

## OFFICE BUILDING REFURBISHMENT BASED ON ASSESMENT OF ENERGY AND NATURAL RESOURCE CONSERVATION

Theocharis E. POIRAZIS<sup>1\*</sup> and Vassilios A. TSIHRINTZIS<sup>1</sup>

<sup>1</sup> Laboratory of Ecological Engineering and Technology,  
Department of Environmental Engineering, School of Engineering,  
Democritus University of Thrace, GR-67100 Xanthi, Greece

\* Currently: Division of Energy and Building Design,  
Department of Construction and Architecture, Lund University,  
P.O. Box 118, SE-221 00 Lund, Sweden

E-mail: [tsihrin@otenet.gr](mailto:tsihrin@otenet.gr) , [tsihrin@env.duth.gr](mailto:tsihrin@env.duth.gr) , [harris.poirazis@ebd.lth.se](mailto:harris.poirazis@ebd.lth.se)

### EXTENDED ABSTRACT

When the replacement of an existing building by a new one is financially restrictive or not possible for any reason, refurbishment can be the only option. The refurbishment of a non-residential building may require a specialized study, not only because of building location, use, importance and historic significance, but also because it provides the opportunity to take measures to reduce energy consumption. A refurbishment project must consider energy consumption and propose measures to improve energy use efficiency.

In this paper, the case study is presented of the refurbishment of the building of the Ministry of Commerce in Greece, located in the center of Athens. The main purpose of the study is to propose refurbishment suggestions for reduction of energy consumption and provision of comfort to the occupants. The existing condition of the building in terms of energy consumption was assessed. Then, alternatives were studied including, among others, changing the windows from single to double, adding thinner curtains and external wooden shutters, ventilating naturally the building (during the spring and summer months), and adding insulation on the external walls. In energy consumption computations for existing conditions and proposed refurbishment alternatives, the computer program *tsbi3* was used. Environmental impacts and energy consumption for the production of the refurbishment materials were assessed using the computer program *BEAT 2000* (Building Environmental Assessment Tool). Both pieces of software have been developed by the Danish Building Research Institute (SBI).

Eleven refurbishment alternatives in terms of energy consumption reduction were tested in total using the two pieces of software. A final alternative was proposed, which, according to the study and software used, would save about 28% of the currently consumed energy in the offices of the building.

**Key words:** office building, refurbishment, energy consumption, heating, cooling, computer modeling.