# EUREKA PROJECT E!672 - EUROCARE THAUMASITE

## 1. General description

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|---|---|---|---|
| **Project** | E! 672 - EUROCARE THAUMASITE | **Status** | Finished - 06-JUN-1994 |
| **Title** | **Detection, Monitoring And Reduction Of Thaumasite - Deterioration Of Constructions** | | |
| **Class** | Sub-Umbrella | **Technological area** | Environment |
| **Start date** | 01-JUL-1991 | **End date** | 01-JUN-1994 |
| **Duration** | 35 months | **Total cost** | 0.26 Meuro |
| **Partner sought** | No | | |

**Summary**

Establishment Of Service Tools Collection For Construction Industry To Reduce Problems With Thaumasite Formation, Comprising Detection And Monitoring Techniques, Guidelines For Repairs And Recommendations For Damage Prevention

### Budget and duration

| Phase | Budget(Meuro) | Duration (Months) |
|---|---|---|
| Definition phase | 0.26 | 6 |
| Implementation phase | 0 | 29 |
| **Total** | **0.26** | **35** |

### Member contribution

| Member | Contribution | Position | Since |
|---|---|---|---|
| **Denmark** | **38.00%** | **Notified Finished** | **06-JUN-1994** |
| United Kingdom | 54.00% | Notified Finished | 06-JUN-1994 |
| Italy | 8.00% | Notified Finished | 06-JUN-1994 |

### Participants

| Company | Country | Type | Role |
|---|---|---|---|
| **Innovell A/S** | **Denmark** | **Large company** | **Main** |
| Dtu - Department Of Geology And Geotechnical Engineering Danmarks Tekniske Universitet | Denmark | University | Partner |
| Enco S.R.L. | Italy | SME | Partner |
| Bre - Building Research Establishment/Inorganic Materials | United Kingdom | Research Institute | Partner |

## 2. Project outline

### Project description

The project refers to a broad spectrum of technical areas, from repair of historical buildings and collapse of concrete structures to development of new materials and protection of the environment. The common denominator of problems in these areas are the formation of the mineral THAUMASITE.
The project aims at establishing a collection service tools for the construction industry to reduce problems with THAUMASITE formation.
The collection of service tools comprises detection and monitoring techniques, guidelines for the repair of damaged constructions and recommendations for the prevention of damage.
The establishment of the service tools will be based upon creation of basic knowledge, syntheses of experience from different technical areas and application of advanced analytical techniques.
THAUMASITE ($CaSiO_3$, $CaSO_4$, $CaCO_3$, $15H_2O$) has been found as a reaction product in a severely damaged concrete lining of a tunnel in ITALY and in deteriorated historical buildings which have been repaired with portland cement mortar, also in ITALY. Mortars and renders of brickwork and concrete structures in the UNITED KINGDOM have deteriorated due to THAUMASITE formation. In DENMARK the mineral has been found in new cement-bonded products which contain waste materials from flue-gas cleaning and also in a large deposit for waste materials.
The traditional mineralogical methods of analysis of THAUMASITE are inadequate due to the similarity of the mineral with other minerals.
The THAUMASITE deterioration mechanism is not known. It is probably quite different and may be more serious than most other deterioration mechanisms. At the same time, the risks of severe THAUMASITE deterioration are increasing, due to an increasing usage of waste water materials from the environmental protection sector, due to the lack of monitoring systems and insufficent knowledge of repair.
The present partners of this project have been working with THAUMASITE problems in quite different areas and with different techniques. It is envisaged that a concerted action by these partners will lead to results which may increase the service lifetime of exposed constructions, avoid future costly durability problems with new products, avoid environmental problems from deposit areas and save historical buildings from further degradation.
The project will include activities related to:
- survey of the extension of the problem,
- collection of existing information,
- reaction mechanisms,
- analytical methods,
- monitoring methods,
- changes in properties due to THAUMASITE formation,
- establishment and test of guidelines,
- dissemination of results.

The project will be divided into three phases, a definition phase, a main project phase and a dissemination phase. The main project phase will be divided into steps. There will

be a decision point after each phase and after each step.
In the definition phase a series of activities will be carried out which will result in 3 reports:
1. Description of the extension of the problem and the importance of the problem. A report based on a literature survey and on the experience of the partners.
2. A state-of-the-art report on reaction mechanisms, stability and methods of analysis of THAUMASITE.
3. A "blueprint" of the activities of the main project phase, including, objectives, work plan, timescale, budget, funding plan, partners' involvement and the cooperation agreement.

