

## MW-Composites – Sustainable composites based on hydraulic binders and mineral wool residues

### Summary

**Scope** – The construction industry is vital for sustainable development, contributing to the social and economic development of Europe. However, it is responsible for serious environmental issues. In this context, the incorporation of waste and by-products in building materials has been identified as a key strategy to achieve a more circular economy and greater sustainability in the construction sector. This project aimed to study the use of mineral wool residues for the production of new mortars and concrete, leading to the development of new cement and hydraulic lime-based thermal mortars containing cork granulates, new pre-dosed lightweight concretes incorporating expanded clay aggregates, as well as projected mortars. In this way, an improvement in mechanical resistance, durability, fire behaviour and environmental performance was expected for the newly developed products, when compared with current thermal mortars and lightweight concrete. Simultaneously, an increase in the circularity of the new products was achieved.

### Main objective

In line with the circular economy models promoted by the European Commission, which foresees the reduction of waste generated and also their reuse, this project aimed at the development of new thermal mortars and lightweight concrete with the incorporation of wool waste minerals.



### Project activities and expected results

It was expected that the work in the MW-Composite project, with a total duration of 30 months, was developed according to the following structure:

#### Activity 1 – Preliminary studies

Initially, a detailed survey of the national and international regulations and standardization applicable to this type of product was carried out. The mineral wool waste was characterized and a compatibility study of the mineral wool

waste with the various binders and aggregates was also performed.

#### Activity 2 – Design, development & characterization of the new products

The definition of the compositions and the physical, chemical and mechanical behaviour of the new composites were characterized in this activity. The durability of the defined compositions was also evaluated, in several conditions of accelerated aging.

#### Activity 3 – Fabril approach

The existing conditions and the necessary adaptations for the preparation of the mineral wool waste and the production of new products were analysed, which allow us to select the best compositions, and to adapt the conditions for the industrial manufacturing. The manufacture of new products in a factory environment was also achieved in this activity.

#### Activity 4 – Validation of the new products developed

The application conditions and the performance of the new products developed, both in the laboratory and in real conditions, were evaluated in the scope of activity 4. A life cycle assessment study that allowed to demonstrate the environmental performance of the products developed was also carried out.

#### Activity 5 – Promotion and dissemination of results

The activity to promote and disseminate the results led to technical sheets and application rules for the newly developed products. Technical and scientific content, to widely disseminate the project's results (seminars, scientific conferences, publications, website) were also elaborated. The team also participated in relevant technology events in the sector, in the scope of activity 5.

### Main results achieved

#### Reactivity of mineral wool waste as a supplementary cementitious material

The reactivity of mineral wool waste as an additive to cement was explored, by performing hydration heat and pozzolanicity tests. Although the incorporation of these residues resulted in the reduction of the heat of hydration of the Portland cement, the mineral wool fibres showed pozzolanic activity after 15 days. In this context, mineral wool waste can potentially be used as a supplementary

### Project Reference

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### Leading Institution

Secil Martingança – Aglomerantes e Novos Materiais para a Construção S.A. (Portugal)

### Partners

Volcalis – Isolamentos Minerais S.A. (Portugal), Itecons – Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia, Ambiente e Sustentabilidade (Portugal)

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### CERIS

Coimbra Hub: 273 972.26€

### Project Website

<https://www.itecons.uc.pt/services/projects/105>

cementitious material for the development of more sustainable construction materials.

Incorporation of mineral wool waste in thermal mortars and lightweight concrete

This project allowed the development of at least 4 new thermal mortars with the incorporation of mineral wool: 2 mortars incorporating hydraulic binders and cork aggregates, 1 mortar formulated with natural hydraulic lime binder and cork granules and 1 plastering mortar. Additionally, 2 new lightweight concretes containing expanded clay and mineral wool waste were developed.

Improvement of the mechanical properties of the new thermal mortars with the incorporation of mineral wool waste

The studies carried out in this project allowed us to increase the compressive strength by at least 10% and the flexural strength by at least 15% of one of the new mortars with the addition of mineral wool waste, when compared to the reference mortar.

Ease of application of the new mortars developed

The capacity of application through spraying of the new mortars with mineral wool waste was

demonstrated in this project. The new mortars were applied by spraying them on masonry support and compared with the reference samples. During the mechanical projection, it was observed that the new mortars present good workability. It was shown, that the introduction of mineral wool waste in the mortar formulation does not affect the typical application process of this type of coatings, proving to be suitable products from the applicator's perspective.

Environmental performance

During the course of the project, a life-cycle assessment was carried out with the aim of quantifying the environmental performance of the new products developed and also to compare with the environmental performance of reference products already available on the market. It was shown that, one of the new mortars and a new lightweight concrete incorporating mineral wool present better environmental performance for most categories studied when compared to the reference solutions. The incorporation of mineral wool waste, which comes from the Volcalis production process, into new products, allows the recovery of this waste, reducing the environmental impacts associated with the landfill of this type of waste.

