



NEW TOWN DEVELOPMENT IN TEHRAN-KARAJ (Iran)

CODE: KAR-AB11

ACTION BRIEF ARCHITECTURAL ENERGY EFFICIENCY

TOPICS:
ENERGY
PLANNING

CHALLENGE

The building sector is the biggest energy consumer worldwide. Nowadays, energy saving in the building sector is predominantly done through cost- and energy-intensive measures, such as the use of insulation materials, high-tech materials, renewable energy systems, etc. Nevertheless, for production of these materials and technologies, a great amount of resources are consumed and a high amount of CO₂ is emitted. From an economic point of view, the investment costs of such buildings (user investment and governmental subsidies) are sometimes so high, that they are economically not viable for the national capital. Therefore, constructional and technological methods of energy efficiency must not be considered as the sole method of energy

efficiency. However, available technologies and building materials must also be utilised for improving the energy performance of buildings.

Beside the general problems of energy saving through cost- and energy-intensive methods, there are additional problems regarding energy saving through these cost-intensive measures especially for Iran. Because of still relatively low energy costs in Iran, energy saving through high-tech materials and insulation materials are not always economically viable. Therefore, there is a lack of social interest in energy saving through methods, which effectively increase the building costs such as application of insulation materials and renewable energy systems.

ACTION

The objective was to find a highly economic and ecologic method of energy saving for buildings. One of these methods is architectural energy efficiency. It deals with the optimization of architectural design of buildings in order to improve the energy performance and minimize the energy consumption of buildings. Architectural design is a very effective method towards an integrated, cost-efficient energy concept. Energy saving through architectural design (Architectural Energy Efficiency) is cost-efficient and emission free and, thus economically and ecologically very sustainable. Factors like orientation, building form, opening ratio in different orientations, sun shading, zoning of functions, natural ventilation etc. exceedingly

affect the (heating, cooling and lighting) energy consumption of buildings. Therefore, these factors are crucial for a climate responsive design. In a series of studies and researches, the effect of various architectural factors on energy demand of office and residential buildings is parametrically studied through dynamic energy simulations.

The results of these studies lead to a design guideline (Green Office Buildings: Low Energy Demand through Architectural Energy Efficiency) for designing energy efficient office and residential buildings in the climatic condition of the Tehran region. (ISBN 978-3-7983-2578-4 [print]; ISBN 978-3-7983-2579-1 [online])

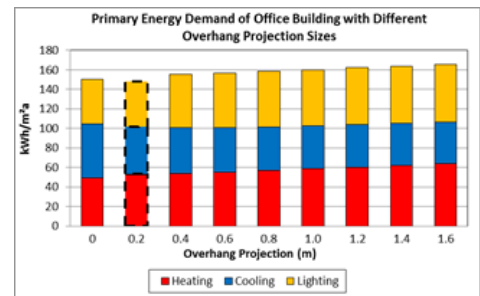
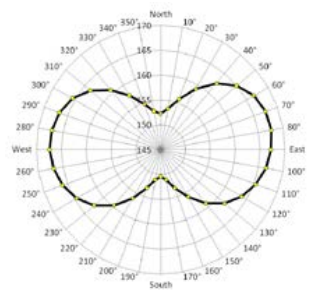
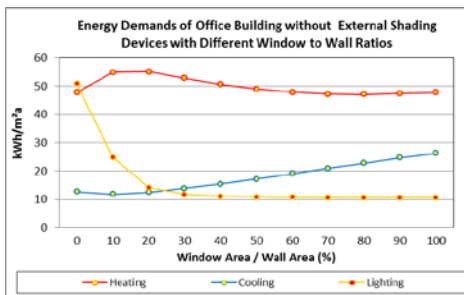


Figure 1: Window ratio and energy demand (F. Nasrollahi) Figure 2: Orientation and primary energy demand (F. Nasrollahi) Figure 3: Overhang and energy demand (F. Nasrollahi)

RESULTS

STATE OF IMPLEMENTATION:

- This method of energy efficiency is implemented in a study for office buildings in the climatic condition of Tehran region. The results of this study, which can be implemented in design process of office building in this climatic region, are published in the book "Green Office Buildings: Low Energy Demand through Architectural Energy Efficiency" (see ISBN above)
- Architectural Energy Efficiency is implemented in the design process of New Generation Office Building, which leads to a high amount of energy saving

LOCAL USERS / TARGET GROUPS:

- The main target group of this design method are Iranian architects and building designers
- This method has been used by the author for designing the New Generation Office Building (7 KAR AB 10) and the first Zero Energy (Office) Building in Iran, which is designed with cooperation and involvement of MABNA energy company. This building is under realisation now.
- The building owners and investors benefit from this action, because they save a high amount of energy without increasing the building investment costs.

IMPACTS:

- The added value is awareness of the role of architectural design for reduction of energy demand of buildings

Ecologic Impacts:

- Optimisation of architectural design of buildings effectively reduces their energy consumption as well as their CO₂ emission.
- Design impact on reduction of energy consumption of buildings varies according to specific climates and building usage (type); in climates which have a high temperature range, low relative humidity and high solar radiation, this impact is very high.

CONTACT

Project: Young Cities - Developing Energy-Efficient Urban Fabric in the Tehran-Karaj Region.
Web: www.youngcities.de

- In the cold climatic region of Iran, the potential of architectural energy saving for residential buildings is about 60% and in Tehran region about 50%. For office building, this potential is a little less than that of residential buildings.
- Because this method of energy saving does not need any additional materials or technologies and the energy saving will be reached only through architectural measures, the buildings with an optimised architecture have neither any additional resource demand nor (embodied) energy demand for production of building materials or (embodied) CO₂ emission.

Economic Impact:

- The architectural energy saving is a cost-neutral method for saving energy. It leads to an energy saving and reduction of energy costs without increasing the building costs.
- A broad use of this method for saving energy in buildings is profitable for national capital.

Social-Cultural impacts:

- The cost-neutrality of architectural energy efficiency will increase the social interest for saving energy.

MULTIPLICATION:

- This method of energy efficiency is published in different scientific papers and books.
- One of the publications addressed the definition of national Architectural Energy Saving Regulation in Iran.

LONG-TERM CONSOLIDATION:

- Architectural Energy Efficiency can be implemented for all building occupation, such as residential, office, etc., and in different climatic regions. The results will be the basis for definition of building energy saving regulation regarding architectural design.

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