

***The Use of Climate Design Knowledge in Urban Spaces Design  
Emphasizing on Thermal Comfort – Design Realization and Results of  
Soheil Project***

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**Introduction**

Science of climatic design is defined as a set of theoretical principles and practical methods of management. The knowledge wants to provide a suitable living environment leading to healthy life based on sustainable development and the coherence relationship between the concepts of climatology, architecture and urban design. This attempts to provide aesthetic elements as the main criteria for the development of cities along with making profound effects on the use of sustainable energy with thermal comfort and reduction of energy costs. Therefore, the metropolitan such as Tehran is evident in this case. In addition to loss of preparation in providing thermal comfort conditions in the space activities, no consistent pattern, standard and desirability are observed for the development of its space, except inspecial cases. As a result, principles of climatic design could be used as an important factor in the context of solving the problems. In this case, using the Micro-climate simulation models is necessary for a better understanding and detailed calculations of the way of operation and influence of climatic elements in the design of urban spaces. This seems essential to achieve a consistent and stable pattern by providing thermal comfort conditions. Because, using these models can contributes to estimation of the performance of designed space to take the benefit of effective climatic elements influencing thermal comfort. According to what stated, the presented study focused on assessment ability and rules of climatic design knowledge in creation of a Good Life Center, using three-dimensional microclimate model ENVI\_met<sup>®</sup>. Moreover, observation of the ability

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of climatic design principles in creation of a real space in the city is based on thermal comfort conditions as another aspect of this research.

### **Materials and Methods**

In this study, for designing a site based on climatic design principles, first atmospheric data on the required variables were collected from Mehrabad Airport Weather Station. They were analysed in Autodesk Ecotect-Analysis software. Thereafter, output data from Autodesk Ecotect software were merged by techniques of library and review of the studies. This finally will lead to the design of the site. In the final stage, the pattern designed in the Envi-met model (version 4) was simulated.

### **Results and Discussion**

Results of this research indicated that how the climatic design science principles in creation of urban space contribute to creation of an environment based on thermal comfort suitability. For example, evaluation of massing site, deviation of main façade of masses with flexibility in using radiation energy, predominant wind flows, the use of vegetation in the green roofs, brick on sidewalk surface, and applying networks of gullies made the area able to create thermal comfort for all seasons.

Therefore, site simulation results in the microclimate model ENVI\_met ® showed that temperature and relative humidity of designed space in the warmest month (July) were 24.60 °C and 50%, respectively. This is in comparison with maximum average temperature of 37 °C and relative humidity of 20% in the coldest month (October) because of use of solar energy. Effective temperature level in designed space reached up to 15 °C while maximum average temperature of environment was 9 °C. Thus, it can be argued that biosphere designed on the basis of principles of climate designing science will be a good bio-climatic state. The complex is agreeable with natural environment and human condition.

### **Conclusion**

Improvement of thermal comfort conditions in urban areas, especially open spaces, is the main aim of each bioclimatic design. Thus, the sufficient knowledge about the most important tools of science of climate designing is very important. Results of designing of a real urban project with area of 9207 square meter is based on the principles of science of climate designing and simulation in the three-dimensional microclimate model by ENVI\_met®. This indicated that designing and building a mass-based investment analysis chart (S.R.W.R) is the result of combination of both solar radiation and wind rose region. As one of the tools of the science, this analysis directed the urban spatial structure in the forms that sidewalk networks during days of July are exposed to direct sunlight with breeze in peak hours of daily temperature and that in winter while receiving direct radiation of sunlight at noon the temperature is effectively increased up to 15 °C degrees on the sidewalk networks. The use and suggestion of cold traditional flooring techniques in sidewalk networks are application of brick in contrast with modern floorings such as asphalt. The widespread use of vegetation in green roof patterns and networks of gullies are supplement to increase the effects of designing and securing the thermal comfort conditions in context of the site. This could be as general principles of rules the

knowledge in designing of urban spaces in the areas with dry and warm summers. These are the principles that their application in designing fabric site created space that decreased the average of maximum air temperature from 37 C° degrees up to 24.60 C° degrees in July. In general, there is a claim that the use of the knowledge in design of urban spaces provides stable coherent pattern in the structure of urban space and different patterns of fabric in comparison with each other, in addition to supplying thermal comfort conditions.

**Keywords:** *climatic design, Envi-met, Tehran, temperature, thermal comfort.*

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