



DIPARTIMENTO DI STRUTTURE PER L'INGEGNERIA E L'ARCHITETTURA
CORSO DI DOTTORATO DI RICERCA IN
INGEGNERIA STRUTTURALE GEOTECNICA E RISCHIO SISMICO

XXXIX CICLO

Il sottoscritto prof.

(PO PA X RU RTD) afferente al Dipartimento di

Strutture per l'Ingegneria e l'Architettura

S.S.D. ICAR/09 - Tecnica delle costruzioni

CHIEDE

di essere inserito tra i possibili tutor di studenti di dottorato per il XXXIX ciclo.

1. Curriculum sintetico del proponente (max 500 parole)

Gennaro Magliulo is Associate Professor of Structural Design at the Department of Structures for Engineering and Architecture (DIST) of University of Naples Federico II since 2018. He is qualified for Italian Full Professorship of "Structural Design" since 2019 and is affiliate researcher at the Construction Technologies Institute of the National Research Council since 2016. Prof. Magliulo was awarded PhD in Structural Engineering at University of Naples Federico II, discussing a thesis titled "Seismic behavior of RC frame buildings with plan irregularities" in 2001.

At DIST, prof. Magliulo teaches two master's degree courses: Precast Structures and Healthcare Facilities. He is currently tutor of a PhD student in the frame of the doctorate in Structural and Geotechnical Engineering and Seismic Risk at the University of Naples Federico II. Prof. Magliulo has been tutor of nine PhD students, six in the frame of the doctorate in Seismic risk at University of Naples Federico II, one in the frame of the doctorate in Engineering of Materials and Structures at the same university, and two in the frame of the doctorate in Environmental Phenomena and Risks at the University of Naples Parthenope. He also taught the course of Seismic Analysis of Buildings within the doctorate in Seismic Risk. He is currently member of the board of doctorate professors of the doctorate in Biology and Applied Sciences at University of Molise. Prof. Magliulo was tutor of more than 100 master's students in the frame of their thesis projects and supervised more than 50 final year internships.



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Prof. Magliulo is author of 6 patents and more than 200 articles, and more 50 of them were published in international peer reviewed journals. Prof. Magliulo is reviewer for several international peer reviewed journals and is member of the editorial board of Bulletin of New Zealand Society for Earthquake Engineering. His research concerns earthquake engineering and dynamics of structures, nonstructural components, RC structures and precast structures, in the fields of theoretical modelling, numerical analysis, experimental research and code activity.

Prof. Magliulo has been principal investigator of more than 20 international and national research projects, funded by either public or private entities. He is member of the board of ACI Italy Chapter and of "Seismic Performance Of Non-structural Element" association, and member of the fib committee TG 6.17 "Retrofitting and repairing of precast structures in seismic areas". He is also member of ACI and of the European Association of Earthquake Engineering.

2. Dottorandi dei quali il proponente è stato tutor nell'ultimo triennio

n. <u>1</u>	<i>PhD Course in Structural and Geotechnical Engineering and Seismic Risk</i> <i>University of Naples Federico II</i> <i>TUOZZO FEDERICO - XXXVIII cycle</i>
n. <u>2</u>	<i>PhD Course in Structural and Geotechnical Engineering and Seismic Risk</i> <i>University of Naples Federico II</i> <i>ZITO MARTINO - XXXV cycle</i>
n. <u>3</u>	<i>PhD Course in Environmental Phenomena and Risk</i> <i>University of Naples Parthenope</i> <i>DI SALVATORE CHIARA - XXXIV cycle</i>
n. <u>4</u>	<i>PhD Course in Environmental Phenomena and Risk</i> <i>University of Naples Parthenope</i> <i>PICCOLO VALERIA - XXXIV cycle</i>



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3. Titolo della ricerca proposta
<u>Rocking-based techniques for seismic protection of precast reinforced-concrete structures.</u>

4. Area tematica
Ingegneria Geotecnica <input type="checkbox"/>
Ingegneria Strutturale <input checked="" type="checkbox"/>
Rischio Sismico <input checked="" type="checkbox"/>

5. Tipologia di borsa per la quale si propone il progetto
Ateneo <input checked="" type="checkbox"/>
DM 117 (Investimento 3.3) <input type="checkbox"/> <i>(in questo caso indicare l'azienda co-finanziatrice)</i>
DM 118 (Investimento 4.1 P.A.) <input type="checkbox"/>
DM 118 (Investimento 4.1 generici) <input checked="" type="checkbox"/>
DM 118 (Investimento 4.1 Patrimonio culturale) <input type="checkbox"/>

