

Dossier Editorial:
*Energy efficiency in
 buildings/Building physics
 and environmental control*

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The objective of modern building design and construction is to provide a secure, healthy and comfortable built environment, which at the same time addresses sensitive subjects such as energy consumption and impact on the natural environment. Building physics subjects present a cornerstone for creating built environment with the desired quality, in fields of architecture and engineering. Requirements for solutions to environmental problems are set forth according to user activities in the building, user's physical, sociologic and psychological necessities and limit values of energy and resources. At this point, the task for designer and builder is to accomplish designing a built environment with possibilities at hand and within the limits defined by requirements. In this manner, Association of Building Physics has a crucial role in developing a mutual understanding between architects and engineers, under a legal organization, within sustainability framework in Turkey, which is a national body of IABP (International Association of Building Physics). Association of Building Physics has been founded by members of ITU Faculty of Architecture, Building Physics and Environmental Control Working Group.

The objectives of Association of Building Physics are to support national progress and academic studies aimed at development of science and technology in the fields of building physics discipline such as thermal, visual, acoustical and energy performance of buildings, fire safety and water management. It is also aimed to contribute constitution of economic, ecologic and sustainable architectural environments, to improve the efficiency of scientific researches by enabling communication between researchers dealing with abovementioned fields, to provide and conduct documentation

and knowledge, to organize national and international meetings and conferences. In this regard, "Second National Conference on Building Physics and Environmental Control" was organized by Association of Building Physics at 4-6 May 2016 in ITU Faculty of Architecture, Taşkışla Campus. This conference consisted of 8 sessions where a total of 38 peer-reviewed papers had been presented, focusing on Building Physics and Environmental Control. As part of this conference, a panel entitled 'Integrated Design Approach for Comfortable Buildings' was organized serving a platform to reunite academicians, students, architects and building industry representatives enabling them to exchange ideas, knowledge and experience on different aspects of Building Physics and Environmental Control.

The dossier subject for A|Z ITU Journal of the Faculty of Architecture Vol.13-2 issue is entitled "Energy efficiency in buildings / Building physics and environmental control" as parallel to the organized conference by Association of Building Physics.

This dossier part consists of eleven selected papers focusing on energy related aspects of building design, thermal comfort, architectural lighting design, visual comfort, sound environment and acoustic comfort topics.

The first article by Suzi Dilara Mangın and Gül Koçlar Oral concentrates on energy and environmental problems in their article entitled "Energy, economic and environmental analyses of photovoltaic systems in the energy renovation of residential buildings in Turkey" and in this regard introduces a study on the assessment of the energy potential of the photovoltaic (PV) system considering a multi criteria evaluation which involves both economic convenience and environmental impacts. This study was conducted for five climate zones of Turkey through an evaluation that accounts for the crucial parameters related to the energy, economic and environmental analysis which have considerable impact on the promotion of PV system applications in terms of the energy renovation of existing residential buildings. The findings of the study can serve to

underscore the potential PV profitability concerning the achievement of low carbon economy target of Turkey.

In the second article by H. Merve Yarnardağ and Gülten Manioğlu entitled “Evaluation of photovoltaic systems in different building forms in terms of energy and cost efficiency”, it is aimed to evaluate photovoltaic systems in different building forms in terms of energy and cost efficiency and to identify the most efficient building form and photovoltaic system alternative. In this study, different building forms, with the same volume to building envelope surface ratio (V/A) are developed, and all forms are further fitted and compared with flat, pitched and gabled roofs. Additionally, different tilt angles for photovoltaic panels, different building components on which the panels are mounted and different orientations are used to obtain multiple different alternatives.

The third article by Selcen Nur Erikci Çelik, Gülay Zorer Gedik, Alihsan Koca, Gürsel Çetin and Zafer Gemici is entitled “The Performance Evaluation of the Modular Design of Hybrid Wall with Surface Heating and Cooling System”. In this study, it is proposed that wall elements, which are vertical building elements, and constitute a broad area within the structure, are regulated with a different system concerning the reduction of building energy consumption ratio. As a result of this study, the ready-wall product with surface heating and cooling modules are created and defined as hybrid wall and it is compared with the conventional system in terms of thermal comfort.

