

EUREKA PROJECT E!664 - EUROCARE CON-COAT

1. General description

Project	E! 664 - EUROCARE CON-COAT	Status	Finished - 17-JUN-1994
Title	Hydrophobic Coatings For Facades Of Concrete And Rendering - An Investigation Into The Effects On Transport Of Moisture		
Class	Sub-Umbrella	Technological area	Environment
Start date	01-JAN-1991	End date	01-OCT-1993
Duration	33 months	Total cost	0.3 Meuro
Partner sought	No		
Summary	Obtaining Information On How Water Repellents And Visible Coatings Can Be Used In Combination In Order To Control The Transport Of Moisture In And Out Of The Outermost Layers Of Facades Made Of Concrete And/Or Rendering.		

Budget and duration

Phase	Budget(Meuro)	Duration (Months)
Implementation phase	0.3	33
Total	0.3	33

Member contribution

Member	Contribution	Position	Since
Iceland	49.00%	Notified Finished	17-JUN-1994
Finland	8.00%	Notified Finished	17-JUN-1994
Norway	43.00%	Notified Finished	17-JUN-1994

Participants

Company	Country	Type	Role
Ibri - The Icelandic Building Research Institute	Iceland	Research Institute	Main
Ice Tec - The Technological Institute Of Iceland	Iceland	Research Institute	Partner
Malning H.F.	Iceland	SME	Partner
Scancem Chemicals A/S	Norway	SME	Partner
Norsk Leca A/S	Norway	SME	Partner
National Institute Of Technology	Norway	Research Institute	Partner
Verkraeoeistofan Linuhoennun H.F.	Iceland	SME	Partner
Sementsverksmioeja Rikisins	Iceland	SME	Partner
Wilhelm Wilhelmsen A/S	Norway	SME	Partner
Jotun A/S - Corporate Technology Centre	Norway	Large company	Partner
Lemminkainen Oy	Finland	Large company	Partner

2. Project outline

Project description

The project comprises material systems for exterior facades, composed of concrete and rendering at the substrate and surface treating materials of two main types; water repelling impregnating agents and surface coatings with a visible film (paints and related coatings of organic and inorganic binders). The research involves extensive comparison measurements to be carried out in order to obtain data about the water transport properties of such surface material systems, which are considered to be of importance in reducing damage that occurs in painted cementitious facades.

The main experiments will be carried out on numerous test pieces in "Spray-Dry Towers," simulating rain and wind drying in the laboratory. The test pieces will mostly be cut as regularly shaped stones, from "Facades" specially built of the various substrate materials and surfaced treated more or less at conditions known in real situations.

The experiments will be based on measurements of the quantities of water absorbed through and released out through the test surface of the treated stones under various parameter combinations from the following three categories:

1. Surface treatment material systems, i.e. various combinations of water repellents and paints.
2. Substrates of various types and properties W.R.T. water absorption and inner conditions such as water content and temperature.
3. External conditions, i.e. cycles of various combinations of wet and dry periods. The wet conditions involve water spraying, the drying conditions involve various combinations of air humidity, temperature and speed. For correlation purposes, test pieces subject to exterior exposure will be selected.

The idea is that the results will be used as information basis for the development of:

- a. better functionally oriented products,
- b. test methods simulating natural conditions,
- c. practical descriptions of durable material systems for improved protection of facades.

A preparatory project has already been completed. In the same way as this main project, it was supported by THE NORDIC FUND FOR TECHNOLOGY AND INDUSTRIAL DEVELOPMENT (NI).

The total cost of the preparatory project amounted to about 100 ECU. Its chief objectives were to obtain basic information regarding technical details for carrying out the main research experiments. It involved:

- a. the development of experimental equipment and a comparison method based on the idea of using "Spray-Dry Towers,"
- b. experiments designed to find out whether the parameters involved could be reduced in number, which was found to be the case,
- c. experiments aimed at providing data for the detailed planning and organising of the main project, as well as for correlation purposes.

