

Hydroponic Green Walls as a Sustainable Solution for Thermal Comfort and Energy Efficiency in office buildings

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Abstract. Since Egypt is urbanizing rapidly, office buildings suffer from severe thermal comfort and energy efficiency issues. Poor insulation and high temperatures result in heavy energy consumption in cooling. This study proposes the application of hydroponic green walls to enhance thermal performance and aesthetics in urban office buildings. With these exterior walls integrated into building facades, issues of heavy energy consumption due to poor insulation and high temperatures are resolved. Hydroponic green walls not only enhance insulation and energy consumption but also render working conditions greener and more productive. Both qualitative and quantitative methods are employed by this study in evaluating their efficiency. Qualitative study involves an exploration of green wall systems, hydroponic systems, and the environment considerations toward formulating an initial guideline. Quantitative study tests and validates the applicability of this guideline with case studies. This study ultimately seeks to develop a validated model of achieving higher efficiency in Egypt's office buildings through reduced energy and water consumption, as well as enhanced thermal performance and aesthetics.

Keywords: Hydroponic Green Walls, Thermal Comfort, Sustainability

