



ADAPTIVALL UPDATE

ADAPTIVALL will provide a new solution for energy-efficient buildings by developing a multifunctional and climate-adaptive panel. This novel panel consists of 3 elements based on advanced technologies: 1) lightweight concrete with nano-additives for efficient thermal storage and load bearing capacity; 2) adaptable insulation for switchable thermal resistance; and 3) total heat exchanger (THEX) with nanostructured membrane for temperature, moisture and anti-bacterial control.

In the first two years, the work focused on material development and lab-scale performance testing on the separate components. The material development is supported by TRNSYS simulations of a simplified ADAPTIVALL panel. From the simulations it was concluded that the ADAPTIVALL energy saving ambitions are feasible given certain boundary conditions and these simulations have set the requirements for the switchable insulation, the lightweight buffer and the THEX. Apart from the three chosen elements of the multi-functional Adaptivall panel, the ability of the ADAPTIVALL to harvest solar heat and therefore the role of the cladding, has proven to be important as well.

In the coming 6 months, the lab-scale components will be integrated in a panel to be tested on the scale of one square meter. Next year the making of a larger demo of 10 square meters is foreseen to be tested on Passyscells in Chambéry.

SWITCHABLE INSULATION

Potential insulation materials and design requirements for adaptive insulation were identified. Based on this, four different adaptive insulation concepts were developed. Based on feasibility tests with small scale prototypes (up to 1 m scale) the two most promising were selected for further investigation. 1 m² prototypes of both concepts were built, tested and optimized. Based on the results the final concept was chosen: a short cut based adaptive insulation. Currently, the insulation component is produced to be integrated in the lab-scale prototypes.

LIGHTWEIGHT BUFFER

Design requirements, concrete formulation, concrete panel configuration and characterization of all potential materials have been carried out during the first 18 months. A promising concrete dosage, based on PCM and binder additives to increase the conductivity and energy exchange with the PCMs in the concrete, has been achieved. The mechanical and workability requirements have limited the final density of the concrete with PCMs to 1600 kg/m^3 , while the Specific Heat is double than that of conventional concrete of 2400 kg/m^3 . Currently the concrete panels are being produced to be integrated in the labscale prototypes.



Figure: Preparation of a labscale prototype of the buffer component of Adaptiwall.

TOTAL HEAT EXCHANGER

Specifications and requirements have been set for the realization of a total heat exchanger (THEX) that can be integrated in a prefabricated wall element. Using a numerical model the baseline membrane and a post treatment procedure, separator technologies and separator dimensions have been selected. Now an experimental campaign has been initiated in order to compare the technologies of (3D printed) prototyped separators, in combination with the post treated baseline membrane.

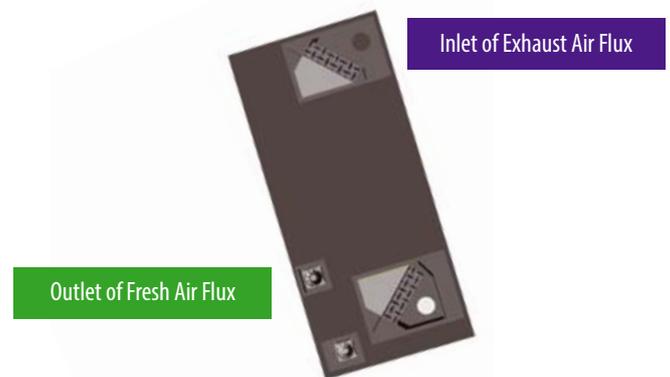


Figure3: THEX representation.

DEVELOPMENT OF THE LAB-SCALE PROTOTYPES

The efforts within the ADAPTIWALL project so far have been concentrated around the development of the adaptive material components: the adaptive insulation, load bearing buffer, and total heat exchanger. These developments on material level have been continuously supported by dynamic simulations to provide input for the optimization of the materials as well as for the control strategy for adapting the panel according to the climate conditions. With the finalization of the performance tests of the material components the project has entered a crucial phase. Through close collaboration all the efforts on material level are being integrated into an actual building component; the ADAPTIWALL façade element. This conversion takes place in two subsequent steps:

1. The designing, building and testing of lab-scale prototypes (approximately 1 m^2),
2. The designing, building and testing of a full-scale demonstrator panel to be applied in the PASSYS cells demo-park of CEA in Chambéry.

