Results

Seismic vulnerability assessment of buildings, through the determination of ground motion in representative regions of Greece.

Fragility curves for all typical categories of reinforced concrete structures in Greece.

Development of a database from repair/strengthening files from ETHNIKI Insurance Company.

Development of a database from repair/strengthening files of buildings after the Athens earthquake (7-9-99).

A new integrated seismic strengthening system, which will form the evolution of the FRP-strengthening technique towards the direction of developing new/improved products, competitive to other, existing, imported solutions. One of them is based on a novel combination of textiles with inorganic binders (Textile-Reinforced Mortars) and may be thought of as an improvement of the FRP-strengthening technique. Analytical and experimental research demonstrated that TRM jacketing is extremely effective as a means of: (a) increasing the ductility and/or the shear resistance of seismically deficient RC members; and (b) retrofitting unreinforced masonry under either in-plane or out-of-plane loading.

Evaluation of the performance of high strength mortars with different cement types. Besides physical properties (strengths), long term performance was examined and the effect on other repair materials.

Assessment of the repairs' relative effectiveness of different strengthening techniques using the results of non-destructive testing (NDT) methods.

Determination of a new design methodology for the pre-earthquake strengthening of the buildings based on the analysis of the profit/cost ratio. Development of a software application for the calculation of the above and application of the methodology in reinforced concrete buildings that were built before 1985 in Thessaloniki.

Application/demonstration of the technique in a real building.

Partners

UNIVERSITY OF PATRAS (Project Coordinator)
www.upatras.gr

EDRASIS - C. PSALLIDAS S.A.
www.edrasis.gr

ETHNIKI INSURANCE COMPANY S.A.
www.ethniki-asfalistiki.gr

ENVIROCOUSTICS S.A.
www.envirocoustics.gr

EXELTEK S.A.

ISOMAT S.A.
www.isomat.gr

TITAN
www.titan.gr

ARISTOTLE UNIVERSITY OF THESSALONIKI (AUTH)
www.auth.gr

DIMOKRITUS UNIVERSITY OF THRACE (DUTH)
www.duth.gr

INSTITUTE OF CHEMICAL ENGINEERING AND HIGH TEMPERATURE CHEMICAL PROCESSES (ICE-HT)
www.iceht.forth.gr

NATIONAL OBSERVATORY OF ATHENS
INSTITUTE OF GEODYNAMICS (GI-NOA)
www.gein.noa.gr

EARTHQUAKE PLANNING AND PROTECTION ORGANISATION (EPPO)
www.oasp.gr

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ARISTION

Vulnerability assessment of existing buildings and development of new materials and strengthening techniques

www.aristion.gr

MINISTRY OF DEVELOPMENT-GREECE
GENERAL SECRETARIAT FOR RESEARCH AND TECHNOLOGY

COMMUNITY SUPPORT FRAMEWORK III
OPERATIONAL PROGRAMME
COMPETITIVENESS
AXIS 4 – MEASURE 4.5
Built Environment and Seismic Risk Management

General

The greatest threat to human life and property loss resulting from earthquakes in modern Greece is associated with seismic vulnerability of existing construction that was either not designed for seismic resistance or was built prior to the introduction of modern earthquake-design practices. The replacement in the near future with new building infrastructure conforming to modern earthquake engineering design standards would be prohibitively expensive.

Evidently, there is a need for prescribing and certifying an easy-to-implement framework for seismic assessment of Reinforced Concrete and Unreinforced Masonry that would lead to unique and reliable conclusions. This is accompanied by pertinent technologies for design and implementation of repair/strengthening schemes optimized in terms of replacement/upgrading cost ratio, speed of application and viability/durability of the solution.

The project comprises two parallel actions:

1st action:

Seismic Vulnerability Assessment

2nd action:

Innovative Technologies for Seismic Upgrading

The project consists of eight (8) Work Packages (WP)

WP1

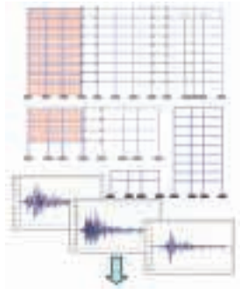
Seismic risk assessment for vulnerable buildings in terms of ground acceleration at specified return periods and the resulting ground motion at representative sites of the Greek territory. *(GI-NOA)*

WP2

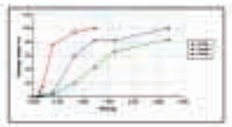
Vulnerability assessment of existing reinforced concrete buildings and reinforced masonry buildings and the **development of monetary loss assessment models.** *(Univ.of Patras, AUTH, DUTH, Ethniki Asfalistiki, EPPO).*