The fourth article by İdil Erdemir Kocagil and Gül Koçlar Oral is entitled “The Effect of Solar Heat Gain on Climate Responsive Courtyard Buildings”. This study deals with traditional houses that are regarded as the best examples of energy efficient design due to their climate responsive design approach. In this study, investigation on Diyarbakir houses is performed in terms of thermal comfort conditions and the effect of solar heat gain on heating-cooling loads in courtyard buildings derived from central courtyard plan with different A/V ratios is evaluated. As a result, the efficiency of heating-cooling

load provided by climate responsive design is aimed to be highlighted by considering the passive building performance of courtyard buildings in hot-dry climate zones in relation to solar heat gain as part of this study.

The fifth article by Hatice Hilal Parlak Arslan and Şule Filiz Akşit entitled “Energy Efficient Mobile Building Design” aims to develop a model to guide designers in terms of designing mobile buildings for the production of energy efficient buildings that cause minimum harm on the environment. In this article, a case study mobile building’s design process is examined in detail including general design decisions and the effective use of energy, water, and materials and this study aims to decrease the energy consumption of houses during their lifecycle.

The sixth article by Feride Şener Yılmaz is entitled “Proposal of a Façade Design Approach for Daylight Performance Determination in Buildings”. This study deals with daylighting in façade design and introduces diverse performance metrics which are developed and are being used in building façade design phase. In this study, proposal of a façade design process is presented in terms of daylight performance determination and this study aims to describe current daylight metrics that can be used for façade design and applications. Proposed process consists of determination stages based on daylight illuminance, control of glare and view out conditions which is of significant importance in terms of providing visual comfort conditions.

Seventh article by Seda Kaçel and Alpin Köknel Yener is entitled “A pilot study regarding to analyzing the performance of the lighting system”. Following a post-occupancy evaluation (POE) study having focused on the user experience on the lighting system, the lighting system of a case study building is analyzed within this paper in terms of natural lighting system and artificial lighting system. The design parameters for each system have been determined and different scenarios have been created and their performance is obtained by means of computational analysis. It is observed in this study that the scenarios created for both the natural

lighting system and the artificial lighting system have had different impacts on the related systems.

Eight article by Fazıla Duyan and Rengin Ünver is entitled “A Research on the effect of classroom wall colours on student’s attention”. In this study, the effect of classroom wall colours on student’s attention is investigated. The research was conducted with the age groups of 8-9 in the two primary schools, one private the other state. A total of 78 students participated in this study. As part of this study, five colours were selected by using Munsell Colour System and classroom walls were painted for five consecutive weeks. The students had lessons under different wall colours and the attention tests were performed on students the end of the weekday. The results of this study show that attention scores deferred according to wall colour conditions.

Ninth article by Mine Aşçigil Dincer and Sevtap Yılmaz entitled “Effect of sound environment on homework performance” investigates the effect of various home sound environments on homework performance through the duration and correctness of solving algebraic equations in multiple choice tests. In the study, high school students (17-18 years, N=32) solved quadratic equations while listening to sound clips: quiet (no sound), aircraft takeoff sound, continuous road traffic sound, verbal television sound, a music piece and children playing (talking, screaming, running). Statistical analysis of the results showed that aircraft, verbal and children sounds effected homework performance, while the others did not.

Tenth article by Derya Çakır Aydın and Sevtap Yılmaz is entitled “Assessment of sound environment pleasant-

ness by sound quality metrics in urban spaces”. The purpose of this study is to generate Sound Quality Index in order to estimate pleasantness of users with sound environment in urban spaces by employing sound quality metrics together such as loudness, sharpness and roughness. Binaural sound recordings and jury tests at laboratory were conducted to correlate between pleasantness and sound quality metrics, while the accuracy was checked by field surveys.

Eleventh article by Nurgün Tamer Bayazıt, Bilge Şan Özbilen and Zeynep Savcı Özgüven entitled “Subjective and Objective Assessment of Environmental and Acoustical Quality in Schools Around Istanbul Ataturk International Airport”, investigates noise annoyance levels of students (N=720) and teachers (N=114) of schools around the airport using questionnaires and intelligibility tests, as well as measured levels of background noise, reverberation time and sound insulation. The questionnaire results revealed that overall, students tend to be more annoyed than teachers; aircraft noise is considered the main external noise source and students’ chatter is rated the main internal noise source for both groups. An improvement study in one of the classrooms revealed the effect of lower reverberation values on increasing speech intelligibility.

I would like to thank all the people who have contributed to organize “Second National Conference on Building Physics and Environmental Control” Conference. I would like to express my special appreciation and thanks to Feride Şener Yılmaz, Mine Aşçigil Dincer and İdil Erdemir Kocagil who edited this dossier articles.