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The role of roof gardens in saving energy and reducing the heat island phenomenon

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ABSTRACT

The Roof Garden of the beautiful and pleasant environment to live and work, to help improve air quality, especially in populated areas. What plants are planted on the ground, whether on walls or roof of a building, they can also attract dust, produce oxygen and cool in the hot summer months, (property due to evaporation) to expand the view of green space and natural help. Studies have shown that ghosting on the outer surfaces of insulatio Internal classification is most effective. One of the ways ghosting is the use of plants. What about the roof garden is important and distinguishes it from other areas, in buildings that save energy and metabolism According to Article 19 of the building and housing regulations on energy conservation The roofs of the cottages in the Arid and hot days in cities like Tehran, ventilation and cooler in the urban environment can be effective. The roof gardens have the potential to act as insulation for the roof because of heat exchange with the outside environment to prevent. Grate cities irregular and irregular structures, represents a heat island is residential. Of about 10 to 15 ° C temperature difference between the downtown and surrounding. As a result, a special climate grate cities and makes its own, only that its problems will follow. Grate cities NASA satellite studies show that all the earth, to destroy and replace them ***with p****lants and plant materials, especially the dark building, have been such a problem. Fight the urban heat island phenomenon is reasonable justification for making the roof garden is wide. is estimated that if all the roofs big city like Tehran are green to 7 degrees Celsius in temperature will decrease .*

Keywords: Roof gardens, energy saving, heat island phenomenon, heat exchange, urban space.

INTRODUCTION

More use of green roofs can reduce the severity of some of the problems of modern cities. buildings that have roof gardens - are, in comparison with the building ordinary roofs, require less heating in winter and in summer are much less cold; and can lead to significant savings in fuel consumption [3]. The building in mass numbers, the ability to

reduce the urban heat island effect of cities have. The roof gardens have the potential to act as insulation for the roof because of heat exchange with the outside environment to prevent [8].

This feature can use a layer of porous soil and the plants of broad-leaved species is increased In fact, green coating on the roof of the indoor heat in winter to prevent weed And reflected heat from the warm seasons neighborhood, and also prevent the absorption of heat by a wide range of roof in summer, less energy to keep cool air inside can be spent [1, 9, 13].

Roof garden and save on fuel and energy

Based on observations, under a green roof spaces which are located at least 3 to 4 ° C cooler than the outside - Trend. Garden roofs reduce heating (by adding mass and thermal insulation layer) and the cooling Through evaporative cooling), especially if the glass was And passive solar heating system or act as a greenhouse. Based on research that was conducted in 2005 by Brad Bass of the University of Toronto, can be shown that the roof garden waste and energy consumption for heating in winter significantly reduce On a hot summer day, the temperature of a conventional roof - can be increased to 60 to 80 ° C But when the temperature of the roof is covered with grass, was not higher than 25 ° C [4].

Infrastructuring a layer 20 cm with grass cover (about 20 to 40 cm) equal to 15 cm thick glass wool insulation is performance. Clearly, having a roof garden, the cost is related energy consumption is reduced [13].

The value of a green roof to insulate the roof is on display. A behavioral study by the Institute of Environment Canada showed a 26% reduction in the required coolness in summer and 26 percent reduction in heat loss in winter is achieved by the use of roof gardens. The American Society of Landscape Architects reconstructed the facade its headquarters in Washington, DC, were on a roof garden. This roof garden in summer temperatures and compared with a tarry roof of a neighbor, as much as 32 ° C reduced [2].

Daily temperature fluctuations in the graph of a pitch-black membrane roof with membrane roof with a roof garden during the year were compared; And can be seen that the thermal fluctuations of the roof with a roof garden roof no less than the thermal fluctuations Roof gardens, especially in the warm months of the year is to reduce heating and cooling energy is consumption [14].

Average daily demand in the energy diagram of the heat from the roof level, in a conventional roof and a roof garden Roof meet over 11 months were compared and evaluated And can be seen that the heating and cooling energy demand, particularly, which is equipped with a roof garden in the warm months of the year (cooling energy) The roof garden roof is no less direct effect on reducing fuel consumption and energy [5, 12].

