SCIENCESPRINGDAY

FACULDADE DE CIÊNCIAS E TECNOLOGIA
UNIVERSIDADE NOVA DE LISBOA

Department of Civil Engineering

Title

Research Unit / Team

The Research Center in Structures and Construction of UNL - UNIC

Hugo C. Biscaia

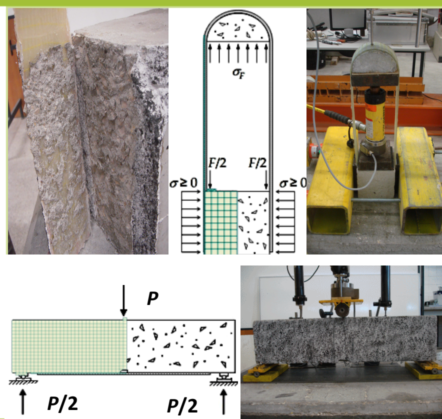
(Student/Advisor/PI)

»6 publications in international journals
»11 publications in international conferences

Advisors:
»Manuel A.G. da Silva
»Carlos Chastre

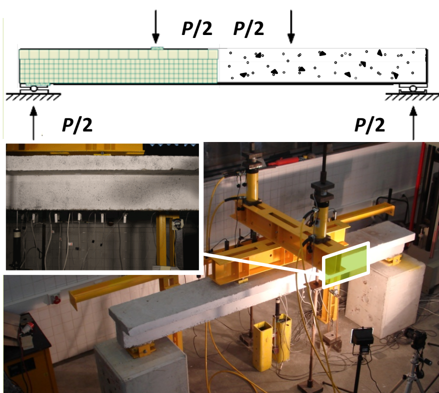
Objectives

Study the degradation of the GFRP-to-concrete interface due to environmental exposure. In particular, the knowledge of the performance of those interfaces is very deficient when submitted to environmental severe conditions like the presence of salt, wet and dry conditions, freeze and thaw cycles, high temperatures (close to T_g), etc..
Develop an experimental program that allows the analysis of several aspects as maximum bond stress, maximum load transmitted to GFRP, maximum strain, relative displacements between materials (slip) and fracture energy.
Model the GFRP-to-concrete interface with the finite element method and compare with the experiments. Develop proposals that may be included in international rules or codes.



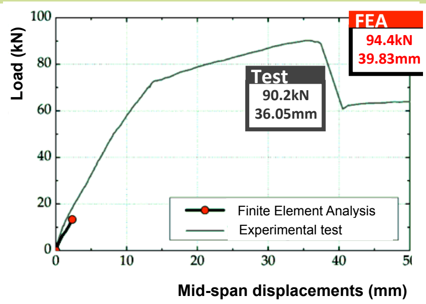
Methodology

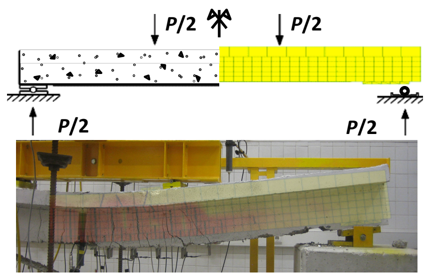
Perform several double shear tests, reinforced concrete beams with GFRP composites bonded to concrete cubes after being exposed to salt fog cycles, wet/dry cycles, temperature cycles between +7.5°C and +47.5°C and between -10°C and +30°C.
Develop a numerical analysis that may estimate the nonlinear debonding process using nonlinear bond-slip models.
Model the GFRP-to-concrete interface with interface finite element which rupture criteria is based no the Mohr-Coulomb rupture criteria.
Compare the experimental results with that obtained from the numerical and computational results.



Expected Results

Report the amount of degradation is observed from the experiments.
It is expectable that humidity environments may change the rupture mode of the reinforced concrete beams.
Define the changing of several parameters that have significant importance on the debonding phenomenon that occurs in FRP-to-concrete interfaces.
Simulate, with good accuracy, all the debonding process with the numerical and computational analysis of the FRP-to-concrete interfaces subjected to the several aggressive environments.
Predict the failure of reinforced concrete beams externally bonded with GFRP plates after being exposed to several aggressive environments.





Funding: Durability of structures (RC and FRP in aggressive environment) – DUST.
Project reference: PTDC/ECM/100538/2008
Sponsor: Fundação para a Ciência e Tecnologia