As to the project background, there are indications that

painted facades can be made quite hydrophobic in a very favourable way by means of certain combinations with water repellents. In overwhelming cases where concrete and rendering are damaged by "Natural" forces, water or moisture plays an important role among the causes. The same applies when the problems are malfunctions, rather than damage, such as efflorescence and reduced insulation properties. Polluting chemicals also normally require water for their damaging effect, e.g. the acidic ones. It is therefore of considerable importance to be in a position to control the moisture level in these cement based materials, especially when their quality is not first class as often turns out to be the case. In such situations protection can be essential and it is often approached or attempted by means of surface treatment.

On the contrary, concrete and rendering surfaces often are treated with coating materials, of widely varying types, purely for aesthetic reasons. In such cases, if the quality of the substrate is such that it is not thought to require protection against e.g. rain water, questions of another kind may need consideration: What surface materials will best fulfil the aesthetic requirements without the risk of being detrimental to the substrate?

Some coatings may disturb the dynamic moisture equilibrium between a cementitious facade and the exterior atmosphere or the ever changing weather conditions. A coating may, for instance be a barrier against the diffusion of water vapour out of facades, without being a very good barrier against rain water. Prolonged wetting of surface films may cause strong water absorption into the concrete or rendering substrate.

It has been shown by systematic measurements of moisture in a number of real facades of concrete and rendering, extending over a few year periods, that the application of water repelling agents alone can effect a considerable reduction in the moisture level. The presence of many types of paint films on top of water repelling agents can, on the other hand, lead to a considerable slowing down of the process of "Drying-Out" of facades. Paint films without e.g. "Priming" with a repellent may not bring about a reduction in the moisture level at all.

Technological development envisaged

The technological objectives are to obtain information on how the two fundamentally different types of surface treating materials, water repelling impregnating agents and surface coatings with a visible film, can be used in combination in order to control the transport of moisture in and out of the outermost layers of facades made of concrete and/or rendering. Water repellents and paints "Used-In-Combination" should be understood as materials from these two categories applied one on top of the other in selected combinations and/or mixed with one another in selected proportions prior to application.

Results of systematic extensive experiments with such combinations have not been found in literature worldwide. Furthermore, no such results and very limited know-how has come out to contact with a number of experts in related fields at research centres and industrial companies in Northern and Middle Europe and America.

Thus, this research project is very likely to contribute considerably towards filling a gap in the knowledge on certain important aspects regarding the durability of facades in wet climates. A substantial improvement in the technology of surface treatment of cementitious facades is expected to result.

The approach used in this project in order to investigate the transport of moisture is based on the idea of simulating as best as possible in the laboratory numerous naturally occurring climatic conditions, rather than relying on conventional standardized methods of measurement. The conventional methods involve absorption by surface immersion and drying out as standardized laboratory conditions, as well as the so called Cup-Method for determining vapour permeability factors.

Results already obtained in the preparatory project very strongly indicate that it might be very difficult if not impossible in many cases to predict the effect of surface material systems on moisture levels in facades, if only factors from such conventional measurements are available.

Markets application and exploitation

Project codes

BSI

CIL.IC	humidity
PK	surface treatment
PL	coating processes
RD	buildings
VUK/VUS	concretes

NACE

3. Main participant

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Organisation type Research Institute
Participant role Main

Contribution to project

Administration, Project Board participation, Working Group (continuous technical planning), preparation of materials, design, construction and mounting of equipment, carrying out of experiments, evaluation of results.

Expertise

Several of the Institute's members of staff have long experience of research within the field of concrete and rendering. This includes problems related to high moisture levels in facades of concrete, e.g. frost damage and alkali aggregate reaction damage. The experience also extends to surface coatings for concrete and rendering, education by means of courses and technical report and leaflet writing, as well as testing and product development work under both short and long term contracts from industrial companies. R & D, testing and consultation, technical publications and education (courses) for the building industry, with main emphasis on general construction (including road and soil) technology and cementitious materials technology.

