

Architectural design strategies based on experimental analysis in office buildings in Santiago, Chile

Abstract

Overheating, glare and high energy demand are recurrent problems in office buildings in Santiago, Chile ($33^{\circ}27'S$ $70^{\circ}42'W$) during cooling periods. Santiago climate is Mediterranean, with intensive solar radiation and high temperatures during spring and summer. More than 50% of office buildings of the country are built in this city. Currently, policies regulating the energy use in this type of building do not exist in Chile and their design patterns are imported from other countries without considering local climate requirements. This paper shows results of a research where thermal and lighting performance of different type of office buildings in Santiago have been studied. Buildings were selected through a cluster analysis applied to a sample of 101 buildings, representing those constructed during the last years in the city. This analysis considered the following façade variables: % of transparency, presence of solar protection (SP), type of SP, number of floors. Clusters obtained are the following: Combined façades without external solar protection, fully glazed façades with external solar protection and fully glazed facades without solar protection. Continuous lighting and temperature measurements have been made in different buildings representing the 3 mentioned clusters. Measurements of lighting and solar gains through different facades were also made. A survey applied to users has shown the perception that they have regarding to thermal and lighting comfort. Results showed critical thermal and lighting problems in fully glazed façade buildings. Better performance was showed in buildings with a certain percentage of opaque façade area. External SP and glazed area control are highly recommended for energy efficiency in office buildings of Santiago, Chile.