

## Editorial

# Topical Section: The Second International Conference on Building Energy and Environment

This topical section features seven selected articles from the Second International Conference on Building Energy and Environment (COBEE). The COBEE conference was held in August 2012 at the University of Colorado, Boulder with a focus on reducing energy requirements for maintenance of comfortable and healthy environments. This is an inherently difficult problem because the implications of reduced energy consumption include difficult-to-measure effects on the environment and human occupants. For example, thermal comfort has been traditionally assessed for steady-state indoor environmental conditions, with more recent provisions for localized and adaptive thermal comfort concepts. The localized and adaptive comfort conditions allow for transient phenomena to be considered in the occupant perception of the thermal environment. These considerations opened opportunities for advanced occupant interactions with the building cooling systems in reaching thermal comfort. For example, this topical section features articles on novel building cooling systems, including cooled office chairs and local ventilation that both promote thermal comfort and save energy for cooling.

The advances in building cooling system design also need to be coupled with advances in building cooling system operation supported by controls systems. This section features articles on system-level incipient fault detection method and model-predictive controls. Both fault detection and model-predictive controls are enabling intelligent buildings that are able to identify system problems and occupant needs proactively. This building intelligence includes both hardware developments as well as software/model developments. This section mostly presents articles that feature software/model developments in regular building environments and aircraft cabins. The two most popular modeling approaches include energy simulations and computational fluid dynamics. Both approaches are necessary and are sometimes even coupled if the studied building systems are required to reduce energy requirements while

maintaining comfortable and healthy environments. Several of the featured articles experimentally investigate the accuracy of different simulation models and provided application specific instructions to maintain acceptable software/model accuracy levels.

Modeling and optimization methods for building energy consumption and thermal comfort are in a more advanced stage than modeling of environmental conditions that have implications on occupant health. This is due to a more complex relationship between health and environment than a relationship between comfort and environment. Both relationships are quite complex, but the number of influencing factors on thermal comfort, even though not small, is still significantly smaller than the number of influencing factors on occupant health resulting from environmental conditions. Therefore, the state-of-the-art investigations on health environments still mostly focus on individual building system components, while the integrative studies, such as the one on total environmental control are still in their infancy. This section features modeling and validation papers on two critical systems that contribute to the total environmental quality, including filtration and daylighting.

The articles featured in this topical section represent a cross section of hardware and software/model developments presented at the COBEE 2012 conference. The future COBEE conferences will continue to focus on the critical tradeoffs between building energy and occupant comfort and health. An integrated optimization approach for examining these tradeoffs is not possible at present, but these existing research efforts provide key building blocks for future studies.

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