UNIVERSITA' DEGLI STUDI DI NAPOLI FEDERICO II

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

XXXVI CICLO

Il sottoscritto prof. Antonio De Luca

(PO ■ PA □ 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 XXXVI ciclo.

1. Curriculum sintetico del proponente (max 500 parole)

Antonio De Luca is Professor of Structural Engineering (Group ICAR/09) since 1991. He is author of about 300 scientific papers, with particular attention for masonry structures, steel structures seismic engineering, and seismic isolation of buildings.
In the field of Base Isolation System (BIS), he has coordinated important research projects (COSMES, Parnaso (1998), PRIN (2000/2001), PRIN (1997/1999), PRIN (1995/1996). Since 2005 he is the Coordinator of a Research unit for the ReLUIS DPC Projects and he has also Coorganized and CoEdited with Giorgio Serino the volume "Base isolation and seismic control of structures and infrastructures" at conclusion of Task 7 activities within the Reluis research project (2005/2008). His earliest publications on BIS date back to the end of 80's (De Luca, A. and Serino, G., 1988 - 1989). Nowadays, he is author of about 70 scientific papers on this subject. His expertise in this field is also proved by Protezione Sismica Ministero dell'Università e della Ricerca scientifica e tecnologica at (http://www.protezionesismica.unina.it/INDEX2.htm).
He has carried out also many professional projects. He has design several outstanding base isolated buildings, also including retrofit solutions. He has been awarded (i) the ACAI 2001 award for the "Centro Commerciale San Paolo" of which he designed Steel Structures; (ii) the Sisto Mastrodicasa award in 2007 for the design of restoration of the masonry building: Palazzo Scarpa in Naples; (iii) the AICAP 2009 award for the design of the Don Bosco Bridge at Arenaccia in Naples.

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2. Dottorandi dei quali il proponente è stato tutor nell'ultimo triennio	
n.1	Borsa Ateneo

3. Titolo della ricerca proposta

<u>New design trends of Base Isolated Structures to withstand the "next" generation of strong motion signals.</u>

4. Area tematica

Ingegneria Geotecnica □

Ingegneria Strutturale ■

Rischio Sismico □

5. Sintesi del progetto di ricerca (max 500 parole. Stato dell'arte, obiettivi e breve programma previsto per le attività e)

The proposed research program include the following steps:

(Phase 1) State of art in in current design practice and international building codes. Studies will follow a previous research path [1], which has proposed a classification of BIS designs in three generations, marked by significant earthquakes: (1984-1994), (1995-2004), (2005-2018). Also the AIJ (2016) has underlined changes in BIS design, valuing improvement occurred through four different periods. The deriving requirements for more effective design strategies leads to a preliminary study of international building codes and their evolution in the last decades.

(Phase 2) Analysis of seminal case studies of base isolated structures in Japan and Europe. Japan supremacy in BIS design is testified by more than 5000 existing applications and is clear visible from benchmark cases, as the Building of Shimizu corporation (2003) whose 6 LDRBs one supports a tributary area of 266 m^2 , ensuring a vibration period of 4.0s, or the Corporation Tokyo Headquarters (2012), whose 42 seismic isolators supports a mean tributary area of 60 m^2 with T = 5.40 s. The analysis of such a kind of structures is effective to understand the degree of efficiency nowadays reached by BIS.

(Phase 3) Recent earthquake events: analysis of signals form the BIS design point of view. In the last two decades, destructive events like Chi Chi Taiwan, Tohoku or Christchurch earthquakes revealed high and unexpected spectral values of displacements, velocities and accelerations, far away from the ones building codes expect. At the time when NGA-East and NGA-West2 (PEER in partnership with the U.S. Geological Survey and the SCEC) make available very large set of ground motions worldwide recorded and develop new attenuation models, the redefinition of seismic action has to develop from the evaluation of earthquake signals. The program aims to analyse how this "new generation" of seismic signals affect base isolation design

(Phase 4) Performance of BIS building in Japan (in situ). After recent earthquakes, Japan represents an "open-scale-lab", with real earthquakes and real signals recorded on real buildings. This humongous amount of data has not being studied and analysed so far. During this research program, good relations with Prof. Nakashima and Kyoto University will make feasible data acquisition and elaboration, studying Japanese base isolated structures in situ.

