

Composite UHPC-AAC/CLC façade elements with modified interior plaster for new buildings and refurbishment

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Abstract

The awareness of the environmental impact of the building sector is increasing. Steel reinforced concrete is the most commonly used construction material though with a high embodied energy and carbon footprint. Large environmental gains may arise if an alternative to steel reinforced concrete is developed. In this context, Ultra-High Performance Concrete (UHPC) materials are shown to be promising alternatives with advantages such as lower embodied energy and reduced environmental impact. Predictions suggest that UHPC sandwich elements for building envelopes could have other benefits such as an increased service life, optimised use of building area due to thinner elements and minimized maintenance due to the absence of reinforcement or use of non-corrosive reinforcing materials such as carbon fibres. In the framework of the H-HOUSE project funded by the EC, composite elements are developed. The aim is to create façade panels in a one-step production process, combining an Aerated Autoclaved Concrete (AAC) or Cellular Lightweight Concrete (CLC), insulation layer with an external UHPC supporting layer. To enhance occupant comfort and health hygroscopic materials that are capable to buffer indoor air humidity shall be applied to the inside of such elements. The material development to date indicates that aerogels increase the water vapour adsorption capacity of an earth plaster by approx. 70% - 90%. Indoor air humidity levels are expected to be more stable which shall subsequently improve the indoor climate and minimise potential damages to the construction.