

The Performance Evaluation of the Modular Design of Hybrid Wall with Surface Heating and Cooling System

Authors : Selcen Nur Erikçi Çelik, Burcu Ibaş Parlakyıldız, Gülay Zorer Gedik

Abstract : Reducing the use of mechanical heating and cooling systems in buildings, which accounts for approximately 30-40% of total energy consumption in the world has a major impact in terms of energy conservation. Formations of buildings that have sustainable and low energy utilization, structural elements with mechanical systems should be evaluated with a holistic approach. In point of reduction of building energy consumption ratio, wall elements that are vertical building elements and have an area broadly (m²) have proposed as a regulation with a different system. In the study, designing surface heating and cooling energy with a hybrid type of modular wall system and the integration of building elements will be evaluated. The design of wall element; - Identification of certain standards in terms of architectural design and size, -Elaboration according to the area where the wall elements (interior walls, exterior walls) -Solution of the joints, -Obtaining the surface in terms of building compatible with both conceptual structural put emphasis on upper stages, these elements will be formed. The durability of the product to the various forces, stability and resistance are so much substantial that are used the establishment of ready-wall element section and the planning of structural design. All created ready-wall alternatives will be paid attention at some parameters; such as adapting to performance-cost by optimum level and size that can be easily processed and reached. The restrictions such as the size of the zoning regulations, building function, structural system, wheelbase that are imposed by building laws, should be evaluated. The building aims to intend to function according to a certain standardization system and construction of wall elements will be used. The scope of performance criteria determined on the wall elements, utilization (operation, maintenance) and renovation phase, alternative material options will be evaluated with interim materials located in the contents. Design, implementation and technical combination of modular wall elements in the use phase and installation details together with the integration of energy saving, heat-saving and useful effects on the environmental aspects will be discussed in detail. As a result, the ready-wall product with surface heating and cooling modules will be created and defined as hybrid wall and will be compared with the conventional system in terms of thermal comfort. After preliminary architectural evaluations, certain decisions for all architectural design processes (pre and post design) such as the implementation and performance in use, maintenance, renewal will be evaluated in the results.

Keywords : modular ready-wall element, hybrid, architectural design, thermal comfort, energy saving

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020