

Researches Regarding the Determination of Temperature Differences Between Buildings Equipped with Vertical Garden Systems and Two Conventional Wall Constructive Types

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Abstract. The research was conducted at the University of Applied Sciences, Neubrandenburg, Germany. In order to emphasize the difference between the walls of various buildings have been made infra-red image in order to delineate the differences between surfaces covered with 9 (nine) vertical gardens and conventional construction. Were followed differences between walls made of different materials (ceramics and wood), vertical gardens and walls covered with climbing species. The results show that the temperature difference between the vertical garden systems and conventional walls range from 0.1°C and 7.14°C.

Keywords: differences, materials, infra-red, vegetation, wood, ceramic

Introduction. Has been demonstrated that the cooling effect of a building during the warm season, depends on the shaded area and not on the thickness or the density of the vegetation layer (Wong, 2009, 2010). Also, the vegetation applied to a building wall provides an insulating layer during winter, reducing wind effects on the buildings walls surface by forming protective air cushions between vegetation and the wall (Farha, 2010). In urban areas, where the level of pollution and dust is high, any form of vegetation absorbs the pollutant particles (Wilmers, 1990, 1991). The extent of absorption is proportional to the existent green foliage surface from a building wall. Another important aspect taken into consideration by the sustainable development is to improve the biodiversity in urban areas (Barnett, 1982).

Aims and objectives. The necessity to implement vertical gardens systems in Romania is justified by problems related to urban pollution, energy consumption, carbon emissions, and water consumption. Vertical garden systems have the capacity to reduce or even eliminate these problems.

Materials and methods. The research was conducted at the University of Applied Sciences, Neubrandenburg, Germany. In order to emphasize the difference between the walls of various buildings have been made infra-red image in order to delineate the differences between surfaces covered with vertical gardens and conventional construction. Were followed differences between walls made of different materials (ceramics and wood), vertical gardens and walls covered with climbing species. Have been used the following types of walls: Optigrün, 90 Degreen, Schadenberg, Sempergreen 2010, Sempergreen 2013, Vertiko, Vivagreen, Vertis, Cultilene. The infrared images were taken with the camera "infratec varioscan", night and daytime, on 13.07.2013.

Results and Discussion. The obtained images show the difference between the temperature of vertical gardens and the wood, respectively brick walls. The temperature differences are also due to the North or South exhibition of the various vegetal walls and their disposition on the campus of the University of Applied Sciences from Neubrandenburg. The highest difference of temperature during the day was found at Optigrün wall (7.14°C), and the lower at Schadenberg wall (0.1°C). The biggest differences during the night were found to

Schadenberg wall (4.7°C) and the lower at walls 90Optigrün and Degreen (2.04°C). Average of the differences of the daytime temperature is 3.15°C , and the average of the differences of the night time temperature is 3.01°C . In figure 1 is shown a type of the vegetal wall included in the study - the vegetal wall Vertiko with North exhibition during the day and the infrared image taken with the camera "infratec varioscan". Figure 2 present the results obtained concerning the vegetal walls 90Degreen and Optigrün.

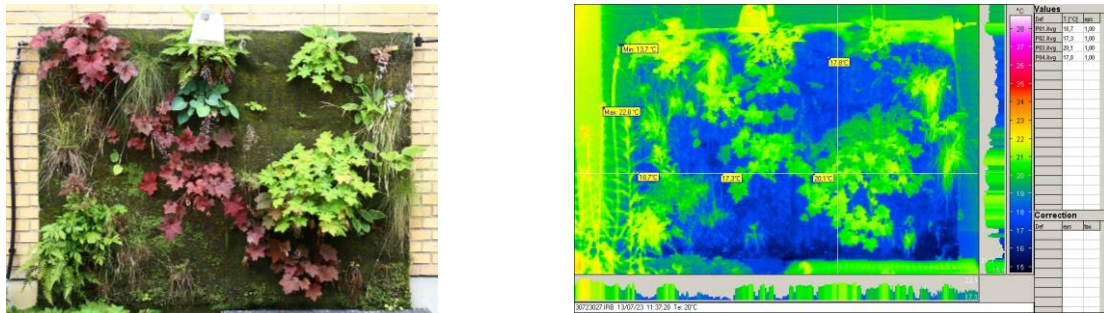


Fig. 1. The vegetal wall Vertiko - infrared image taken with the camera "infratec varioscan" in daytime, northern exhibition

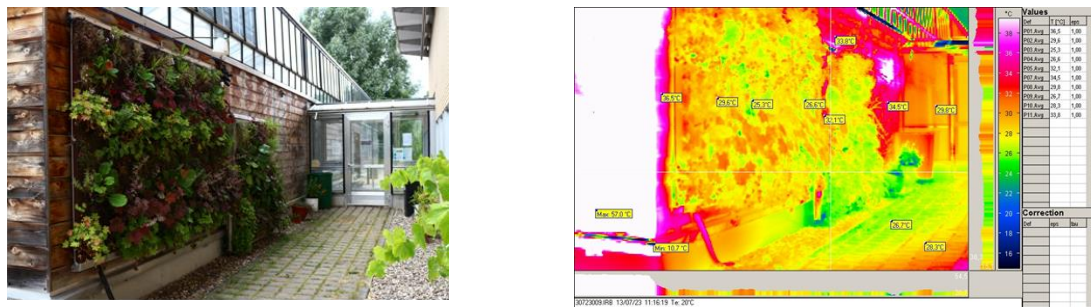


Fig. 2. The vegetal walls 90Degreen and Optigrün - infrared image taken with the camera "infratec varioscan" in daytime, southern exhibition

Conclusion

Plants certainly helps to promote thermal comfort as they cools down the building façade and cools down the surrounding by transpiration. Extending the plant or greenery onto the building façade has shown potential in reducing surface temperature in the built environment. Materials and equipment used facilitated the setting up of the experiments, associated monitoring, data collection and interpretation. Even though the experiments were conducted in Neubrandenburg, Germany results can be valued in drawing of the guidelines for the construction of vertical gardens systems in Romania.

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