(Phase 5) New design trend in Japan (in situ). As mentioned above, effective design strategies have been put into practice in Japan recently, to face increased design requirements. To realize the effectiveness of structural solution adopted in Japan, the research program provide for a tour in the oldest and largest construction companies, as Kajima Corporation or Shimizu Corporation. It is well known that in Japan construction companies have strong energy and financial efforts in research, due to national legislation.

(Phase 6) Non-linear analysis of new buildings designed under seismic loads from recent effective acceleration and displacement spectra. Coming back from Japan, the acquired notions and experimental results will support new BIS application: non-linear analysis these structures will be put into practice, valuing the effects of real earthquake signals

<u>A period abroad (in Japan), lasting up to one year, is foreseen.</u>

Research Program Time												
Year	**I**				**II**				**III**			
Semester	**1**		**2**		**3**		**4**		**5**		**6**	
Phase 1												
Phase 2												
Phase 3												
Phase 4												
Phase 5												
Phase 6												
Period abroad												
Scientific reports, papers, thesis												

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

1) De Luca, A. and Guidi, L.G., *Base isolation issues in Italy: Integrated architectural and structural designs*, Soil Dynamics and Earthquake Engineering, Elsevier. Volume 130, March 2020, 105912. Received 23 September 2018, Revised 21 October 2019, Accepted 21 October 2019, Available online 18 November 2019. DOI: 10.1016/j.soildyn.2019.105912

2) De Luca, A. and Guidi, L.G., *State of art in the worldwide evolution of base isolation design*, Soil Dynamics and Earthquake Engineering, Elsevier. Volume 125, October 2019, 105722. Received 24 September 2018, Revised 6 June 2019, Accepted 11 June 2019, Available online 11 July 2019. DOI: 10.1016/j.soildyn.2019.105722.

3) Montuori, G.M., Mele, E., Marrazzo, G., Brandonisio, G. and De Luca, A., *Stability issues and pressure–shear interaction in elastomeric bearings: the primary role of the secondary shape factor,* (2016) Bulletin of Earthquake Engineering, 14 (2), pp. 569-597. DOI: 10.1007/s10518-015-9819-x

4) Imbimbo, M., De Luca, A., *F.E. stress analysis of rubber bearings under axial loads* (1998) Computers and Structures, 68 (1-3), pp. 31-39. DOI: 10.1016/S0045-7949(98)00038-8.

5) Cuomo, G., De Luca, A. and Mele, E., *Design aspects in seismic isolation: Application to retrofit churches.* International Journal of Architectural Heritage. Conservation, Analysis and Restoration. Volume 2, (2008). DOI: 10.1080/15583050802063741.

6) Palmieri, A, Ricciardelli, F., De Luca, A. and Muscolino, G., *State space formulation for linear viscoelastic dynamic systems with memory*. Journal of Engineering Mechanics, Volume 129, Issues 7, pp. 715 – 724, (2003).

7) De Luca, A., Mele, E., Molina, J., Verzelletti, G. and Pinto, A.V., *Base Isolation for retrofitting historic buildings: Evaluation of seismic performance through experimental investigation*. Earthquake Engineering and Structural Dynamics. Volume 30, Issue 8, pp. 1125 – 1145, (2001). DOI: 10.1080/15583050802063741.

8) De Luca, A., Faella, G., *Modelling of elastomeric devices in the dynamic linear and nonlinear range*. Proceedings of the US- Italy workshop on "Seismic protective systems for bridges", Columbia University, NY (1988).

9) De Luca, A., Mele, E., *Base Isolation and Energy Dissipation General Report,* Proceedings of the second international conference STESSA '97, behaviour of steel structures in seismic areas, pp. 683-699. Kyoto, Japan (1998).

10) De Luca, A., Reinhorn, A.M., Faella, G., Mele, E., Ramasco, R., *Design level and damage in base isolated steel structures*. Proceedings of the 10th ECEE, Vienna (1994).

7. Eventuali progetti di ricerca finanziati in cui l'attività si inserisce
Responsabile Unità di Ricerca Progetto ReLuis. DPC 2019-2021. Isolamento Sismico

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

9. 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 program provides for a period abroad, lasting up to one year. It corresponds to the aforementioned "Phase 4", to value performance of BIS buildings in Japan, and "Phase

5", to look at new design trend in Japan. This period will be in collaboration with Prof. Nakashima.

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

Napoli,14/02/2020 FIRMA

Il presente modulo va compilato in ogni sua parte ed inviato all'indirizzo di posta elettronica phd.dist@unina.it entro e non oltre **venerdì 14/02/2020**.