6. Sintesi del progetto di ricerca (max 500 parole. Stato dell'arte, obiettivi e breve programma previsto per le attività e)
The study of the rocking dynamics began in the Sixties' with the so-called classical theory by Housner [1]. At the beginning, the study of rigid blocks under rocking motion was addressed to monumental freestanding structures (e.g., ancient temples), in order to detect the key parameters conditioning the seismic response and to develop novel assessment methodologies. In recent times, the rocking theory finds applications in the field of seismic protection of RC structures, both existing and new. In particular, both structural elements [2,3] and nonstructural components [4,5] have been involved. The beneficial effect of these applications can be detected in the reduction of the transmitted stresses, leading to a lower



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damage level. Moreover, if the overturning does not occur, the seismic response is stable and not affected by resonance phenomena. The rocking-based seismic protection is usually achieved for bridges and precast RC construction. In this framework, it is worth remembering the PRESSS project [6], developing a low-damage system consisting of RC wall with unbonded post-tensioning cables. Later, the technique is extended to applications other than concrete walls, defining novel strengthening solutions.

The main goal of the PhD will be the focus on the topic of rocking dynamics, implementing existing and/or improved design/retrofit solutions. Innovative assessment tool will be developed, and novel enhancement solutions will be proposed, when possible, able to increase the performance of the system and favoring the structural resilience. To this end, different case-studies will be properly selected, so as to ensure the generality of the applications. The PhD candidate will develop advanced numerical models according to the latest updates of the state of the art on the topic; advanced numerical analyses will be performed, and the outcomes will be elaborated through a multi-level approach for the structural resilience, taking into account seismic and structural responses, different limit states and performance levels, effectiveness, reparability and sustainability.

1. Housner GW. The behavior of inverted pendulum structures during earthquakes. *Bulletin of the Seismological Society of America* 1963; 53(2): 403–417.
2. Nazari M, Sritharan S, Aaleti S. Single precast concrete rocking walls as earthquake force-resisting elements: Precast Concrete Rocking Walls for Seismic-resistant Design. *Earthquake Engineering & Structural Dynamics* 2017; 46(5): 753–769
3. Naserpour A, Fathi M. Numerical study of a multiple post-tensioned rocking wall-frame system for seismic resilient precast concrete buildings. *Earthquake Engineering and Engineering Vibration* 2022; 21(2): 377–393
4. D'Angela D, Magliulo G, Cosenza E. Seismic damage assessment of unanchored nonstructural components taking into account the building response. *Structural Safety* 2021; 93: 102126.
5. Fragiadakis M, Diamantopoulos S. Fragility and risk assessment of freestanding building contents. *Earthquake Engineering & Structural Dynamics* 2020; 49(10): 1028–1048
6. Priestley MJN, Sritharan S (Sri), Conley JR, Stefano Pampanin S. Preliminary Results and Conclusions From the PRESSS Five-Story Precast Concrete Test Building. *PCI Journal* 1999; 44(6): 42–67.

7. Eventuali pubblicazioni del tutor sul tema di ricerca (max 10)

1. D'Angela D, Magliulo G and Cosenza E (2022). Incremental dynamic analysis of rigid blocks subjected to ground and floor motions and shake table protocol inputs. *Bulletin of the New Zealand Society for Earthquake Engineering* 55(2):64-79.
2. Zito M, D'Angela D, Maddaloni G, Magliulo G. (2022) A shake table protocol for seismic assessment and qualification of acceleration-sensitive nonstructural elements. *Computer-Aided Civil and Infrastructure Engineering* 2022: mice.12951.
3. Zito M, Nascimbene R, Dubini P, D'Angela D and Magliulo G (2022). Experimental Seismic Assessment of Nonstructural Elements: Testing Protocols and Novel Perspectives. *Buildings* 12(11):1871.
4. Prota A, Zito M, D'Angela D, Toscano G, Ceraldi C, Fiorillo A and Magliulo G (2022) Preliminary results of shake table tests of a typical museum display case containing an art object. *Advances in Civil Engineering* 2022.



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5. D'Angela D, Magliulo G, Cosenza E. (2021). Seismic damage assessment of unanchored nonstructural components taking into account the building response. *Structural Safety* 2021; 93: 102126.
6. Di Sarno L, Magliulo G, D'Angela D and Cosenza E (2019). Experimental assessment of the seismic performance of hospital cabinets using shake table testing. *Earthquake Engineering & Structural Dynamics* 48(1):103-123.
7. Di Sarno L, Petrone C, Magliulo G and Cosenza E (2017) Seismic fragility of freestanding buildings contents modelled as rigid blocks. Conference: 6th international conference on computational methods in structural dynamics and earthquake engineering methods in structural dynamics and earthquake engineering. <https://doi.org/10.7712/120117.5617>, 2017. Vol. 17865.
8. Bosio M., Di Salvatore C., Bellotti D., Capacci L., Belleri A., Piccolo V., Cavalieri F., Dal Lago B., Riva P. and Magliulo G. (2022) Modelling and Seismic Response Analysis of Non-residential Single-storey Existing Precast Buildings in Italy. *Journal of Earthquake Engineering*:1-22.
9. Ercolino M., Magliulo G. and Manfredi G. (2016) Failure of a precast RC building due to Emilia-Romagna earthquakes. *Engineering Structures* 118:262-273.
10. Magliulo G, Bellotti D, Cimmino M and Nascimbene R (2018) Modeling and seismic response analysis of RC precast Italian code-conforming buildings. *Journal of Earthquake Engineering* 22(sup2):140-167.