Figure 1 - Comparison of daily temperature fluctuations in pitch-black membrane roof with membrane roof with a roof garden during the year

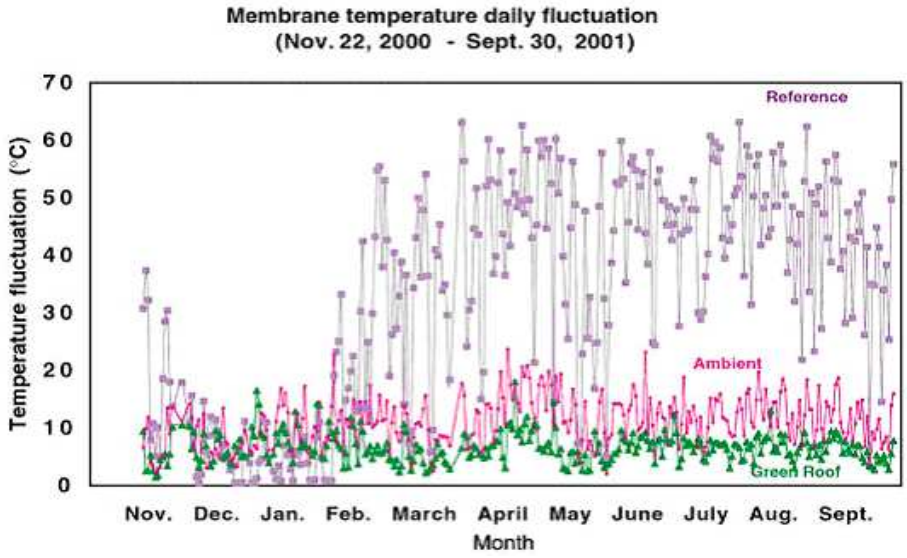
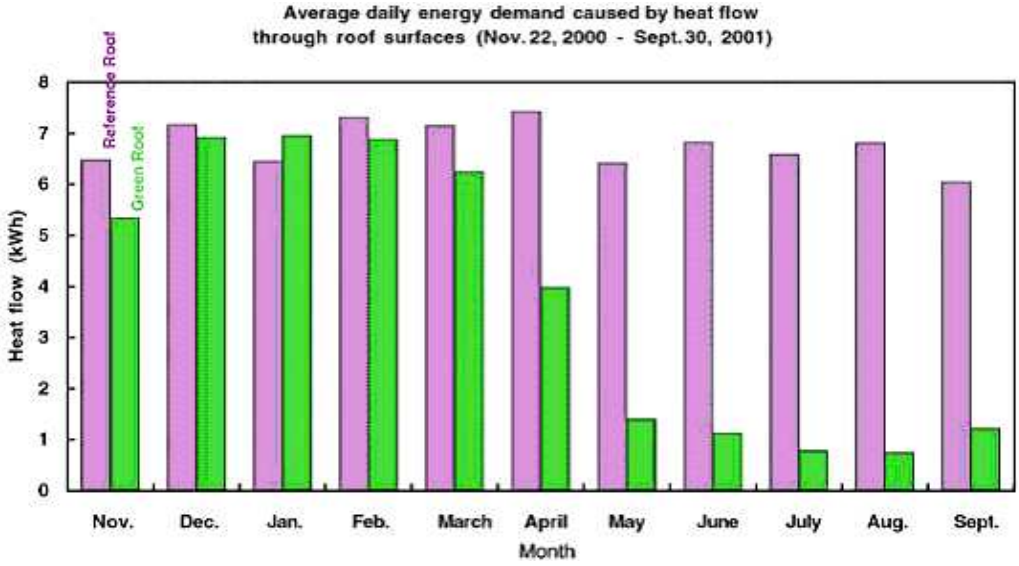


Figure 2 - Comparison of average daily energy demand for heat from the roof level, in a conventional roof and a roof garden Roof meet over 11 months



Roof garden and the reduction of heat island phenomenon in grate cities

During the summer, in the process of absorbing ultraviolet radiation and infrared emission in each region, the roofs of buildings, streets and dark surfaces, and heat are emitted into the air [9].

