



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 FORMISANO

(PO PA RU RTD) afferente al Dipartimento di
STRUTTURE PER L'INGEGNERIA E L'ARCHITETTURA

S.S.D. (*indicare codice e nome per esteso*_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 Formisano is researcher and Aggregated Professor of Structural Design at the Department of Structures for Engineering and Architecture of the University of Naples "Federico II". Enabled to the role of Associate Professor in the competition sector 08/B3 "Structural design" since April 2017, he is lecturer in courses on metal structures and vulnerability and seismic retrofitting of existing buildings within the framework of the International Masters ETeC, Design of Steel Structures in Smart Cities, SUSCOS, ELARCH and ArINT.

His research is mainly focused on the following topics: analysis of steel and aluminum alloy structural systems and connections; seismic vulnerability analysis of masonry buildings, with particular reference to building aggregates in historic centres, and reinforced concrete ones; vulnerability and seismic risk of historic centres; seismic consolidation of existing structures by systems based on the use of metal materials; seismic analysis of cold-formed thin walled structures; robustness of steel structures; composite materials made of natural fibres, life cycle assessment and energy requalification of buildings. He is the author of more than 350 publications published in national and international journals and books, as well as on national and international conference proceedings, where he participated as speaker and chairman. He was part of the working group that delivered the technical document CNR-DT 208/2011 on the design of aluminium alloy structures. He was a consultant of UNI for the translation of EuroCode 3 Part 1.8 on the design of steel joints. Currently he is a member of the project teams for the development of the new version of Eurocode 9 "Design of aluminium alloy structures".



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He was member of the editorial and scientific committee of numerous national and international conferences and congresses. He participated and is participating as a member and coordinator of numerous national and international research projects. He is a member of the editorial board and reviewer of numerous national and international journals. He held lectures and seminars at several Universities and National and International Research Centres, as well as training courses at Universities and Professional Orders on European Community marking, design of steel and aluminum structures and connections, seismic vulnerability and retrofitting of existing buildings, study and experimentation on new eco-friendly building materials. He has received awards in the fields of Structural Engineering and Green buildings.

2. Dottorandi dei quali il proponente è stato tutor nell'ultimo triennio	
n. _____	<i>specificare tipologia di borsa: ateneo, pon, por, senza borsa, ecc.</i> _____

3. Titolo della ricerca proposta
<u>COLD-FORMED STEEL STRUCTURES AS ENVELOPE SYSTEM FOR SEISMIC AND ENERGETIC RETROFITTING OF EXISTING BUILDINGS</u>

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



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

In Italy, almost 60% of buildings were built without any reference to seismic design criteria. In addition, it should be considered that the seismic regulations prior to 2003 set the problem of safety in different terms and with less explicit objectives than the current standard, where a clear reference is made to the approaches in terms of limit states and post-elastic structural behaviour. On the other hand, the issue of saving energy resources has become a pressing requirement for residential constructions. In general terms, it is needed to intervene on the existing building stock to provide the building with better performances both from seismic and energy point of view. Therefore, it is urgently required the development of a coordinated and extensive plan for the integrated requalification of the building heritage on a national scale, able to combine architectural, functional and energy aspects in the preservation and upgrading of the structural security. However, at the moment, in the absence of ad hoc guidelines, the three aspects of the problem (architectural, energy and seismic) are often analysed and taken into account independently. In addition, cold-formed steel (CFS) structures are not usually used as systems for the seismic and environmental requalification of the existing built-up. The proposed study starts from the need to investigate in an integrated way the seismic and energy response of existing buildings, identifying in the application of CFS elements an innovative and effective approach to obtain the required results.

The program of study and research activities to be developed consists of the following steps:

- 1) Examination of the state-of-the-art research and applications on steel systems for the integrated retrofitting of existing buildings;
- 2) Seismic behaviour analysis in the non-linear field of existing buildings;
- 3) Seismic and energy design of CFS systems;
- 4) Numeric calibration in the monotonic and cyclic field of the experimental seismic behaviour of existing structures and systems made of CFS;
- 5) Parametric FEM analysis for the choice of the best seismic and energy design parameters of the CFS system and for the optimization of the connection systems between the CFS structure and the existing building;
- 6) Applying the CFS system to an existing building selected as a case study for assessing the improvement of its seismic and energy performances.

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

Formisano, A., Vaiano, G., Fabbrocino, F. (2019). A seismic-energetic-economic combined procedure for retrofitting residential buildings: A case study in the Province of



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Avellino (Italy). AIP Conference Proceedings, 2116, art. no. 420008. DOI: 10.1063/1.5114435.

Formisano, A., Di Lorenzo, G., Landolfo, R. (2019). Seismic retrofitting of industrial steel buildings hit by the 2012 Emilia-Romagna earthquake: A case study. AIP Conference Proceedings, 2116, art. no. 260021. DOI: 10.1063/1.5114272.

Formisano, A., Vaiano, G., Fabbrocino, F. (2019). Seismic and energetic interventions on a typical south Italy residential building: Cost analysis and tax deduction. Frontiers in Built Environment, 5, art. no. 12. DOI: 10.3389/fbuil.2019.00012.

Chieffo, N., Formisano, A., Miguel Ferreira, T. (2019). Damage scenario-based approach and retrofitting strategies for seismic risk mitigation: an application to the historical Centre of Sant'Antimo (Italy). European Journal of Environmental and Civil Engineering. DOI: 10.1080/19648189.2019.1596164.

Fumo, M., Formisano, A., Sibilio, G., Violano, A. (2018). Energy and seismic recovering of ancient hamlets: The case of Baia e Latina. Sustainability (Switzerland), 10 (8), art. no. 2831. DOI: 10.3390/su10082831.

Terracciano, G., Di Lorenzo, G., Formisano, A., Landolfo, R. (2015). Cold-formed thin-walled steel structures as vertical addition and energetic retrofitting systems of existing masonry buildings. European Journal of Environmental and Civil Engineering, 19 (7), pp. 850-866. DOI: 10.1080/19648189.2014.974832.

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

ReLUIS WP5 "Low-impact and integrated rapid execution interventions" - Task 5.1 "Quick execution and low-impact interventions"

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

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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)



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The PhD student will take advantage of a three months research period at the Politehnica University of Timisoara (referent Prof. Marius Mosoarca – e-mail: marius.mosoarca@upt.ro), where he/she will have the opportunity to perform seismic and energy experimental tests on the components of the proposed system.

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

The research topic is the subject of a preliminary scientific advisory agreement between DIST (scientific leader Prof. Antonio Formisano) and the Irondom srl company inherent the study of a resilient coat system, with high seismic and energy performance, as well as the ability to counteract the effects of the products of volcanic actions, based on the CFS prototype system developed by the same company and named "IRONDOM – Steel Frame".

Napoli, 10/02/2020

FIRMA

A handwritten signature in black ink, appearing to read "Antonio Formisano".

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**.