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The effect of spatial interventions on historic buildings' indoor climate (Case Study: Tire Necip Paşa Library, Izmir-Turkey)

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Abstract

The indoor climate of historic libraries should meet rigorous requirements related to human thermal comfort and conservation of books, manuscripts and cultural proper-ties. Paper based collections in historic libraries can be deteriorated chemically, mechanically and biologically because of inadequate indoor climate conditions. In this paper, Necip Paşa Library, the historic library located in Tire-Izmir, Turkey, was selected as a case study. The chemical, mechanical and biological degradation risks on the manuscripts were evaluated based on the indoor climate parameters measured for one year period. The Library, consisting of a main hall, a manuscript zone and an entrance hall, was modelled via the dynamic simulation software, Design Builder. Calibration of the model was conducted with respect to the measured indoor temperature and relative humidity values. The portico/Revak at the south facade of Library was converted into the entrance hall by wooden framed windows in 1930. To be able to see the effect of that intervention on the indoor climate (correspondingly on degradation risk of the manuscripts), a new model, namely semi-open model, was created and simulated. A remarkable change has not been observed on chemical degradation risk when the results of semi-open and existing library models were compared, while mechanical and biological degradation risks were less in semi-open model.

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1. Introduction

Historic buildings represent the cultural heritage of societies, and provide substantial continuity between each phase of human development. Therefore, during the restoration and energy efficient retrofits of historic buildings, the main concern must be the preservation of cultural heritage value [3].

Historic buildings can be categorized according to their functional manner of construction (museum, library, archive, dwelling, palace, etc.). Historic libraries can be seen as educational and cultural centers where the primary sources of national heritage such as manuscripts, unique historical books, collections and archival documents are kept [3]. These cultural properties should be preserved in suitable storage and exhibition conditions far from any environmental risk factors which are related to inappropriate humidity, temperature and illuminance levels of indoor climate and microbiology [4]. The environmental risk factors can cause to chemical, mechanical and biological deteriorations. As a result, delamination, dimensional alterations, shrink-ing, swelling, discoloration and mould growth can be seen on the cultural properties.

Extreme values in temperature (T) and relative humidity (RH) are the main reason for chemical deterioration. Fluctuations in T and RH values result in mechanical deterioration on the cultural properties. Extreme T, RH values and substrates in the environment are the main risk indicators for biological deterioration.

In this paper, chemical, mechanical and biological degradation risks on the manuscripts in a historic library are evaluated by measuring the indoor climate parameter (T and RH). The Necip Paşa Library in Tire-Izmir-Turkey is selected as a case building. The Library was constructed in the beginning of the 19th century, which houses 1147 manuscripts and 1312 books printed in the era of Ottoman Empire [19]. The Library had undergone some basic interventions, one of which was the closure of portico/Revak at the south façade with wooden-framed windows in 1930. The effects of this spatial intervention on the indoor climate of the Library consequently the effect on the deterioration of the manuscripts were evaluated by modelling the Library with a Build-ing Energy Simulation Tool.

2. The Necip Paşa library

The Library was built in 1827 in Tire-Izmir-Turkey. The original construction of the Library consists of a cubic shaped single zone building (Main Hall) and a portico/Revak (Figure 1(a)). The Library had undergone two main spatial interventions: 1) addition of an octagonal shaped cage-like structure called Manuscript Zone, into the middle of the Main Hall in 1908, where all the manuscripts are kept in (Figure 2) the closure of the portico/Revak in 1930 to create an office space for library staff and a read-ing hall for visitors as called as Entrance Zone (Figure 1(b), Figure 2) [6].

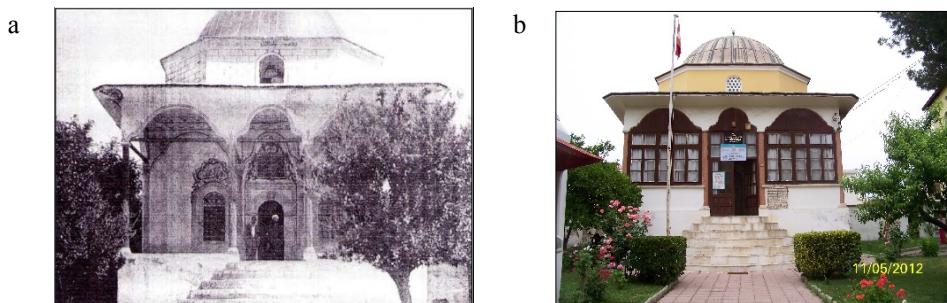


Fig. 1. The Necip Paşa Library (a) before 1930, (b) after 1930 (Sources: [12]; [7]).

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