

EUREKA PROJECT E!1992 - EUROCARE ANCIENT RENDERS

1. General description

Project	E! 1992 - EUROCARE ANCIENT RENDERS	Status	Finished - 23-NOV-2001
Title	Methodologies For Characterisation Maintenance And Repair Of Renders For Ancient Buildings.		
Class	Sub-Umbrella	Technological area	Environment
Start date	01-SEP-1998	End date	01-SEP-2001
Duration	36 months	Total cost	0.5 Meuro
Partner sought	No		
Summary	Characterisation And Analysis Of Ancient Renders, Taking Into Account The Historic, Architectonic And Technological Aspects. Identification And Quantification Of The Main Characteristics To Be Reproduced. Test Methods.		

Budget and duration

Phase	Budget(Meuro)	Duration (Months)
Definition phase	0.04	6
Implementation phase	0.46	30
Total	0.5	36

Member contribution

Member	Contribution	Position	Since
Portugal	59.00%	Notified Finished	23-NOV-2001
Spain	6.00%	Notified Finished	23-NOV-2001
Slovenia	35.00%	Notified Finished	23-NOV-2001

Participants

Company	Country	Type	Role
Laboratorio Nacional De Engenharia Civil	Portugal	Research Institute	Main
Ljubljana University/Civil Engineering Institute (Zrmk)	Slovenia	University	Partner
Stap - Reparacao, Consolidacao E Modificacao De Estrut. Lda.	Portugal	SME	Partner
Monumenta - Cons. E Restauo Do Patrimon.Arquitectonico Lda.	Portugal	SME	Partner
Oz-Diagn.,Levantam.E Contr.De Qual.Em Estruturas E Fund.Lda.	Portugal	SME	Partner
Gras D.O.O.	Slovenia	SME	Partner

Participants

Company	Country	Type	Role
Centro De Estudios Y Experimentacion De Obras Publicas Lab. Central De Estructuras Y Materiales	Spain	SME	Partner

2. Project outline

Project description

Renders have great importance in the interventions on ancient buildings. In fact they have a fundamental function on the protection of ancient masonry, against climatic actions, impact actions and environmental contamination. They influence the internal ambience, due to their contribution to watertightness and water vapour permeability of the walls. They have a strong influence on the final aspect of the buildings, a function which acquires particular relevance when the historical heritage is concerned. A wrong choice of renders may mean that these functions are not insured and contribute to the acceleration of wall degradation.

Conservation interventions on renders of historic buildings must also guarantee the maintenance of the historical and architectonic authenticity of the building and the preservation, as much as possible, of the original solutions. The requirements imposed on renders, to accomplish their intended functions in each case, the characteristics corresponding to the verification of these requirements and the methodologies used to verify them are, usually, relatively poorly known. The use of empirical knowledge to fill up gaps in scientific knowledge is not sufficient for ancient buildings, for which knowledge of the usual technologies and application practice are not enough.

The project will comprise 5 distinct phases, summarised as follows:

1. Methodology of analysis and general characterisation of ancient renders.
2. Techniques for identification of different historic layers.
3. Selection of the most representative zones of a building for the execution of tests and the recollection of samples.
4. Analysis techniques of the composition of renders: development, selection, adaptation of techniques and application to case studies.
5. Identification of the main characteristics to reproduce in eventual substitution renders: development, selection, adaptation and application of test methods to case studies.

Keywords: conservation, ancient, render.

Technological development envisaged

Most current conservation interventions use materials and methods that are unsuitable for ancient buildings, so they often contribute to deprive the original constructions of their characteristics and even accelerate their physical degradation. Individual case studies, directed at finding a solution of each specific problem, usually in a short time frame, do not allow for an indepth study of the subjects or even take full advantage of the knowledge acquired in each one.

The project aims to develop a global and systematic methodology to guide conservation interventions on ancient

buildings as far as renders are concerned. It also aims to define specific requirements of renders for ancient buildings, as far as possible in a quantified way, and finally, develop, improve and adapt experimental techniques making them suitable methods to use to verify these requirements. This necessarily multidisciplinary approach, must guarantee the required information for the conservation interventions and repair of renders and will be made available to the technical milieu, thus permitting savings in human and financial terms in research activities and fruitless experimentation.

