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Adaptive Design of Large Prefabricated Concrete Panels Collective Housing

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Abstract : More than half of the urban population in Romania lives today in residential buildings made out of large prefabricated reinforced concrete panels. Since their initial design was made in the 1960’s, these housing units are now being technically and morally outdated, consuming large amounts of energy for heating, cooling, ventilation and lighting, while failing to meet the needs of the contemporary life-style. Due to their widespread use, the design of a system that improves their energy efficiency would have a real impact, not only on the energy consumption of the residential sector, but also on the quality of life that it offers. Furthermore, with the transition of today’s existing power grid to a “smart grid”, buildings could become an active element for future electricity networks by contributing in micro-generation and energy storage. One of the most addressed issues today is to find locally adapted strategies that can be applied considering the 20-20-20 EU policy criteria and to offer sustainable and innovative solutions for the cost-optimal energy performance of buildings adapted on the existing local market. This paper presents a possible adaptive design scenario towards sustainable retrofitting of these housing units. The apartments are transformed in order to meet the current living requirements and additional extensions are placed on top of the building, replacing the unused roof space, acting not only as housing units, but as active solar energy collection systems. An adaptive building envelope is ensured in order to achieve overall air-tightness and an elevator system is introduced to facilitate access to the upper levels.

Keywords : adaptive building, energy efficiency, retrofitting, residential buildings, smart grid
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