The principles of green design in architecture

In modern communities, healthy environment is the foundation of our daily lives. However, environmental problems are becoming serious. Much research illustrate that the pollution from architecture, from construction to operation, is one of the main contributors of these problems. The world famous design theorist Victor Papanek claimed in the 1960s, that designers should consider the limited resources around the world to protect the planet. This was the first announcement globally promoting the set of principals of green design. This assignment will firstly explain the principles of green design, then show several applications of these principles and finally evaluate the contribution of these principles to society .

According to Yeang and Spector, green design is based on four principles, the green principle, the grey principle, the blue principle and the red principle, which aim to reduce contamination to the environment, recycle waste and reuse energy. The green principle is the principle about interconnecting natural areas and buildings. The grey principle refers to the circular systems in the buildings, such as energy or electric power systems. The blue principle is about the water cycle which should be designed to close the loop, which means that try best to reduce or reuse waste water. Finally, the red principle suggest designers should meet the requirements of customers. When applying these principles in architecture, it means sustainable design to comply with economic, social and ecological sustainability.

The green principle states that whenever and wherever possible, the existent natural eco-system should be reserved to a great extent during the period of designing. This has been highlighted by Yeang and Spector (2011), “ having

an eco-infrastructure in the master plan is vital". The obvious benefit, such as providing cleaner air and improving water supply, of designing under the green principle is significant. However, a hidden potential, for instance, being a conditioner of climate change and keeping water from washing away, is also meaningful. As will be illustrated later, designing under green principle bring citizens better lives.

The grey principle is the principle which is frequently used in urban engineering. Applying it into architecture aims to regard buildings as a small city. Therefore, buildings should produce parts of energy by themselves, which can lighten the burden of government as numerous pressing global social issues have been caused by limitation of resource. The best explaination of this is the application of solar energy.

The third principle of green design is the blue principle, which can also be called the water principle. This principle claims that " new technological trajectories for the water infrastructure should be applied (Hiessl et al 2001)". As the predicament of global shortage, it should be used in cyclic way. " Water used in the built environment needs to be recovered and re-used wherever possible"(Yeang and Spector). As a result, blue principle is an additional built-up principle for green design.

The last principle of green design is the red principle, which is a principle of serving human communities directly. Applying this principle, designer should realize what citizens really require, whether they are satisfied with your design. It is important for a designer to remind themselves as a service provider. " What we do not know can hurt us"(Bondan & Sosnowchik, 2007).

“ This is the social and human dimension that is often missing in the work of green designers” (Yeang and Spector).

As the environmental problems become more and more serious, green design principles have been applied more frequently. Modern buildings always contain element of green design more or less. Designers usually apply principles of green design in their design in order to improve the quality of them. The particular examples below cover the application of the four fundamental principles of green design and demonstrate evidences of the principles of green design that should be used more widely.

With the speedy construction, increasing population and rapid-developing transportations, the phenomenon of urban heat island effect become significant, which lead to the environmental deterioration of life quality. Therefore, the applying of green principle require action imperatively. According to this, vertical planting have been utilized in common design. Vertical planting is a technique that uses different resources to allow plants to extend upward rather than grow along the surface of city. In some cases, no support frame of any kind is needed as the plants naturally grows upwards. The plants outside the building provide a layer to protect buildings from sunshine, which is benefit for preserving the temperature inside the buildings. Research demonstrate that buildings with vertical planting would keep the temperature 3-9 degrees lower than without that. With the help of vertical planting, the burden of air- conditioners could reduce 12. 7% approximately. It can be seen in some of modern constructions that green roofs, walls and facades are some of the City of Melbourne’s latest tools in the work to adapt city to climate change.

As the rapidly developing of green design, in order to applying the grey principle more effectively, the Building Information Modifying technology, based on the 3D technology, a new building design model collecting and managing effectively all kinds of information in the entire building life circle, have been exploited to assist architects to design recycle systems of buildings(Liu & Liu 2013). Applying this new technology, designers could be able to design the circular energy or electric systems inside the buildings, such as solar energy system, to decline the negative effects to environment and to achieve sustainable building design. Furthermore, wind catcher, a suitable ventilation means for houses to creates pleasant airflow in rooms, hall and basement, is another latest technology to reduce the energy of a building requiring to function normally. In addition, while hot water is the largest component of residential energy costs after heating and cooling, a solar domestic water heating system that is well designed will provide 50-80% of hot water needs, depending on the building’s geographical location and the time of year.

Water, often called the source of life, provides a valuable resource to be celebrated in the process of green design. According to Art Ludwig, only about 6 per cent of water people use for drinking. Consequently, potable water should not use for irrigation or sewage. The Monterey Bay Shores approach to water management is a representative example show how blue principle working. In Monterey Bay Shores’ water systems, main water sources is from the rain, which is collected by a storage and used in swimming pools, toilets, spa, laundry and bath after different processes of treatment. An additional water supplying line is municipal water supply,

which provides potable water for drinking and cooking. Finally, all the graywater(used water) after treatments will be irrigated for the plants of green roofs and green walls. Furthermore, the recycling system in Bird’s Nest is another example. With the help of six water collection and storage tanks with a capacity of 12, 000 cu m over 70 per cent of the water supply at Bird’s Nest is recycled water, while 23 per cent is recycled rainwater, which will be used for washing the stadium, road, toilet, garage and irrigating the land around the venue.

Recent years, residents in modern cities complain more frequently about the crowded sky scrapes. The grim tall buildings bring them the felling of choking. As the quality of people’s lives improved, a place for living is not the basic requirement of customers. The happiness and comfort taken by the style of space have been regard as more important. It tends to be a tendency that applying the red principle in modern design of architecture to satisfied the customers. Bauhaus Design School, the origin of modern design, for some, is synonymous with the greater term modernism. For others, the Bauhaus is a type of font or an architectural design style. “ Architecture is designed for human” is one of the most prominent view of Bauhaus. Architecture is service for people and should be combined with environment to become a gorgeous place for living. In German and Sweden, numerous buildings are designed with large dimensions but amiable, moderate and comfortable. The architecture to people is what human to nature. While nature never change following the human’s minds, building designers should consider more about the suggests from residents. Otherwise, a eye-

attractive design without suitableness for people could not be treat as a successful design.

The four principles of green design described above have being applied successfully in many parts of the world and have produced a significant reduction in environmental damage. To be more specific, the mainly benefits of applying principles of green design could be divided into three parts: economic benefits, environmental benefits and social benefits. Firstly, for the economic aspect, green buildings typically have lower annual cost for energy, water, maintenance and other operating expenses. Although the first costs may be higher, the payback would be worthy as the time goes by. Secondly, as original buildings use the energy and produce waste, green buildings could produce energy by themselves and reuse the waste to minimize the pollutant. Furthermore, in social respect, the principles using in green design bring the improvement in the quality of life, health and well-being. Residents in modern community would feel more health, comfortable and satisfactory to live in a green building.

In conclusion, green design is helpful to relieve the pressing global environmental problems while the situation become increasing serious, such as the urban heat island effect and greenhouse effect. Applying the principles in design, the cost of operating buildings would reduce by a margin, for instance, the expenditure of using air-conditioners will decrease sharply. Furthermore, applying principles of green design could take numerous benefits to people’s health lives. For instance, plants can produce oxygen and absorb carbon dioxide, which suits for human that need oxygen every second particularly. Principles of green design enable people to live in

a more comfortable and sustainable environment, which could improve their work efficience and bring them a safer and more environmental friendly future.

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