



PhD in INGEGNERIA STRUTTURALE, SISMICA, GEOTECNICA / STRUCTURAL SEISMIC AND GEOTECHNICAL ENGINEERING - 39th cycle

**THEMATIC Research Field: HIGH-PERFORMANCE FIBRE REINFORCED CONCRETE
COUPLED WITH CONTINUOUS FABRICS**

Monthly net income of PhDscholarship (max 36 months)

€ 1250.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

A large amount of R/C and P/C concrete structures have reached their nominal end of life and they exhibit a significant damage correlated to environment exposure. They require very often the substitution of the cover and of the external reinforcement. At the same time, Standards have increased the design loads and therefore the structures require several times a strengthening. In Italy, but also all over the world, no standards concern the coupling of high-performance fibre reinforced concrete and synthetic fabrics. For this reason CNR asked me to coordinate a new committee to propose in two years a new guideline that has to be supported by a suitable applied research.

Methods and techniques that will be developed and used to carry out the research

Both experimental techniques and numerical methods are needed to evaluate the contribution of these composites on the whole structure behavior and solve the still-open problems in severely-cracked, corroded structures. For instance, assessing the bond under chloride attack, or quantifying the ductility of special retrofitting or the healing capacity of cementitious composites, requires special techniques and equipments to simulate different exposure conditions, accelerate their effects, e.g. in terms of corrosion rate, recovery of performance, and to quantify the related effects. Assessing concrete damage via non-destructive test methods based on concrete colorimetry,



	ultrasounds and x-rays, as well as linking concrete fresh-state properties to those after hardening are bringing in advanced techniques. At the same time, adequate theoretical and numerical models at the meso-structural and structural level are being developed, to be implemented into available FE codes.
Educational objectives	Designing concrete structures for durability, fire proofing and blast resistance requires a multi-disciplinary approach, since many and different topics are involved (materials, structures, human and structural safety, heat transfer, diffusion of chemical products, fluid-structure interaction.....). Consequently, the Candidate will not only have the opportunity to contribute to the broadening of the knowledge in one or more directions, but will have also an insight into a variety of problems, with high technical and socio-economical impact.
Job opportunities	In-depth research activities concerning the mechanical environment-induced decay of structural materials and constructions is a sound basis for understanding and mastering not only disasters induced by natural hazard, but also corrosion, fire, and blast-related events and any incident that may regard other scenarios related to the safety of large and socially-relevant structures. The job opportunities are basically the same as for structural engineers (universities, public and private research centers, large engineering firms, consulting and insurance companies), but with a plus granted by a large-spectrum formation.
Composition of the research group	2 Full Professors 2 Associated Professors 1 Assistant Professors 3 PhD Students
Name of the research directors	Marco DI PRISCO

Contacts	
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	625.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research: 1. SUPSI, Canobbio-Lugano (Switzerland) http://www.supsi.ch/ 2. Ben Gurion University of the Negev (Israel) http://www.cs.bgu.ac.il/ 3. University of Dresden (Germany) http://www.uni-dresden.de; 4. Arizona State University(USA) http://www.asu.edu/ 5. ETH – Zurich (Switzerland) 6. EPFL – Lausanne (Switzerland) 7. Northwestern University, Evanston (Illinois, USA) 8. INSA–Mech. et Durabilité des Constr., Toulouse (France) 9. Holcin, Merone (Italy) 10. CSTB-Centre Scientifique et Technique du Batiment,Marne-La-Vallée (France) 11. RELUIS (http://www.reluis.it) 12. Universidade Federal do Rio de Janeiro (Brasil) 13. University of Leuven 14. University of British Columbia (Vancouver) 15. Universitat Politecnica de Catalunya 16. DTU, Delft Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): The Ph.D. course supports the educational activities of its Ph.D. students with an additional funding equal to 10% of the scholarship, starting from the first year. Teaching assistanship (availability of funding in recognition of support to teaching activities by the PhD student): Ph.D. students are encouraged to apply, upon prior authorization, to the calls to support teaching activities at the undergraduate and Master levels at Politecnico, being paid for that. The teaching assistantship will be limited up to about 80 hours, maximum half of them devoted to teaching and classroom activities and the rest to support classworks and exams. Computer availability and desk availability: Each Ph.D. student has his/her own computer for



individual use. Each Ph.D. student has his/her own desk, cabinet and locker.