8. Eventuali progetti di ricerca finanziati in cui l'attività si inserisce

- Research project PRIN “ENRICH: ENhancing the Resilience of Italian healthCare and Hospital facilities” (2022-2025), funded by MUR. National coordinator: Prof. Gennaro Magliulo.
- Research project ReLUI WP3 – Task 2: “Seismic reliability of structures. T2: seismic reliability of retrofitted existing structures” (2022-2024), funded by DPC and ReLUI. Research unit coordinator (UNINA-Magliulo): Prof. Gennaro Magliulo.
- Research project ReLUI Ponti WP4: Gerber joints. (2022-2024), funded by DPC and ReLUI. Research unit coordinator (UNINA-Magliulo): Prof. Gennaro Magliulo.

9. Eventuali fondi disponibili a supporto dell'attività del dottorando (escluso finanziamento borse)

- Research project PRIN “ENRICH: ENhancing the Resilience of Italian healthCare and Hospital facilities” (2022-2025), funded by MUR. National coordinator: Prof. Gennaro Magliulo.
- Research project ReLUI WP3 – Task 2: “Seismic reliability of structures. T2: seismic reliability of retrofitted existing structures” (2022-2024), funded by DPC



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and ReLUIIS. Research unit coordinator (UNINA-Magliulo): Prof. Gennaro Magliulo.

- Research project ReLUIIS Ponti WP4: Gerber joints. (2022-2024), funded by DPC and ReLUIIS. Research unit coordinator (UNINA-Magliulo): Prof. Gennaro Magliulo.

10. Informazioni relative ad un periodo di ricerca all'estero (minimo tre mesi) previsto per il dottorando (*indicare Università/ente di ricerca e docente/ricercatore di riferimento con indirizzo mail*) (max 300 parole)

The PhD course will include a period of six months of visiting research at an internationally recognized university, under the supervision of expert academics. The research period will be carried out during the second year of PhD. In particular, Prof Magliulo collaborates with several international universities and research groups in the field of seismic assessment of structures and nonstructural elements, which would be potential hosts/co-supervisor in the framework of research period abroad for the PhD student. The following options would be suitable for arranging the abroad period of the PhD student:

Prof. Antonio Nanni, University of Miami (USA); nanni@miami.edu. Prof. Nanni is one of the most expert in construction materials and their structural performance. His interests are in the field of infrastructures sustainability and renewal.

Prof. Tatjana Isakovic, University of Ljubliana (Slovenia). Tatjana.Isakovic@ikpir.fgg.uni-lj.si. Prof. Isakovic is one of the most expert in seismic engineering and precast structures performance under earthquake loads.

11. Eventuali collaborazioni con imprese/aziende sul tema di ricerca (max 300 parole)

PreMer Srl Prefabbricati Meridionali

Company specialized in the field of precast elements, in vibrated and prestressed reinforced concrete, for civil and industrial constructions. Besides the ordinary elements production (columns, beams, cladding panels and roof covering members), the company is also specialized in long span members, like bridge beams and beams longer than 30 meters. The company is able to offer a wide range of structural solutions, based



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on the specific requirements. It surely represents a valid partner for the development, realization and testing of innovative solutions, aiming to enhance the seismic performance of precast structures, both existing and new.

SEIEFFE Prefabbricati Spa

Leading company in Italy in the field of design, realization, transport and mounting of precast elements and RC precast structures, for civil and industrial civil constructions and bridge beams. In last years, the company has focused on innovative retrofit systems for RC precast structures. In particular, it has collaborated to scientific research for the application of the PRESSS system to precast buildings, proving its effectiveness and the consequent economic advantage.

Napoli, 27/06/2023

FIRMA

A handwritten signature in black ink, consisting of a large, stylized initial 'P' followed by a surname that appears to be 'Figli'.

Il presente modulo va compilato in ogni sua parte ed inviato all'indirizzo di posta elettronica phd.dist@unina.it entro e non oltre **il 30/06/2023**.