4. Partner

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Organisation type Research Institute
Participant role Partner

Contribution to project

Project Board participation (administrative planning), Working Group participation (continuous technical planning), preparation of materials, construction and mounting of equipment, carrying out of experiments.

Expertise

Experience in testing of coatings for concrete and rendering. R & D, testing and consultation, technical publications and education (courses) for the industry in general.

4. Partner

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Organisation type SME
Participant role Partner

Contribution to project

Project Board participation (administrative planning), Working Group participation (continuous technical planning), preparation of materials, design, construction and mounting of equipment.

Expertise

The Company's technical staff enjoys long standing experience in the field of surface treatment of concrete and rendering, and has in terms of research and product development contributed considerably towards the solving of the problem of reducing high moisture levels frequently occurring in ICELAND. Production and sale of paints, water repelling impregnating agents and related products.

4. Partner

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Organisation type SME
Participant role Partner

Contribution to project

Working Group participation (continuous technical planning), preparation of materials.

Expertise

The Company's technical staff has long experience in the development of additives for concrete and mortars, as well as the solving of problems connected with the surface treatment of concrete and rendering. Production and sale of additives for concrete and related products, including water repelling impregnating agents.

4. Partner

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Organisation type SME

Participant role Partner

Contribution to project

Working Group participation (continuous technical planning), preparation of materials.

Expertise

The Company's technical staff has long experience in the development of the use of mortars and rendering as well as in the solving of problems connected with surface treatment of LECA block masonry. Production and sale of LECA blocks and materials for rendering.

4. Partner

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Organisation type Research Institute
Participant role Partner

Contribution to project

Administration, Project Board participation, Working Group (continuous technical planning), preparation of materials, design, construction and mounting of equipment, carrying out of experiments, evaluation of results.

Expertise

The Institute's Division for Surface Technology enjoys long experience in dealing with surface coatings for concrete and rendering, as well as for other substrates. The activities in this field involve research and education by means of courses and technical report and leaflet writing, as well as testing and product development work under contracts from industrial companies. R & D, testing and consultation, technical publications and education (courses) for the industry in general.

4. Partner

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Organisation type SME
Participant role Partner

Contribution to project

Working Group participation (continuous technical planning), design of equipment, evaluation of results.

Expertise

The Company's engineers have specialised in the design and wear of concrete constructions with and without rendering, and have dealt with the serious damage which has occurred on a large scale in ICELAND as a result of the high moisture content in facades, e.g. frost and alkali aggregate reaction damage. Construction engineering consultation.

4. Partner

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Organisation type SME
Participant role Partner

Contribution to project

Project Board participation (administrative planning), Working Group participation (continuous technical planning), preparation of materials, design, construction and mounting of equipment.

Expertise

The Company's technical staff enjoy long standing experience in the field of concrete and rendering and have dealt with the serious damage that has occurred on a large scale in ICELAND as a result of high moisture content in facades, e.g. frost and alkali reaction damage. Production and sale of hydraulic cement (through a daughter company, SERSTEYPAN S.F.) development, production and sale of cement-based products such as concrete repair mortars, rendering mortars and coatings, construction components, etc.

4. Partner

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Organisation type SME
Participant role Partner

Contribution to project

Project Board participation, Working Group participation (continuous technical planning), preparation of materials.

Expertise

The Company is supported by technical information from WACKER CHEMIE GMBH in GERMANY, a leading company in the field of water repelling impregnating agents for mineral substrates. Sale of water repelling impregnating agents manufactured by WACKER CHEMIE GMBH.

4. Partner

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Organisation type
Participant role

Large company
Partner

Contribution to project

Project Board participation, Working Group participation (continuous technical planning), preparation of materials.

Expertise

The Company's technical staff enjoys long standing experience in the field of surface treatment of concrete and rendering, in terms of research and product development and the solving of problems connected with facade surfaces. Production and sale of paints and related products as well as raw materials for paints and plastics.

4. Partner

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Organisation type
Participant role

Large company
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Contribution to project

Expertise