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ACOUSTICAL POST-OCCUPATION EVALUATION APPLIED TO POPULAR HABITATIONS IN HUMID TROPICAL CLIMATE

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ABSTRACT

The acoustical post-occupation evaluation (Acoustical POE) consists in an important analysis tool to verify the influence of architectural elements, e.g. layout, facade elements and implantation of the building, on its acoustical quality. Associated with the user's opinion, it can supply data on the reaction of the population. In this work, results of a survey in Rio de Janeiro, a typical tropical region in Brazil, are presented. Data obtained from the reaction to community noise, such as traffic of vehicles, recreational areas, neighbouring habitations and those related to internal noise are considered. Results are based on the comparison of outcomes supplied by technical and behavioural analyses.

1 - INTRODUCTION

In tropical regions, presenting a characteristic humid weather, like in most parts of Brazil, care must be taken during the architectural planning, including all stages of the construction.

Regularly, in tropical areas, a number of activities take place outdoors. Cultural aspects influences the architectural plan, integrating the natural landscape and delivering natural ventilation, what contributes for a heat reduction at the constructions.

Usually, popular habitations are not artificially cooled, as the low incomes of its residents permits only, in an extreme situation, the acquisition of mechanical fans. Although in tropical regions there is no need for thermal insulation, except for the roof, it is important to control thermal exchanges between indoors and outdoors through the adequate proportions and localisation of doors and windows.

Likewise, in Rio de Janeiro – a city which is characteristically hot and humid – it is convenient to emphasise the natural ventilation, which reduces the effects of solar radiation and guarantee the thermal comfort all over the year. However, this procedures are favourable for noise intrusion. Therefore the buildings implantation should be altogether suitable to external conditionings, i.e. dominant wind, solar trajectory, rain, noise sources and etc.

Environmental noise is one of the leading issues influencing in the quality of life in Rio de Janeiro. This occurs, mostly, due to concentration of human activities in urban areas where there is a high concentration of machinery that produces intense noise levels. Concluding, due to the regional diversity in Brazil, there is a lack of regulations concerning the acoustic quality of buildings which leads to negative solutions adopted by the construction industry. In order to avoid the employment of acoustic insulation of facades and consequent artificial ambience corrections, it is necessary to think in alternative solutions, low-priced and compatible with the users requests.

2 - THE ACOUSTICAL POST-OCCUPATION EVALUATION (ACOUSTICAL POE)

The acoustical POE [1], [2] consists in a multifaceted methodology originated in the 70's like an instrument for evaluation of buildings performance. It applies a number of techniques that are based on the relation between the human being and constructed environment. In this way, it is an instrument for weighting the satisfaction of the user and to verify whether the construction is suitable or not for its purpose. The acoustical APO can be defined as a technical expertise in which are utilised physical, functional and behavioural surveys.

The acoustical POE is restricted to a categorised evaluation in which are considered the relations between the human being, noise and constructed environment, i.e. houses, workplaces, buildings, urban areas and etc. As part of this methodology, psychoacoustics concepts related to judgmental surveys plays an important role. Acoustical APO involve physical and biological variables, e.g. climate, and the relations of environment versus human behavior. It consists in an important analysis tool to verify the influence of architectural elements, e.g. layout, facade elements and implantation of the building, on its acoustical quality. Associated with the user's opinion, it can supply data on the reaction of the population. The knowledge provided by acoustical APO through data obtained from computer simulations, noise measurements, technical-functional and behavioural analyses provides means for improvement of acoustical quality inside constructions of any kind.

3 - INVESTIGATION

The survey was performed in low-cost buildings localised in Rio de Janeiro. The first study was carried out in an industrial zone, near a road called Avenida Bento Ribeiro Dantas. It is constituted of one or two floors houses that were superimposed forming puzzled lanes. Each construction has 44 m², comprising a living room, two bed rooms, a bathroom and a kitchen. The populations average age is around 35 years old and it is predominantly constituted by workers with low incomes.

The second study was carried out in a region called Jacarepaguá. It is composed of four residential buildings, each one with six floors and a play-ground. Each apartment has an area of 50 m², including a living room, two bed rooms, a bathroom, a kitchen and a balcony.

The acoustical POE was done in different stages: a technical evaluation concerning the constructions, its functions and physical aspects; behavioural and economical investigation; and aesthetics analyses after obtaining the architectural plans for the technical evaluation, a survey was applied in the residents for the behavioural analyses. The samples was dimensioned considering a 95% confidence interval. Through the analyses of the architectural and structural layout, as well by local observations, it was possible the identification of the elements responsible for the acoustical quality degradation. Afterwards it was possible to define the important issues to be judged in questioners.

4 - RESULTS

Through the acoustical POE it was possible to verify that the major acoustical problems were generated during the planning and execution of the project.

In the first stage of the study, in Bento Ribeiro Dantas, it was observed the non-existence of internal and external coating, the lack of quality from the windows and partitions of half height between rooms; all aspects contributing for a poor acoustical insulation. In what concerns the implantation of the buildings, although the construction of commercial stores was not included on the original planning, a number of residents transformed the living room in bars, workshops and etc. This is a social issue, regarding the economical situation and contributed greatly for the noisy environment on the surroundings.

In the second part of the investigation, in Jacarepaguá, a simple improving on the walls weight would be enough to minimise the acoustical problems. The ventilation between bathrooms of all apartments is a propagation media of noise that generates much annoyance. The total of 79% of the residents complained about the high levels of noise generated by parties on the play-ground of the building. This could be avoided by acoustical treatment on its boundaries. Annoyance is mainly caused by the fact that almost all activities are performed outside the buildings and by vehicle noise.

5 - DISCUSSION

Regularly, in tropical areas, a number of activities are carried out outdoors. Therefore, some problems connected to noise exceed the building boundaries towards an urban scale. Mostly, constructive techniques associated with acoustical quality in buildings are incompatible with the local humid climate and with many aspects of the population in such areas, such as social, economical and cultural conditions.

In this study was observed that the acoustical quality in this areas were below the minimum required. Errors in the architectural planning shows that it is necessary to integrate knowledge about basic acoustics

in the education of this professionals. Through a good architectural planning, most part of the acoustical problems could be resolved. Minimum recommendations for acoustical quality in distinct regions could be included in a regional legislation.

A next step of this investigation would use the results of this survey applied on the residents for indication of the principal points to be evaluated physically by noise measurements. A computer program of noise evaluation, the Raynoise, is going to be utilised to study the noise comportment on the facades. Concluding, it will be possible to cross information among the outcomes of each step of the investigation and complete information concerning acoustic quality should be accomplished.

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