



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No 314678



**FINAL CONFERENCE - DORDRECHT**

**ENERGY EFFICIENCY FOR EU HISTORIC DISTRICTS SUSTAINABILITY**

**NEW INSULATING MORTAR - ISOCAL**

**Dr. Harold Brocken, Bas Verhey**

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## FINAL CONFERENCE - DORDRECHT



**Producer-supplier; finish for facades, walls, ceilings**

**Privately held, markets in NETHERLANDS, EU, World**

**Project oriented techn. support, innovation-development**



**Product group; mineral based, restauration - historic substrates**

**Knowledge & expertise together CH organisations**

### Co-operates in EU-EFFESUS:

**Bas Verhey; former owner BOFIMEX, CH expert**

**Harold Brocken; Ph.D. material science, Building consultancy (TNO, private office)**



### EFFESUS GOALS FOR INSULATING MORTAR

- **Technical compatible on historic substrates**
- **Acceptabel in Cultural Heritage (cosmetic & technical/reversible)**
- **Appicabel (normal requirements-conditions substrate, professional execution)**
- **Preferably inside & outside, if possible all relevant substrate types**
- **Affordable**
- **Innovative (items above + optimal insulation property)**

**Description of Work – in 2 years developed-tested-market ready, follow-up case studies**



## STARTING POINTS TO DEVELOP INSULATING MORTAR

### Selection of binder

- cement, cement-lime
- lime, trass-lime
- natural hydraulic lime, NHL2, NHL3, **NHL5**

### Insulating agent/filler

- aerogel
- expanded clay, perlite, vermiculite
- cork
- EPS (expanded polystyrene)



### FORMULATION TEST AEROGEL INSULATING MORTAR

#### Achievements (lab scale)

- develop mortar composition with aerogel
- prepare mortar bars, apply mortar layer

#### Disadvantage

- dusty, not robust in application, expensive, weak-fragile





### RECONSIDER STARTING POINTS MORTAR DEVELOPMENT (market ready in 2 years)

- PROFESSIONAL applicability
- Affordable – NOT EXPENSIVE
- EPS as insulating filler if REVERSIBEL than TECHNICAL ACCEPTABLE

### WHAT IS COMPATIBILITY?

STEP 1 – thermal insulation on historic substrates needs adding material layer

STEP 2 – preserve ancient material

STEP 3 – new material must be reversible (without harming ancient material)

STEP 4 – necessary finish layer is technically-cosmetically the same



## FORMULATION TEST NHL5-EPS INSULATING MORTAR - ISOCAL

### Achievements

- develope mortar composition with high vol% EPS
- prepare mortar bars, flex.strength 0.17 N/mm<sup>2</sup> (28d) 0.22 N/mm<sup>2</sup> (90d)
- lambda-value 0.063 W/m<sup>2</sup>K

### Advantage

- EPS cheap-available, light weight (building logistics, health-safety)





### APPLICATION TEST ISOCAL INSULATING MORTAR

- Results**
- sticky, but general applicability OK
  - good consistency and flattening/levelling
  - apply by hand and spray (contact layer to increase surface on substrate)
  - 3cm in one layer







### EOTA WALL TEST (DURABILITY) ISOCAL INSULATING MORTAR

- Set-up**
- simulate outside conditions, cyclic heat-rain, freeze-thaw (Univ. Stutt.)
  - substrate brick masonry, stone, wood frame (masonry fill in)
  - build up in 2x (1<sup>st</sup> wall break down 100% reversible)
  - contact layer (sprayed), finish layer (NHL5) with mesh, partly transp. coating





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### FIELD TEST & CASE STUDY ISOCAL INSULATING MORTAR

#### laboratory

- further product specifications (Univ. Stutt.)

#### 2 locations

- field test (panel outside) Fraunh. Holzkirchen – thermal specs, durability
- case study monastery Benedikt Beuern – inside, energy saving



Holzkirchen



Benedikt Beuern



### MARKET READY BOFIMEX ISOCAL PRODUCT SYSTEM

#### Fields of Application

- cultural heritage buildings and historic districts
- applicable on mineral substrates; natural stone, ceramic brick/block, old render, concrete

#### Advantages

- NHL5 binder compatible with historic substrates
- for both indoor and outdoor application
- excellent thermal insulating characteristic
- hand or spray application
- light weight: upto 3 cm layer thickness in one application
- ready-to-use product