Fragility curves

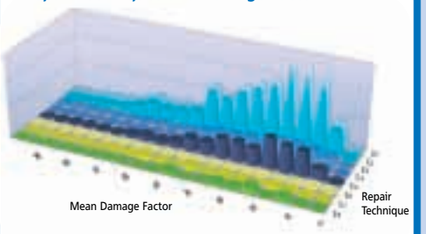
Inelastic dynamic analyses of typical reinforced concrete structures



Calculation of economic damaga factore for different levels of seismic intensity



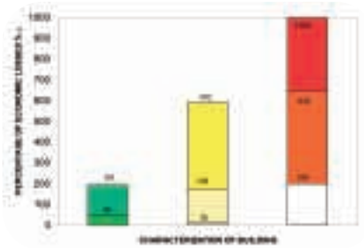
Repair Techniques and Damage Factor



Υπόμνημα

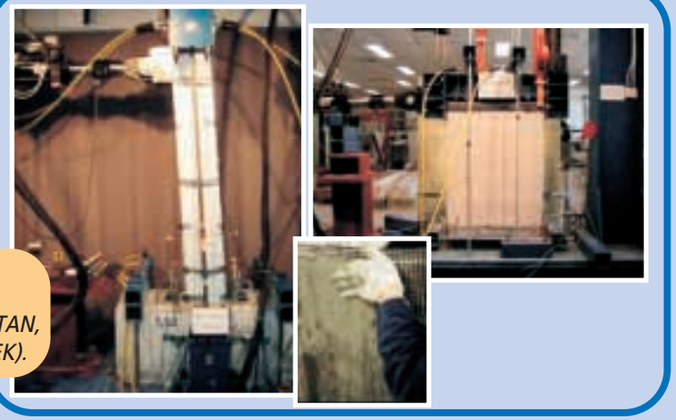
E1	Crack Filling
E2	Gunite
E3	Steel plates
E4	FRP
E5	New Concrete Elements
E6	New Steel Elements
E7	Section Restoration
E8	Other
E9	Connection Beam

Correlation of economic losses to building characterization



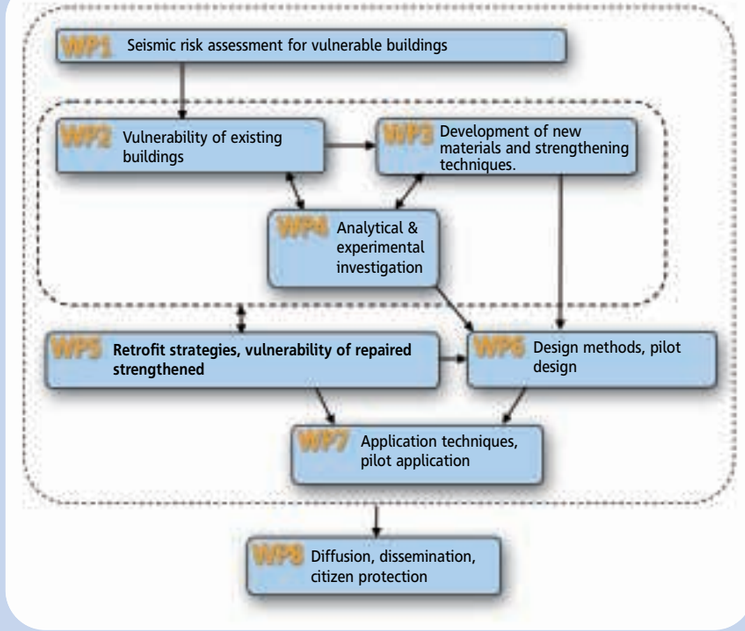
WP3

Development of **new materials and strengthening techniques**. *(ISOMAT, TITAN, Univ.of Patras, ICE-HT, EDRASIS, EXELTEK).*



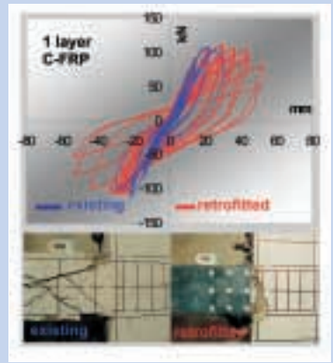
WP4

Analytical and experimental investigation of the new strengthening scheme in combination with state of the art **non-destructive** evaluation techniques. *(Univ.of Patras, ICE-HT, ENVAC).*



WP5

Vulnerability assessment of repaired/strengthened buildings and the development of **retrofit strategies,** along the lines of existing but mainly the new strengthening technique. *(DUTH, ENVAC).*



WP6

Development of a methodology for seismic strengthening priorities followed by the development of an **integrated design methodology**, specifically addressing the new system. This new design tool will be used to perform comparative studies of the new technique with existing ones and to develop a **prototype design**. *(AUTH, EXELTEK).*

WP7

Application of the new strengthening technique to a real building with full cost analysis. *(EDRASIS, ISOMAT, TITAN).*

WP8

Dissemination of the results of the project to the affiliated technical community of the country aiming at the protection of the citizens *(EPPO).*