



LIFETIME ENGINEERING

of Buildings and Civil Infrastructures



Objectives of NATIONAL DISSEMINATION GROUPS in Thematic Network Lifetime:
National information, demonstration, education and training of lifetime engineering

Demonstration project of lifetime engineering in CZECH REPUBLIC :

Research projects:

IERD - Integration of the Measurement of Energy Usage into Road Design. The project of the SAVE II programme.

The objectives of this project are to facilitate and encourage road design Engineers and their employers to consider the energy implications when they are designing new roads and/or realigning existing roads. The project will look at all aspects of road design and the energy implications involved in them. The project will allow the use of energy in road construction to be reduced by quantifying what energy is used identifying potential energy efficiencies and also will demonstrate how energy usage by vehicles can be reduced by designing roads that facilitate energy efficient driving.

SUREURO (Sustainable Refurbishment Europe) is an acronym for one of the largest research projects supported under the 5th Framework Programme by the European Commission. Its main objective is the development of methodical and operative tools for sustainable refurbishment of existing European large housing estates. Czech part of the project was titled **SUREURO CZ NAS**. The participants in the project aim to find sustainable refurbishment approaches and tools usable for regeneration of large real housing estates built after World War II in the Czech Republic with the emphasis on adaptation, transfer and direct application of selected tools of the main SUREURO project. Research and following application of the tools (in pilot sites Havířov and South Town in Prague) concern both technical and social dimensions of the refurbishment.



USE OF RECYCLED WASTE MATERIALS (GAČR 103/98/0091)

- material and shape, optimization
- experimental verification of structural reliability
- hygienic aspects investigation and assessment
- life-cycle assessment and optimization
- verification in situ in the building construction

HIGH PERFORMANCE MATERIALS

- material optimization
- nano-technology
- structural testing

SUSTAINABLE CONSTRUCTION (MPO 2000-2003)

- application of sustainable principles in the design of buildings for housing
- sustainable, low energy and low cost housings
- Life Cycle Assessment of Buildings, environmental impact evaluation
- concept of Guidelines for Sustainable Building

LIFE CYCLE ASSESSMENT AND OPTIMIZATION OF STRUCTURES (VZ 01 2000-2003)

- LCA of buildings
- environmental profiles
- integrated design and optimization of structures
- development of programme
- MSA – Multicriterion and Sensitivity Analysis

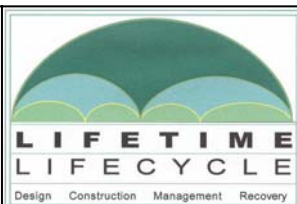
LOW ENERGY HOUSES – DESIGN – CONSTRUCTION – MEASUREMENT IN SITE

- energy concept - warm air heating + heat recovery
- structural concept



Principal contractors of Thematic Network LIFETIME:

- VTT Technical Research Centre of Finland, FI
Coordinator Prof. Dr. Asko Sarja, asko.sarja@vtt.fi
- Taylor Woodrow Construction Ltd, UK
- CSTB Centre Scientifique et Technique du Bâtiment, FR
- Imperial College of Science Technology and Medicine, UK
- Universität Karlsruhe, DE



Thematic Network LIFETIME in figures:

- Working period: 1/6/2002 - 31/5/2005
- Participation: 96 partners from 28 countries
- Plenary workshops: 2002 Norway, 2003 Finland and 2005 France
- 25 National Dissemination Groups
- Funding from 5th Framework Programme:
Competitive And Sustainable Growth (GROWTH) Programme



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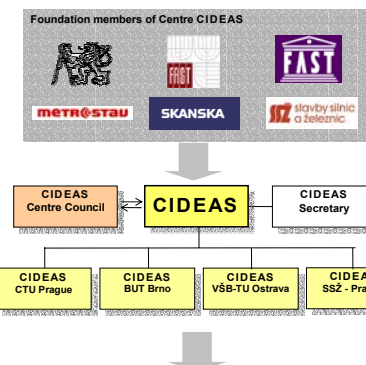
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Research Centre CIDEAS:

CIDEAS "see ideas" – Centre for Integrated **DE**sign of **AV**anced **S**tructures is research centre of expertise on advanced materials, construction, energy, environment, extreme situations and risk in civil engineering. The initial concept was led by the effort to facilitate cooperation of young research teams managed by top researchers at three largest civil engineering faculties in the Czech Republic, as well as specialists and staff involved in corporate research in major Czech construction companies (SKANSKA CZ, Metrostav and SSŽ).