Markets application and exploitation

The maintenance of our historically built heritage has come to occupy, in Europe, a more and more expressive sector of the construction industry, as awareness of its historic and cultural value has increased and the needs for new construction have, on the contrary, diminished.

The construction typology of a great part of the European historic buildings includes the use of renders. The availability of systematic methodologies and specific requirements for the maintenance and repair of renders, will facilitate the work of construction enterprises dedicated to this kind of work and reduce its costs, as the need for research work will decrease and their possibilities of effectively plan works will improve. Establishing coherent and clear rules will also create better conditions for the emergence of specialised enterprises. The monument authorities will benefit from significant advantages by having access to technical elements and clear rules to draw up design specifications, prepare bidding processes and supervise works.

Project codes

BSI

ABL.Y	building specifications
AIP	defects
AK	research
AKO.KO	experimentation
ATR.R	quality
ATT.I	compatibility
AUR	treatment
AUY	conservation
BNF/BNJ	mechanical testing
BO/BW	chemical analysis and testing

NACE

1412	Quarrying of limestone, gypsum and chalk
142	Quarrying of sand and clay
2664	Manufacture of mortars
45	Construction
4525	Other construction work involving special trades
4541	Plastering
73	Research and development
7310	Research and experimental development on natural sciences and engineering
7420	Architectural and engineering activities and related technical

NACE

7430

consultancy
Technical testing and analysis

3. Main participant

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Organisation type Research Institute
Participant role Main

Contribution to project

Research into materials and building elements performance; definition of methodologies; execution of tests; evaluation of techniques; definition and quantification of requirements compiling of publications.

Expertise

Research institution basically devoted to research in the field of civil engineering. Its activity is mainly centered in the spheres of public works housing and town planning and industries manufacturing building materials and components. In order to achieve its aims, LNEC has accomplished research and tests, either on its own initiative or at the request of public or private clients. For the last few years, several research projects, related to such matters as the maintenance and repair of ancient buildings, materials characteristics and building performance, have been carried out. Many case studies and technical reports relating to interventions on ancient buildings have been accomplished by LNEC. For its research work, LNEC has human resources - consisting of researchers dedicated to these subjects and experimental analysts - and appropriate, modern equipment for mechanical, physical and chemical tests and microstructural analysis (including a scanning electron microscope SEM). Many of LNEC's researchers are members of international committees and groups (for scientific research, national and international normalisation, etc. LNEC also has design offices and workshops where mechanical and electronic devices can be modified or built. LNEC's library - open to the public and including some hundreds of thousands of technical documents on civil engineering and related sciences - is also an important instrument for research work. LNEC periodically organises national and international courses and seminars in the field of civil engineering. LNEC has a specialised sector devoted to editing scientific publications and a bookshop open to the public.

4. Partner

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Organisation type University
Participant role Partner

Contribution to project

Will contribute experimentally to support the development of mortar render mixes to be applied on ancient buildings. Special attention will be paid to the influence of local material properties.

Expertise

Established in 1917 on the foundation of a long established pedagogical tradition. The Faculty of Civil and Geodetic Engineering FGG is a member of the UNIVERSITY OF LJUBLJANA, SLOVENIA and involved in education, research and professional activities in the field of civil engineering and geodesy. It employs about 120 teachers, researchers and technical staff and has close to one thousand students on various courses. In the field of building materials, the main R & D projects deal with masonry and concrete. Special attention is paid to concrete with improved mechanical and durability properties, concrete made using expansive cement, polymers in mortars and concrete and restorative materials used for grouting and the injection of masonry structures. Masonry research is oriented to improvement in its strength and ductility with the accent on earthquake-resistant structures. Research is very much oriented on the development and testing of retrofitting techniques applicable to the renovation of urban heritage. Studies on sustainability as well as building physics characteristics of various masonry structures are one of the most focused in recent times. The research team, which will work on the proposed project, is experienced in the testing of materials and structures. Members of the team have carried out many national and international projects in cooperation with researchers from the USA, CHINA, INDIA, EC countries and CEE countries.

4. Partner

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Organisation type SME
Participant role Partner

Contribution to project

Development and production of trial renders; contribution to research, drawing on the firm's experience with repair materials.

