

## Keynote Address 1

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### **USE OF MODELING AND SIMULATION FOR ENHANCED PERFORMANCE OF BUILDINGS**

Energy use and Carbon Dioxide emissions related to buildings account for at least 30% and 35% respectively of their corresponding global values. In the present context, great emphasis is made to optimize the building performance and also the Carbon footprint related to buildings. This essentially includes all categories of buildings including residential. In an overall perspective, building performance encompasses energy performance, indoor environment and air quality for human comfort & health respectively and also related to environmental degradation and economical aspects. Building performance standards/codes have played a very significant role and in particular, in view of pushing the sector above a globally acceptable minimum energy performance level since the first petroleum crisis in 1973. This trend in building energy performance standards/codes subsequently evolved to other aspects of building performance such as indoor air quality, comfort etc.

Building performance standards which are either of mandatory or voluntary nature have traditionally played an important role in building regulations. As of now, building performance standards have been established and adopted by many countries irrespective of whether they are in the developed or developing world. Building performance standards fall into two generic categories namely prescriptive and performance based. In the prescriptive category the standard stipulates mandatory and prescriptive criteria for generic building elements, equipment and energy supply conditions to be complied by the user in view of achieving the minimum level of performance. In the case of performance based standards, the compliance is based on achieving the performance with respect to stipulated performance metrics that have to be established by pre-determined methods.

The potential of performance based methods over the widely used prescriptive methods for building performance have proven to be much higher. Modeling and simulation play a principal role in the performance based method. This speech will discuss the distinct characteristics between the two and the potential advantages of the performance based standards. It will further highlight through case examples how modeling and simulation would be employed at the design stage to predict the building performance in the key aspects stated with a certain level of confidence and also subsequently to verify the predications with actual measurements. Furthermore, the current status of application of such standards, their evolution in the recent past, key benefits that they have brought about in to the sector of building performance together with challenges in adopting the same in the local building sector will also be highlighted.

**Keywords:** Building Standards, performance based standards, energy performance, modeling & simulation