## Technological development envisaged

It is envisaged that the project will result in techniques for the detection and monitoring of THAUMASITE deterioration as well as guidelines for the prevention and repair of damage caused by THAUMASITE formation.

## Markets application and exploitation

The results may be used by contractors, entrepreneurs, designers, consultants involved with concrete in aggressive environments, historical buildings, building materials containing waste materials and deposits of waste materials. The initial results will be exploited in the three countries represented in the project by the participants. The final results will be available to all countries.

## Project codes

### BSI

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|---|---|
| RCE.R | tunnels |
| RD | buildings |
| VUK/VUS | concretes |

### NACE

## 3. Main participant


**Company** **Innovell A/S**
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**Contact** **Dr. Lars Hjorth**
Director

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**Organisation type** Large company
**Participant role** Main

### Contribution to project

Danish contribution: 520,000 ECU. Responsible for activities related to the use of waste materials, also project coordination and contacts with other industries and R & D centres.

### Expertise

Private consulting company operating internationally with technology transfer, industrial development, business development and materials technology. It is a member of the SPRINT network, the European Community Programme for Innovation and Technology Transfer. Mr. L. Hjorth (M.Sc.), is a Director of INNOVELL and has been engaged with industrial R & D in the cement and concrete industry for more than 20 years. For the last 3 years he has been involved as a consultant and a coordinator in development work on the utilization of waste materials from flue gas cleaning at the Danish power plants.

## 4. Partner


**Company** **Dtu - Department Of Geology And Geotechnical Engineering Danmarks Tekniske Universitet**
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**Contact** **Dr. Torben Knudsen**

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**Organisation type** University
**Participant role** Partner

## Contribution to project

Will be responsible for the activities related to reaction mechanisms and stability problems.

## Expertise

IMI is a Department of the DANISH TECHNICAL UNIVERSITY engaged in R & D work related to the mineral industries such as ceramics, glass, cement and concrete. Dr. Torben Knudsen has been engaged in research on the hydration of cement for 20 years. He has developed a special technique which has been applied to THAUMASITE problems since the end of 1990. For the last 6 years, Mrs. K. Gram Jeppesen (M.Sc.) has been engaged in work on the properties of cement-bonded materials which contain waste materials from flue gas cleaning. One year ago, Mrs. K. Gram Jeppesen detected serious deterioration and THAUMASITE formation in new cement-based materials containing such waste materials.

# 4. Partner

**Company** **Enco S.R.L.**
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**Contact** **Prof. Mario Collepardi**
General Manager

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**Organisation type** SME
**Participant role** Partner

## Contribution to project

Italian contribution: 270,000 ECU. Will be responsible for activities related to historical buildings and repair methods.

## Expertise

Private consulting company engaged in materials technology of building materials, the repair of historical buildings, R & D and education. Mr. M. Collepardi is the Director of ENCO and a Professor of materials science at the UNIVERSITY OF ANCONA. He has detected THAUMASITE in historical buildings in the region of Venice, and he has published papers on THAUMASITE problems based on field examinations and laboratory investigations.

## 4. Partner


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| **Company** | **Bre - Building Research Establishment/Inorganic Materials**<br>(Near Watford),<br>Wd2 7jr Garston<br>United Kingdom<br><br>Tel +44 1923 894 040<br>Fax +44 1923 664 010 |
| **Contact** | **Dr. N. J. Crammond**<br><br>Tel +44 1923 894 040<br>Fax +44 1923 664 010 |
| **Organisation type** | Research Institute |
| **Participant role** | Partner |


### Contribution to project

British contribution: 270,000 ECU. Will be responsible for the establishment of guidelines to the construction industry.

### Expertise

BRE is the National R & D organisation of the building industry in the U.K. and has substantial knowledge of materials technology, based on decades of R & D work. Over the last 10 years, Dr. N. J. Crammond has specialised in the research of both internal and external sulphate attack of brickwork and concrete. Since 1985 she has become involved in studying deterioration of existing structures caused by THAUMASITE formation. The type of constructions vary greatly and THAUMASITE has been found to occur in concretes, mortars, grouts, air-cooled blast furnaces slags and road sub-bases. BRE has established laboratory methods for the detection of THAUMASITE. This experience will be utilized to further develop monitoring techniques.