Expertise

Established in 1980 in Lisbon to work on projects involving a high degree of expertise in the field of rehabilitation of buildings and structures. Under cooperation agreements with LNEC (National Civil Engineering Laboratory), STAP has been able to develop its own repair, rehabilitation and protection materials, consisting of pre-packed powder materials and polymer-based liquid materials.

4. Partner

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Organisation type SME
Participant role Partner

Contribution to project

Field maintenance, repair and rehabilitation work on ancient buildings and monuments; contribution to research; application of methodologies defined by LNEC.

Expertise

Private company established in 1997 in Lisbon, with the objective of carrying out interventions in the field of architectural heritage and ancient buildings. MONUMENTA stems from STAP, which has been active in the

rehabilitation sector of the construction industry since 1980 and is also a specialised product manufacturer. Interventions in the field of architectural heritage, demand specific skills and, above all, a different attitude, more caring and cautious, than that prevailing in general construction work. It has therefore been decided that MONUMENTA would devote itself exclusively to interventions in architectural heritage and old buildings. To pursue its goals, the new firm has acquired know-how and equipment and created a team of specialised personnel, capable of applying several techniques for the repair, strengthening, protection and modification of ancient structures, and has secured the cooperation of specialists involved in the various areas related to the conservation and restoration of monuments and ancient buildings, to work in projects involving a high degree of expertise.

4. Partner

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Organisation type	SME
Participant role	Partner

Contribution to project

Field testing, using techniques agreed with LNEC; collaboration in the production of reports and publications.

Expertise

Carries out activities in the field of non-destructive and semi-destructive tests in the inspection, survey, monitoring and quality control of structures and their materials. These techniques may be of use in the quality control of conservation and restoration interventions, in order to ensure conformity with the specifications, particularly those concerned with compatibility and durability. Since 1989, OZ has carried out numerous projects in PORTUGAL and in some of the Portuguese-speaking African countries. OZ is currently implementing its Quality Assurance System, regarding certification according to NP EN ISO 9002. OZ is a member of * CEB (COMITE EURO INTERNATIONAL DU BETON) and * RILEM (THE INTERNATIONAL UNION OF TESTING AND RESEARCH LABORATORIES FOR MATERIALS AND STRUCTURES).

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Organisation type

SME

Participant role

Partner

Contribution to project

Chemical analysis of mortars and trial applications on ancient buildings during their retrofitting. Experience gained from trial applications will help in the pilot production of mortar.

Expertise

The parent organisation - the CIVIL ENGINEERING INSTITUTE ZRMK, Ljubljana - was established in 1949: designed as a civil engineering institute on the pattern of similar ones, especially the Swiss Institute EMPA. Today, it has about 200 employees, nearly 40% of whom have had a university education. They use about 30 laboratories located on about 9000 m² of space for testing and R & D activities. Their output is about 2500 research studies and test reports a year. Significant achievements of the Institute have been published in more than 3000 scientific papers, publications and studies. The Institute holds several patents for its inventions and innovations. A number of laboratories involved in the testing and research of all civil engineering materials enable complete solutions to be found to a wide range of civil engineering and building problems. The GRAS company is part of the Technological Park of CEI ZRMK. It is engaged in various activities: R & D projects, consulting, planning, monitoring and the execution of special works in the field of structural engineering and energy and environmental issues in buildings with major effects in post-earthquake rehabilitation of masonry and reinforced concrete buildings. Over the last five years, CEI ZRMK, Ljubljana has cooperated in 10 international projects dealing with the thermal performance of buildings and energy efficiency and more than 20 larger national projects from the targeted domain.

4. Partner

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Organisation type	SME
Participant role	Partner

Contribution to project

Research on rendering and plastering materials and related building elements performance; definition of methodologies; evaluation of tests; comparison of methodologies/results obtained by participants; production of publications.

Expertise

Research institution specialised in technical assistance, R & D in the field of civil engineering and building structure behaviour, as well as properties of all building materials and their applications and performances. For the last ten years, CEDEX has been carrying out works related in monumental/historical buildings restoration assessment. Main topics/subjects are: study and definition of masonry pathologies, analysis of environmental causes of material deterioration, characterisation of materials (stone, brick, mortars, renders, mud walls) of masonry by laboratory and in situ tests, selection of cleaning methods and the efficiency and durability of the repair treatments.