Considering that nearly all the roofs are dark in Tehran Metropolis About half of the dark surface encompasses an area of Tehran, the heat emitted by the sun and absorb its keep. This phenomenon increases the temperature of the residential areas from 2 to 15 ° C and the heat island phenomenon is known [10].

The heat island phenomenon in urban areas due to cloud

Grate cities NASA satellite studies show that all the earth, Due to the destruction of plants and replacing them with plants and materials, especially the dark building, have been such a problem. During the dark days of building materials, they absorb heat and keep it until several hours after sunset. Irregular structures and irregular Tehran, represents a heat island is residential Of about 10 to 15 ° C temperature difference between the downtown and surrounding In a special climate grate cities and makes its own, only that their problems will follow. With a simple survey that focused on the environment in two, three decades Tehran abysmally, in both vertical and horizontal expansion has had. This phenomenon is not too distant past where the rich variety of plants and plants mass has now been covered with concrete and asphalt is dark [13].

Obviously, cities, rural areas have a higher temperature. Input of solar energy plants and soil water evaporation in the rural areas. The latent heat of evaporation, the water changes from liquid to vapor is. The process temperature does not increase non-residential areas, but rural against urban, soil and plants are less. The amount of incoming solar energy, the direct heat of the streets and buildings, this process increases the temperature in cities is faster. During the night, the heat stored in the streets and buildings that are slowly being emitted to the air temperature will reduce. Cars, factories and air units, heat the heat island effect is to exacerbate [7].

Consequences of the heat island phenomenon in urban areas

Tremendous will heat island effects on air and the great variety of areas, from the perspective on small-scale meteorology, the obvious consequence of increasing temperatures in buildings, especially in areas that are more dense, which increases its energy consumption for heating and cooling of buildings is. The major effect of heat island phenomenon, increasing per capita financial times, especially in warm months and in the central regions grate cities including Tehran. Heat island phenomenon represents a serious deficiency is the second plant. Deficient plants usually cause other problems, including increased levels of various pollutants in city air, pollution, and ultimately

the loss of run off rainfall, increased noise pollution, increase in psychological problems, etc. This process, in addition to the physical processes of radiation and emission wavelength longer than that, worse in hot weather is grate cities. As well as ozone pollution, the city is severely threatened. Chemical reactions of ozone molecules in the ground makes a serious threat to air is among the city. Aerosols affects up to 10 ° C increase in temperature will heat island phenomenon, the chemical processes that occurred and the problem compounded.Ozone in the hot summer months and the most serious threat to health and the health of animals [4, 5].

When the mass of the ground covered with green plants or soil plants and it is wet, the heat absorbed by water evaporation and transpiration (evapotranspiration) plants are quickly replaced Some parts of the city is warmer than other parts of it, this indicates that more heat is released in these areas [6].

Central areas of Tehran has a thermal peak. The heat generated by the motion of a rising low prossuer air this system is the air around the city. If there is enough moisture, then we will see a thunderstorm. This reduces the temperature of the cloud formation and ozone formation process will be slow [3].

CONCLUSION

The roof garden of the solution to deal with the heat island phenomenon
Fight the urban heat island effect is another reason for making the roof garden. The benchmarking of the Hanging Gardens of Babylon about 2600 years ago by Iranian engineers and designers and built. Roof gardens can plan, nearly a fifth of the Tehran city green space and made it possible to overcome the heat island Tehran. The building traditional materials of solar radiation into heat, and they are dipped to . Urban areas and at least 4 degrees Celsius warmer than other areas [8].

In Shykakv, comparing properties with a roof garden, found that 14 to 44 Celsius cooler temperature of the roof on a hot day the roof - is the traditional approach. Garden roofs are common in Chicago, and Portland and other cities as well as in the case of cult to combat the phenomenon of the urban heat Have [1, 7].

One of the earliest and most famous examples of Chicago roof garden roof garden for plants grown in America as they have an experience of A roof garden on a small region to pursue this and other studies, estimated that if all the roofs in the city - have large green to 7 ° C decrease in the temperature [14].

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