SHORT DESCRIPTION OF THE LABORATORY		
NÚCLEO DE MADEIRAS (Laboratório Nacional de Engenharia Civil) Avenida do Brasil, 101, 1700-066 Lisboa Portugal Head: Dr. Helena Pires Cruz http://www.lnec.pt		
Phone: + 351 21 8443295	Fax: 351 218443025	Email: helenacruz@lnec.pt

Main topics	Example of activities	Number of scientists
Nondestructive evaluation	Mechanical evaluation Biodegradation assessment Strength grading	**2**
Structural reinforcement/Strengthening	Local reinforcement with composites Consolidation of timber elements (new products and processes)	**3**
Composite elements	Composite timber concrete structures Bonding quality assessment Mechanical joints	**5**

Main equipment: Testing machines; Climatic chambers; Extensometry mechanical sensors; Data acquisition systems; Ultrasound equipment; Acoustic emission equipment

Activities related to the field of COST Action E24

Assessment of the variation of mechanical properties of timber by acousto-ultrasonics
(J. Saporiti Machado, Helena Cruz)

In this project a new approach for establishing the lengthwise variation of mechanical properties of Maritime pine timber elements is studied. An algorithm for automatic detection of knots (trend analysis plus discriminant analysis) allows splitting the length of the elements into weak zones and clear wood zones. Regression models are used for predicting the density, modulus of elasticity and bending strength of each zone. The results obtained so far shows a good agreement (in 80% of the cases) with the stiffness profile given by proof-loading tests. The project will look now on: the reasons for the 20% of poor agreement between model prediction and the proof-loading test; development of dry couplants; possibility of using the obtained data as input information for glulam bending strength predicting models.

Reinforcement of timber elements by using composite materials
(Helena Cruz, José P. Moura, J. Saporiti Machado)

This research project aims to evaluate the use of FRP for local reinforcement of timber elements that were previously subjected to rupture in service. So far, tests have been carried out on shear strength and delamination of glue lines involving different wood species and different types of epoxy glues. The possibility of using fibre reinforcement polymers (FRP) in the strengthening of timber elements was studied by assessing four different systems (FRP+epoxy resins) and comparing the results with more traditional reinforcement systems consisting of steel plates bolted to the timber element.

Composite timber concrete slabs

(Helena Cruz, Sérgio Lopes, Alfredo Dias, João Negrão, J. Saporiti Machado)

This study will focus on establishing important bases for the design of composite timber concrete slabs. One important topic of the project will consist in the gathering of data on embedment properties for a number of fasteners types and data on fasteners moment-rotation properties. These will enable the establishment of a predictive model of the timber-concrete connection. A number of full size prototypes of composite timber-concrete floors will be built and tested. These will produce fundamental data on the mechanical properties of these structures and will enable, together with other results the establishment of design rules for timber-concrete floors.