The basic conceptual approach applied to design of advanced structures is an **integrated design**, representing a multi-parametric design and optimization of structures viewing various definition levels (material, components, structure) and aimed to achieve optimum function parameters as seen from a wide spectrum of criteria throughout the entire life cycle.



Expected Benefits in three main areas:

■ **integrated design of structures and systems**

theoretical fundamentals of integrated design (methods of life cycle (LCA) and life cycle costs (LCC) assessment, risk analysis as a tool of qualified decision making, Methods of structural design stressing durability and reliability)

design, construction and management of structure of buildings (energy and material-efficient structures of buildings, life cycle analysis and operation management of buildings)

design, construction and management of roads and airfields (advanced structures of roads and their construction, management of development and construction of roads, construction and maintenance of roads in areas affected by mining)

design, construction and management of bridges (design of methods of reliable prediction of behavior of bridges, their durability and life cycle, bridge management)

■ **advanced materials in integrated design of structures**

new material base for advanced buildings (research of new materials based on classical and secondary raw materials, composite materials and cement-based materials for water structures, concept of the use of wood-based materials)

high-performance concrete in integrated design and construction (high-performance concrete in the construction of tunnels (tunnel lining), high-performance concrete in diaphragm walls and foundation slabs, high-performance concrete in bridge structures)

recycled and recyclable materials (recycled and recyclable materials in structures of buildings, recycled and recyclable materials in bridge and road structures)

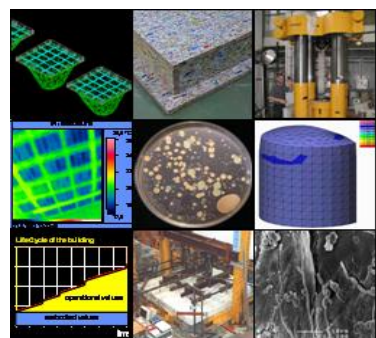
environmentally friendly materials (ecological compatibility in design of composition and construction of road structures, employment of natural bentonites and materials based on smectitic clays in integrated design of environmental structures)

advanced materials based on cement composites, metal, wood and structural glass (methods of a reliable structural design employing basic and composite materials, research of advanced structural elements and structures)

■ **integrated design for extreme situations**

extreme effects on structures and the built-up environment (risk levels and uncertainty estimation during floods, effects of technical shocks and mining activities)

methods of structural design for extreme situations (integrated design of structures exposed to floods, integrated fire design of structures, integrated design of buildings with regard to power supply failures, integrated design of buildings exposed to mining gas outbursts)



Education and Training:

GA ČR 103-03-H089 Sustainable construction of buildings and sustainable development of urban space

The main goal of this project supported by the Czech Grant Agency is to create a professional platform for communication of students in doctoral study programs and their supervisors, dealing in their research activities with different aspects of sustainable construction of buildings and sustainable development of urban space. This project started in October 2003 and is planned for 3 years duration.

Taking into account the multicriterion character of the problem of sustainable construction, the project is organized "across" different department of Czech Technical University in Prague. The aim was to involve into the team students and supervisors working in different segments of the research in this specific field of investigation.

Therefore 20 PhD students from 9 departments and from two faculties are integrated in the established Doctoral Team. Thirteen students are studying at Faculty of Civil Engineering, 7 students are studying at Faculty of Architecture.

Supervising board of the Doctoral team is formed by 6 selected teacher – supervisors of PhD students – three of them are from Faculty of Civil Engineering, three from faculty of Architecture. Overall coordination of activities of Doctoral Team is controlled by Head of Doctoral Team and by one PhD students of combined doctoral studies.

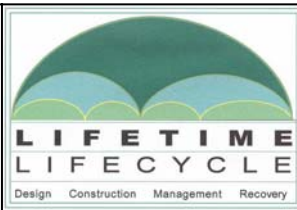
The educational activities of Doctoral team are planned and performed on three levels:

- 1) Working Discussion Meeting
- 2) Seminars
- 3) Workshops

The activity of doctoral team are presented on internet pages www.substance.cz/grant.

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