Currently the design and manufacturing of the 1 m^2 labscale prototypes is in progress. Four prototypes are foreseen to be able to test the influence of

different materializations and interactions of material components in an integrated element. Besides testing of thermal properties, which will give insight in the expected energy savings of an ADAPTIWALL retrofit, also the monitoring and regulating system will be tested for its reversibility and durability. The results will be used for further optimization towards the demonstrator in France.

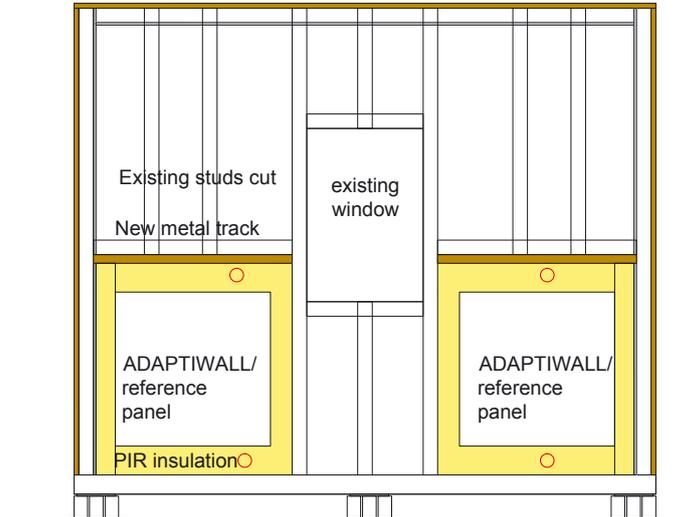
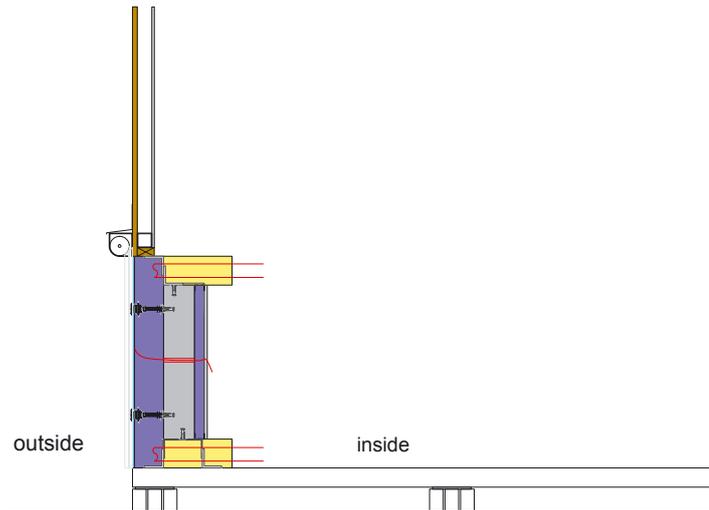


Figure: Overview of ADAPTIWALL set up for testing the lab-scale prototypes

DISSEMINATION ACTIVITIES

VII International Congress on Architectural Envelopes in San Sebastian (ICAE 2015) 27-29 May, 2015

ADAPTIWALL was present at the VII International Congress on Architectural Envelopes in San Sebastian, between 27-29th of May 2015. The main topic of the Congress was related to “Smartization” and/or the introduction of new technologies in Architectural Envelopes. The Congress was hosted by Tecnalia. AMANAC hosted a session where Isabel Lacave Azpeitia from Acciona Infraestructuras on behalf of the ADAPTIWALL consortium, gave an oral



presentation of the paper "How to design an adaptive wall panel for retrofitting with multiple innovative technologies". The presentation explained our integrated design approach in order to develop a complete ADAPTIWALL façade system. The paper can be found in the conference proceedings and on our website.

As part of the AMANAC session a fire workshop was organized. Two ADAPTIWALL partners (ACCIONA and FASADA) participated in the workshop. The most important issues that were discussed on the workshop were:

- New Trends in Fire Retardant Materials
- Overview of the fire characterization of materials
- Façade and structural fire testing
- Computational tools for Fire Research

The Congress gathered more than 300 participants and it was a great opportunity to meet with potential stakeholders and users of ADAPTIWALL system.

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PROJECT INFORMATION

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Website www.adaptiwall.eu



www.adaptiwall.eu

PROJECT PARTNERS

