

APPLICATION OF GREEN ROOF IN REDUCING TEMPERATURE OF RESIDENTIAL BUILDING IN CHITTAGONG CITY

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ABSTRACT

Energy consumption in the building sector is increasing gradually and in Bangladesh it is expected to increase further due to increase in standards of living. To make the surrounding environment sustainable green roof is playing an effective role. Green roofs, also known as 'living roofs' are known as roofs that are intentionally fitted or cultivated with vegetation. Green roofs are popular for their environmental benefits to cities, as they mitigate urban heat island effects, reduce the energy consumption of building. This paper presents an analysis of thermal performance between two selected buildings where one building occupies green roof and other one occupies conventional roof. This analysis shows a certain variation in indoor temperature of these two buildings. This study will help to understand why installation of green roofs are effective on contemporary buildings to control the temperature of buildings and to reduce the energy consumption.

Keywords: Green roof; energy; environment; temperature

INTRODUCTION

One of the most growing concerns of future buildings is the reduction of energy consumption in all their life phases (Lu et al., 2015). The United Nation Environment Program estimates that buildings consume about 40% of the world global energy, 25% of global water, 40% of global resources (Asdrubali et al., 2015). So for a sustainable environment the concept of sustainable building design is getting popularity day by day. Green roof is a vital component in design sustainable building. Green roofs are considered to be an effective solution to improve internal and external environment at the building and urban levels (Ferrantea et al., 2015). To extenuate the heat gain and minimize the cooling load for mechanical air conditioning green roof is an effective solution (Rashid et al., 2010). The practice of green building in Chittagong as well as in Bangladesh is very rare. Still people have a little idea about the concept of green building and the energy consumption of building. Aim of this study to evaluate the potential of reducing the indoor air temperature by applying green roof and maintain a comfort temperature throughout day and night in humid climate of Chittagong city.

METHODOLOGY

In this study, brief literature study on previous related researches was done. To measure temperature and show the variation of temperature of two buildings one with conventional and another with green roof was selected for this study. Both of the selected buildings are in khulshi area of Chittagong City.



Fig. 1: Selected study area

Physical measurement of temperature was done by Temperature and Humidity meter.



Fig. 2: Temperature and Humidity meter

Temperature for both external and internal were recorded at every one hour. Then the data were averaged for every six hours. Indoor air temperature was recorded inside the test room and the position of the device was 1.5m above the floor level. Outdoor temperature was recorded in the outdoor environment, and the position of the device was 3m above the rooftop surface. After collecting all the data, a graphical representation is made to show the variation of temperature between the two selected buildings.



Fig. 3: Green roof application on the selected building

RESULTS AND DISCUSSIONS

Data collected physically from the study area are plotted in a graph to show the variation of temperature between conventional and green roof which is shown in Fig. 4

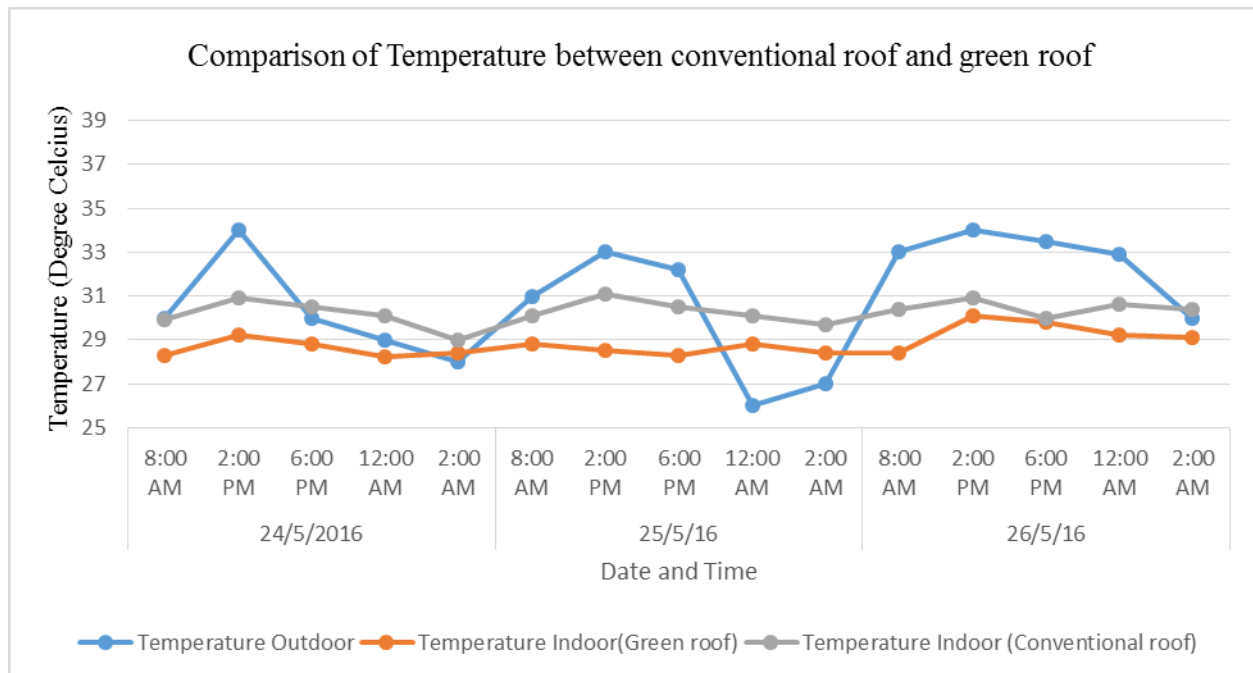


Fig. 4: Comparison of temperature between conventional roof and green roof

The comfort zone analysis for Bangladesh especially during the summer season is between 24°C to 32°C. According to the graph the indoor temperature of the residence is staying within this comfort temperature range. From the figure it is also clear that the temperature of building with green roof has a lower value than the conventional one. The average temperature variation is 1.46°C. This study shows that green roof plays an effective role in reducing room temperature and also minimize the energy consumption of the building. A better planning of green roof can reduce more temperature and maintain a convenient room temperature.

CONCLUSION

The result shows that the green roof application helps to reduce the indoor temperature of a building as well as maintain a comfortable temperature with respect to the outdoor temperature. This research work also provides that, building with green roof can provide a sustainable, energy saving, comfortable and healthy environment.

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REFERENCES

- Asdrubali, F; D'Alessandro, F; Schiavoni, S. 2015. A review of unconventional sustainable building insulation materials. *Sustainable materials and technologies*, 1-17.
- Errantea, P; Gennusaa, ML; Peria, G; Scaccianocce, G and Sorrentino, G. 2015. Comparison between conventional and vegetated roof by means of a dynamic simulation. *Energy Procedia*, 78:2917 – 2922.
- Lu, T; Lü, X and Viljanen, M. 2015. A new method for modeling energy performance in buildings. *Energy Procedia*, 75: 1825 – 1831.
- Rashid, R; Ahmed, MHB and Khan, MS. 2010. Green roof and its Impact on Urban Environmental sustainability: The case in Bangladesh. *World journal management*, 2(2):59-69.