This Paper provides an overview of actions taken by users: with regard to the use of controls introduced in these buildings, e.g. mechanical devices, as well as actions to use the original controls of these buildings, e.g. windows to regulate natural ventilation.

URBAN AND ARCHITECTURAL CONTEXT

"Baixa Pombalina" is located in the historic city center of Lisbon, near "Tejo" River and between hills. After the Great Earthquake of 1755, the area was rebuilt according to the 1758 Plan. And their buildings are called "Pombalino Yield Buildings" ("Prédio de Rendimento Pombalino"), and have similar architectural features and are grouped into blocks.

Figure 1 *(a) View of "Pombalino" Buildings of Baixa and (b) Aerial view of "Pombalino" blocks and (c) View from inside the inner yards of Baixa (photos: author).*

The block improves buildings' salubrity with wider spaces between buildings in order to ventilate and to illuminate. The use of the shape of rectangular block allowed two fronts separated by an inner yard, and also, a large perimeter of the façade. Blocks are of two types: The first are arranged longitudinally with the axis in the direction North-South, and occupy most part of the urban grid. The latter blocks are arranged transversely, with the axis in the direction East-West, in the Southern part of the Plan, interrupting the progression of secondary streets to Trade Square ("Praça do Comércio"). Directions have a torsion of 16,5º to the North axis, making the Southeast oriented façades differ in only 1º of the optimal benchmark tortion of 17,5º to the North axis, recommended by Olgyay (1963) for temperate climates.

An inner yard ("saguão") in the core of the block separates two rows of the lot. For reasons of salubrity, an inner yard was introduced in the block, three metres wide, allowing aeration by ventilation and natural lighting to the interior of buildings. The inclusion of the inner yard ("saguão") in the block allows a larger passive area, i.e., area that allows to be lit and naturally ventilated, according to the LT Method (Baker & Steemers, 2000).

After the analysis of results, it can be concluded about how buildings are used by users in each season:

4. In winter, subjects use less frequently heating devices, as well as the remaining elements to regulate temperature – They have a less interactive attitude - They use environmental controls to regulate temperature less frequently.

5. In summer, subjects use more frequently cooling devices, as well as the remaining elements to regulate temperature – They have a more interactive attitude – They use environmental controls to regulate temperature more frequently.

In winter, buildings of "Baixa", in what regards to their controls are used less interactively. In this season, users use less frequently buildings' original controls. And in the event of using controls, they use more frequently heating appliances. It must be noted that once, these buildings had fireplaces, that were meanwhile removed, and are now practically nonexistent. Over the years, the fireplace was replaced by heating devices.

In summer, architectural elements are used more interactively. In this season, most users use buildings' original controls, such as windows. And users use more frequently cooling devices. It is observed that in summer, there is a greater effort than in winter, in using all means of temperature regulation available, such as windows. And in the event that users recur to air conditioning devices, they also use other controls to regulate temperature, such as opening windows (although it is not recommended to be used simultaneously because of conflict with AC). Architectural elements as a mean of temperature regulation are mainly used in the summer season. And it is an indication that under the climate of Lisbon, it is mostly in the summertime that controls have a greater role to play in these buildings in Baixa.

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REFERENCES

BAKER, N. & STEEMERS, K. 2000. Energy and Environment in Architecture. New York: E & FN Spon.

CÂMARA MUNICIPAL DE LISBOA, (Ed.). 2005. Cartulário Pombalino – Colecção de 70 Prospectos (1758 – 1846). Lisboa: Câmara Municipal de Lisboa.

GONÇALVES, Hélder, & GRAÇA, João Mariz. 2004. Conceitos Bioclimáticos para os Edifícios em Portugal. Lisboa : INETI.

INSTITUTO DE METEOROLOGIA.1981. Normas Climatológicas da Estação de Lisboa/Tapada da Ajuda1951-1980. Lisboa: Instituto de Meterologia.

MASCARENHAS, Jorge. 2004. Sistemas de Construção, Vol. V – O Edifício de Rendimento da Baixa Pombalina de Lisboa. Lisboa : Livros Horizonte.

OLGYAY, Victor. 1963. Design with Climate: Bioclimatic Approach to Architectural Regionalism . 1st Edition. Princeton, N.J.: Princeton University Press.

PINHEIRO, Manuel Duarte 2006 . Ambiente e Construção Sustentável. Amadora : Instituto do Ambiente.

RIBEIRO, Orlando. 1987. Portugal, o Mediterrâneo e o Atlântico. 5th Edition. Lisboa: Livraria Sá da Costa Editora.