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Studio
Materialisation SADD

Course
AR3A160 Msc3 Lecture Series: Research Methods and Design Practices

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Topic
Green roof contributes to good environment and public space in sustainable design
Introductions

When talking about the design process in architecture, people may have a picture in mind that consists of a lot of sketches and models, site operation and completed building. But what I want to declare here is before all these steps, an important issue was already settled, namely the research about the project itself and the basic thoughts in an architect’s mind. The goal of the research process is to deepen understanding of an issue. This position paper is aimed to illustrate my thinking of architectural research method which is related to my graduation project in SADD studio.

The site of the project is in Manhattan, New York city. A new UN Environment council is needed. As shown in the assignment book, sustainable developments and measurements are being taken all over the world nowadays, in all sorts and kinds. The aim for this design task is to make UN Environmental Council be the home-base for this worldwide coordination of sustainable measurements. This determines that the UNEC should be designed in a sustainable way. The building could be in any style, no matter it is a high rise building or low blocks, but low tech is recommended. Considering the unique site location, the relationship to the urban fabric is also a starting point in this design. Manhattan has its own urban fabric with criss-cross style for the whole island, and on the island, except the famous central park, the green public space is quite limited. The green public area is highly needed in this project.

To achieve the goal of designing a building in a sustainable way environmentally as well as spatially, at the same time making it fit the urban fabric and the contribute to green public space of the island, we first come up with an idea of the green platform master plan. In the master plan, along the whole east coast of the Manhattan Island, a green belt is built, and every several blocks, a green platform is shown. Our UNEC site is on one of these green platforms.

Since I want to give back the green area to the city as much as possible, an idea of green roof is formed. Considering the benefits and typology of the green roof, it is quite suitable for this design concept. “Green” has always been the topic when we are talking about sustainable design. Green roof, green façade and green energy are used more and more often in our real design projects and work really in an effective way. Among these, green roof has existed for many years and been used widely.

A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. [1]

Actually the concept of green roof is not a new topic. Early in 600 BC, the Babylonian shocked the world by their amazing “Garden in the air”, which was the classical model of
the green roof. In northern Europe, some houses still keep the sod roof since hundreds of years ago to pass the lengthy cold weather. Modern green roof is invented by German in 19th century, as the waterproofing technology was highly developed. In recent years, architects, engineers and urban planners are trying their best to make green roof concept more and more feasible and widespread.

Research question

Considering the location of the site and the condition of the urban context, the design of the green roof related to my own design is introduced. My research question is: how the green roof contributes to good environment and public space in sustainable design, related to my UNEC project.

Benefits and typology

The green roof itself has lots of benefits in environmental way and different types of the roof will influence the appearance of the building as well. The design of the roof is the starting point of my whole design, and it determines the atmosphere of the public space both inside and outside the building. The green roof is the fifth elevation of the building and the green layer is also a kind of material that gives people a perception of the space, which is related to research method of materiality and perception.

Exploratory research and empirical research are the ways I use to proceed my research about the different possibilities of the green roof appearance. After doing some research of the green roof examples and visiting several green roof buildings, I get my first impression of the green roof in my case, which is a huge floating green roof above the whole building. Then exploring more, to make a good connection with the site, the roof will be a slope with one corner directly connected with the ground.

The benefits of the green roof are a lot. The traditional asphalt roof does not have good effect of heat insulation, thus aggravates urban heat island effect. If the roof is covered with green plants, soil and vegetation can effectively absorb the heat of sunlight; meanwhile the effect of plant evaporating can also reduce the surrounding temperature, and absorb carbon dioxide through photosynthesis. According to statistics, with the green roof during summer daytime the temperature is 30% lower than with the traditional roof.

Another advantage of the green roof is that it is conducive to drainage. When the rain falls onto the traditional roof, the water goes from the eaves directly into the sewer without absorption and filter. Green roof can effectively absorb moisture, for the rain to filter. Through the green roof part of the rainwater after filter is absorbed, so as to share the load of sewer drainage, prolong the service life of the urban drainage system. After the filtration of the green roof, the rain is cleaner, so it can return to the rivers, lakes and reservoirs, reducing pollution.
Green roof also can keep out the ultraviolet radiation, alleviate sudden cold and sudden heat and prevent water from damaging the roof, prolonging the life of the roof. Although the constructing cost is not low, in the long run the green roof for the whole city is money-saving.

For people who are living adjacent to the highway, like the FDR road next to the site, green roof vegetation can be effective sound insulation. People can enjoy the green landscape when opening eyes and enjoy the quietness of the simulative jungle when closing the eyes.

According to the growing requirements of the plants and the functional needs of the roof, the green roof can be divided in to two categories: extensive roof and intensive roof.

