.A., **Petrone, F.**, Monti, G., "Experimental Tests on Composite Steel-Concrete Truss Beams", Conference ACE (Advances in Civil Engineering), June 12-13, 2015, Vietri sul Mare, Italy.
- Kunnath, S.K., **Petrone, F.** and Shan, L., Modeling and Simulation of Progressive Collapse of Reinforced Concrete Frame Buildings, The 6th International Conference of Asian Concrete Federation, 21-24 September, 2014, Seoul, Korea.
- **Petrone, F.**, Liotta, M., Monti, G., Marano, G. C., Trentadue, F., “Studio sperimentale per la valutazione del contributo del calcestruzzo nella resistenza a taglio delle travi reticolari miste”. In: Braga, F., Mezzina, M. (Eds.), Proceedings of the 14th Conference of the Italian National Association of Earthquake Engineering, September 2011, Bari (Italy).
- **Petrone, F.**, (2009) “About the diagnostics of crack patterns with the Load Path Method”, Master's thesis poster presentation, ASS.I.R.C.CO. Bari, Italy.

### **INVITED TALKS/SEMINARS**

- SEMM Seminar, University of California at Berkeley, "Advanced Simulation Methodologies for Seismic Hazard and Risk Assessment", April 17, 2017
- Lecture, Polytechnic University of Bari, Italy, "About the diagnostics of crack patterns with the Load Path Method", March 2009

### **TEACHING/MENTORING EXPERIENCE**

- 2013-2015: Assisted in supervision of 1 PhD student and several undergraduate students during my appointment as Post-Doctoral Scholar at UC Davis. (Met weekly with both graduate and undergraduate students to review progress and provide guidance on research tasks)
- 2012-2013: Assisted in teaching of an undergraduate course (*Structural Design Laboratory 2*) at Sapienza University of Rome. Instructor: Prof. Giorgio Monti
- 2012-2013: Assisted in teaching of two Second Level Master courses (*Structural Analysis, Basis of Probability*) - EU-funded Erasmus Mundus program at Sapienza University of Rome. Instructor: Prof. Giorgio Monti
- 2011-2013: Assisted in teaching of two undergraduate courses (*Mechanics of Materials, Structural Analysis*) taught as part of Summer Abroad program in Rome, Italy; Organized by UC Davis, Instructor:

Prof. Sashi Kunnath, Professor of Civil & Environmental Engineering. (Contributed to lectures and preparation of course material)

- 2011-2012: Assisted in teaching of an undergraduate course (*Structural Design Laboratory 2*) at Sapienza University of Rome. Instructor: Prof. Giorgio Monti
- 2011-2012: Structural analysis lecturer assistant. "Tullio Levi Civita" foundation - School of Excellence, Cisterna di Latina (Italy)

## **ACADEMIC SERVICE**

### **Editorial Committee**

- Liotta M.A., **Petrone F.** Editorial Committee, Monti G., Editor, OpenSees Days Italia, 2012 Conference Proceedings
- Marano G.C., Monti G., **Petrone F.** editors of "Beams with spatial truss reinforcement in seismic design", Italian National Association of Earthquake Engineering, ANIDIS October 2011

### **Reviewer for**

ASCE Journal of Structural Engineering, ACI Structural Journal, Advances in Structural Engineering, Engineering Structures

## **PROFESSIONAL AFFILIATIONS**

- American Society of Civil Engineers (ASCE), Associate Member
- Earthquake Engineering Research Institute (EERI), Member
- American Nuclear Society (ANS), Member
- International Union Laboratories and Experts in Construction Materials, Systems and Structures - RILEM, Affiliate member

## **PROFESSIONAL DEVELOPMENT**

- Professional Engineer (EU), No. 9273
- Certificate of completion for "Structural design and building site management for rehabilitation of historical buildings", ASS.I.R.C.CO. May 2009. Bari, Italy.
- Certificate of completion for "I Advanced Course in Structural Engineering of Existing Buildings", CISEM, October 2008 – December 2008, Bari, Italy

Berkeley, June 2018

Floriana Petrone