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ScienceDirect

Procedia Environmental Sciences 38 (2017) 148 – 154

Procedia Environmental Sciences

International Conference on Sustainable Synergies from Buildings to the Urban Scale, SBE16

Ventilated Facades: Requirements and Specifications Across Europe

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Abstract

The paper presents the ventilated facades as an intervention for efficient energy upgrade of new and, mainly, existing buildings. It focuses on the requirements that this specific building element should fulfill, with regard to legal, technical, social and financial aspects. More specifically, legal aspects concern mainly the regulations that determine the element's behaviour with respect to the hygrothermal, energy, sound and fire performance, as well as other legal restrictions (i.e. urbanism/planning rules or listed buildings). The technical aspects involve structural issues, architectural concerns and aesthetics, as well as functional matters. Finally, the social aspects refer to the acceptance of the element by building users and architects/engineers, while the financial aspects interrelate the ownership with the economic incentives and the investment feasibility. All the above are presented and discussed in the paper in order to highlight the applicability of ventilated façade systems in residential buildings.

Peer-review under responsibility of the organizing committee of SBE16.

Keywords:

1. Introduction

The building's sector – i.e. the buildings of the residential and tertiary sector- is the largest user of energy and CO2 emitter in the European Union and is responsible for about 40% of the total final energy consumption and greenhouse emissions[1]. The sector has significant potential for cost-effective energy savings which, if realized, would lead to a number of benefits, such as reduced energy needs, reduced import dependency and impact on climate, reduced energy bills, an increase in jobs and the encouragement of local development[2].

Within the existing European stock, a large share (more than 40%) is built before 1960's, when there were only few or no requirements for energy efficiency and only a small part has undergone major energy retrofits[3]. It is then

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Peer-review under responsibility of the organizing committee of SBE16.
doi:10.1016/j.proenv.2017.03.096

evident that the oldest part of the building stock contributes greatly to the high energy consumption in the building sector leading to a large energy saving potential. Within this context, the European Commission has emphasized the need for increasing the building energy efficiency for both the new and the existing buildings.

Among the most common actions for the energy upgrade of the building envelope is thermal insulation. Moreover, the last years, ventilated façade systems have gained much attention. They incorporate the insulation layer, positioned usually on the external surface of the wall, the air cavity and the outer skin. The air gap provides infiltration and, depending on the design, may provide pressure equalisation across the outer skin. Any water penetrating the cavity is drained away. To fix the cladding, a support system designed to carry both the mass of the system along with the projected wind and earthquake loading is installed. The support system usually comprises of vertical or vertical and horizontal fixing rails fixed back to the structure using brackets.

The main advantage of the ventilated façade system is the wide range of architectural expression that it offers, as there are various possibilities for the cladding material. In refurbishment projects in particular, the renewed appearance with the use of ventilated façade systems is often a decision-making argument. It improves the thermal resistance of the external wall, reducing heat losses and infiltration rates.

A limitation of the system is the added structural weight on the existing façade, particularly in case heavier cladding material, such as concrete panels or natural stone, is applied. Moreover, depending again on the cladding material and the fixing system, the construction cost can be significant. The benefits of the system have to be balanced against its feasibility and expense, according to each project's design and ambition.

This paper attempts to collect and present the requirements and specifications that a ventilated façade system has to fulfill, as an element of the building envelope. The requirements stem mainly from the regulatory contexts of each member state country from the scale of the element to the building and the urban form. However, beyond the legal restrictions, there are more specifications that should be taken into account when designing a ventilated façade, which concern mainly technical, social and financial issues.

2. Legal issues

The different regulations on the performance of the building elements and the buildings in general, as well as on the urban planning are usually key actors for deciding on the measures that will enhance the energy performance of an existing or even a new building.

A ventilated façade can be designed either for the retrofit of existing residential buildings or for its integration in the study of new ones. The regulatory barriers derive from the restrictions that are imposed by the national regulations and concern either the performance of the system or building/planning and urbanism rules. These appear to differ enormously among the European countries.

2.1. Requirements on buildings' performance

The criteria that are taken into account involve mainly the hygrothermal performance, the energy performance, the sound performance and the reaction to fire. A general overview on the restriction for every parameter is summarized below.

2.1.1. Hyhrothermal performance

A set of restraints for the system to be developed and for the performance of the building after the application of the system is imposed on the basis of the requirements derived from regulations with regard to the building components' hygrothermal performance.

With regard to thermal transmittance of vertical building components, almost all countries technical regulations' define maximum allowed U-values. In some cases, different maximum permissible and reference U-values (or only reference values) are cited, while in some countries' regulations there are different values for building renovation and for new buildings or for different climatic zones. Also, in some cases, differentiations among the buildings of the residential and the tertiary sector have been detected. In very few countries, for the same type of building and the same climatic zone, the maximum permissible U-value depends on the indoor temperature. On the basis of the data