Extensive roof almost needs no management, maintenance or manual irrigation, thus the qualification of roof is not high. In the choice of the plants, they hardly need any trim and can self-develop and self-maintain. The growing medium for natural plants is light and thin. This type of green roof mainly focuses on saving energy, protecting environment, beautifying environment and increasing the service life of roof.

Intensive roof needs more conditions but services better environmental atmosphere. It can be used for roof garden and urban farming, providing space for people to have activities. But intensive roof needs meticulous maintenance, thicker growing medium and regular irrigation. More types of plants are under consideration since the roof structure is better. The function of the roof is closely related to people’s activities.

In my case, the floating green roof is people-accessible, so the extensive roof is the type I choose. The roof will be one corner connected directly with the ground so it will be a huge slope roof, thus citizen can easily get onto the roof and enjoy the green roof life.

**Green roof and environment**

How the green roof contributes to the environmental sustainable design? First, the climate of NY City is important. Climate determines the growth of the plants and it is the basic condition of the success of the green roof. The condition of the sun, rain and wind directly influence the performance of the vegetation layer. Green roof was originated from Western Europe, where the summer was warm with frequent rains as well as the winter was cold. This technique was also developed and tested there. NY City is in the northeast of America, which is sharing a more or less similar climate as Western Europe. The climate here is suitable for the green roof design.

Green roof helps with minimizing heat island effect of the NY City. Somehow urban green roof will reduce localized ambient temperature obviously. It can create a microclimate which does well to the surrounding area by cooling and humidifying the air, thus improving the climatic environment. Since the city is crowded and polluted on some level, green roof
plants can filter out dust and smog significantly. Harmful materials can be absorbed by the green layer. Seeing the heavy traffic of NY City, the carbon emissions issue will be reduced by the summer cooling effect of the green roof, thus also reduces energy consumption like air conditioners. When it turns into the rainy days, green roof system can reduce the water runoff greatly. The drainage system can be designed as the collections for irrigation and energy reuse. In the future, the green roof can be used as recyclable products, thus saving valuable resources.

The building is on a green platform, and the slope green roof will be well merged with the surroundings. The roof itself provides natural climatic advantages for the whole building due to the benefits of the green roof.

**Green roof and public space**

Green roof provides natural bio-diverse habitats for both animals and plants, so the city is more welcome for the whole living beings. It gives people a good visional scenery and extra space to experience the grey space between building and outside. The combination of the green roof and public space is a great starting point to introduce the green roof into public use. The public space can be set on the top floor of the building connecting the green space directly and let people enjoy the beautiful view easily. The roof life will be enriched by the green roof, thus offering people another city experience feelings, especially for the site location like UN area, the beautiful sea view together with the green garden on the roof is an uncommon practice. Also it will reduce the noise levels greatly. In a noisy city like NY City, the noise problem is always considered in a design process.

Since the roof is a huge slope directly connected with the ground, it provides more opportunities for citizen to go onto the roof to enjoy the wonderful roof life. In this way, the roof creates a new public space for the whole site as well as the building itself. The whole area of the site will be accessible for the people, which is the main goal of this design, namely giving back the green area to the city as much as possible.

Inside a building, we can define certain parts as public space functionally. While outside a building, a roof like this will also enrich the public space for the building. The building needs a good conversation with the surroundings, and the roof in this case will work quite well, being the bond between the building and the site.

**Materiality and perception on public green roof**

The roof is the fifth elevation for the building. If the roof is accessible, this elevation will be really important. The green layer is also a kind of material that gives people another sense of the space. The atmosphere of a public space will be perceived by people not only physically but also emotionally. If concrete gives a feeling of cold, then the green plants will give a feeling of warm. A building like this will provide a welcome feeling for the people who even cannot get into it. An open and welcome public space on the roof is very
common now. The dimensions and materials determine the quality of the public space, and this kind of space determines the quality of the site. If the slope roof is large, open, welcome and outstanding, the fifth elevation has its own highlight.

Conclusion

Thus we have a conclusion. Green roof contributes to sustainable design concept in both environmental and spatial way. The site will give green area back to the city as much as possible. The use of the green roof is a good solution to help with the sustainable development of the building. The combination of the green roof system and other systems in the building can provide a better place for both spacial and climatic comfort for people. Related to the site, the green slope roof provides an interesting public space for the city and keeps the green area for the city. This fifth elevation is being most used by people.

Essentially, architecture is seemed as a physical space produced by people, but psychologically the quality of the space is determined by the dimension, material and other factors. The green roof issue I investigate here is not the only way to deal with the site of course, but it really somehow fit the design target and provide a good sustainable design result.

Notes


Reference

1. Green roofs in sustainable landscape design, Cantor, Steven L., 2008
2. The green roof manual, Snodgrass, Edmund C., 2010
5. Architectural positions, Tom Avermaete, Klaske Havik, Hans Teerds, SUN publishers