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How is acoustics of green buildings affecting occupants' productivity?

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Chapter 1: "Green" buildings design strategies are supposed to create better indoor environmental quality compared to standard buildings and at the same time improve occupants' comfort, satisfaction, health and work. Studies have provided evidence of increased productivity and greater worker satisfaction in "green" buildings when compared with standard buildings. Figures also state that better air quality and lighting lead to greater productivity, and therefore increased client satisfaction with the finished building. However, recent studies have shown that satisfaction with the acoustical environment in "green" buildings is low, and generally is lower than for other aspects of the building design such as lighting and indoor air quality. Occupants are dissatisfied with excessive noise and poor speech privacy, and consider that the acoustical environment does not enhance their ability to work. This study aims to assess which "green" technologies influence the acoustics of a work environment and how much its acoustics can influence the productivity of its occupants. I will approach the problem by selecting a number of office buildings with different "green" features and evaluating them acoustically and also by carrying out an occupant satisfaction survey in order to get a clear and useful assessment of occupants' comfort, well being and productivity.

Chapter 2: In an open plan office, the factors that interfere the most with workers' productivity concern the acoustical conditions, for example "conversational distractions" due to a poor speech privacy. Architects and designers should try to minimize the negative effects of these "distractions" by finding a functional office layout and by using acoustic technologies such as hidden sound masking devices. Another issue that seems to be the cause of poor acoustics in a green office environment is whether green buildings require features that inevitably lead to an unsatisfactory acoustic environment.

For example, many green buildings are naturally ventilated, which is detrimental for sound insulation, or have a "thermal core" that, requiring to leave large concrete surfaces exposed (such as ceilings), result in high sound reflections. Several acoustic companies are working on innovative solutions that can secure good acoustic performance even using "green" technologies.

Chapter 3: For this study I have selected three Arup based office buildings, all of them containing open-plan offices presenting different degrees of “green” features. The first one is Building 13 on Fitzroy Street, recently restored and re-cladded, which can be defined as “partially green” due the use of standard technologies (such as a mechanic ventilation system) along with several green features (a double skin façade with a ventilated outer skin and a glazed roof inner courtyard serving as a passive heating system). The second one is Carlow House, a traditional, non-green office building. The last one is Midland Campus, a nominally “full-green building”, built with natural and recycled materials, naturally ventilated and passively cooled using the principles of thermal mass. A web-based survey was carried out among the people working in these three buildings in order to assess their satisfaction with the thermal, lighting and acoustic conditions of their workplace and to see how much their productivity is affected by these factors.

Chapter 4: Cross correlations matrices, graphs and data analysis pinpointed the IEQ factors that affect workers’ productivity the most as well as the factors people are less satisfied about in the three buildings. From these analysis it emerged how crucial a good office layout is, since it can strongly affect visual and speech privacy and people’s perception of the background noise level. In fact, the higher the workstations density in an office is, the higher is the number of people complaining about acoustics. Moreover, data show that in all three offices, the lighting quality is perceived as satisfactory and enhancing productivity, while acoustic and thermal comfort are often judged as poor and interfering with one’s productivity.

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