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Comparative Analysis between Different Proposed Responsive Facade Designs for Reducing the Solar Radiation on the West Facade in the Hot Arid Region

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Abstract : Designing buildings which are sustainable and can control and reduce the solar radiation penetrated from the building facades is such an architectural turn. One of the most important methods of saving energy in a building is carefully designing its facade. Building's facade is one of the most significant contributors to the energy budget as well as the comfort parameters of a building. Responsive architecture adapts to the surrounding environment causing alteration in the envelope configuration to perform in a more effective way. One of the objectives of the responsive facades is to protect the building's users from the external environment and to achieve a comfortable indoor environment. Solar radiation is one of the aspects that affects the comfortable indoor environment, as well as affects the energy consumption consumed by the HVAC systems for maintaining the indoor comfortable conditions. The aim of the paper is introducing and comparing between four different proposed responsive facade designs in terms of solar radiation reduction on the west facade of a building located in the hot arid region. In addition, the paper highlights the reducing amount of solar radiation for each proposed responsive facade on the west facade. At the end of the paper, a proposal is introduced which combines the four different axis of movements which reduces the solar radiation the most. Moreover, the paper highlights the definition and aim of the responsive architecture, as well as the focusing on the solar radiation aspect in the hot arid zones. Besides, the paper analyzes an international responsive façade building in Essen, Germany, focusing on the type of responsive facades, angle of rotation, mechanism of movement and the effect of the responsive facades on the building's performance.

Keywords : kinetic facades, mechanism of movement, responsive architecture, solar radiation
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