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Simplified Linear Regression Model to Quantify the Thermal Resilience of Office Buildings in Three Different Power Outage Day Times

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Abstract : Thermal resilience in the built environment reflects the building's capacity to adapt to extreme climate changes. In hot climates, power outages in office buildings pose risks to the health and productivity of workers. Therefore, it is of interest to quantify the thermal resilience of office buildings by developing a user-friendly simplified model. This simplified model begins with creating an assessment metric of thermal resilience that measures the duration between the power outage and the point at which the thermal habitability condition is compromised, considering different power interruption times (morning, noon, and afternoon). In this context, energy simulations of an office building are conducted for Qatar's summer weather by changing different parameters that are related to the (i) wall characteristics, (ii) glazing characteristics, (iii) load, (iv) orientation and (v) air leakage. The simulation results are processed using SPSS to derive linear regression equations, aiding stakeholders in evaluating the performance of commercial buildings during different power interruption times. The findings reveal the significant influence of glazing characteristics on thermal resilience, with the morning power outage scenario posing the most detrimental impact in terms of the shortest duration before compromising thermal resilience.

Keywords : thermal resilience, thermal envelope, energy modeling, building simulation, thermal comfort, power disruption, extreme weather

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