< Draft – Jaesun Lee>

1. Water Cube Innovation

* Innovative Design : The design of the Water Cube is inspired by the "blister". Designers want to use these bubbles to make the building lights when people watch it. When the "square box" is dressed in a coat of 3615 "bubbles" of various sizes, the dull atmosphere is swept away, however, it looks dynamic and stylish and it is the largest New polyhedron space rigid frame structure in the world. This needs a lot of computation and there must be no mistake in this process, or it will waste several times to correct it. The bubble shape idea came up firstly in the team, when the design team saw the location of the Bird’s nest and forbidden city in Beijing. The Water Cube design shows the harmony of Chinese traditional culture Yin and Yang, Bird’s nest is red colour and a circle shape it represents Yang and the team imagine the blue square shape of the building just next to the Bird’s nest which represents Yin.
* Innovative Construction : Water Cube was built by considering high safety level by using Ethylene Tetrafluoroethylene (ETFE). Carfrae cited(2006) that Chinese fire safety code required the structures be “fire-rated”1. In order to satisfy this requirement, over 90 km of steels are needed to be fire sprayed or fire-resistant painted which is impossible so they decided to use ETFE. According to Carfrae, ETFE is combustible and the greatest thing of this material is that the material shrinks away from a fire1.
* Energy-efficient building : Water Cube is the first attempt for ETFE to be utilized in major building since it satisfies design requirements perfectly. In mechanical aspects, the most energy-efficient way is to build an insulated greenhouse. ETFE allows to keep the heat from the daylight so the building is naturally insulated. This reduces approximately 30 per cent of energy consumption. Moreover, Carfrae reported (2006) that this building has the ability to provide responsive and comfortable environment. For instance, audience seatings will be air conditioning separately during the event by an under-seating air-conditioning system.

1. Major Achievements

* Engineering Accomplishments : Considering any project, it is important to have a proper chain of management which leads to initiating the project and make it happen. In water cube project, a new and innovative structure was required and by the collaboration of Arup, PTW and CCDI and working together they made it possible. They overcame the language barrier and cultural differences (which is always there in projects involving more teams from different parts of the world) and erected an amazing structure in the estimated time. Usage of ETFE material which will allow maximum sunlight into the stadium and help to trap sunlight (20% of solar energy) into the two layers of ETFE to use the structure as a greenhouse and withstand the huge structure along with self-extinguishing properties. By using this saved heat, the energy consumption of the pool was reduced by 55% when not using the artificial lighting2. As the design of the building was a flat roof and a cuboid shape, water collection from the roof was easy and hence 80% of the rooftop water was reused and recycled for usage2.This design and erection were not done by a single group or a company, but many companies and many groups were involved into the making of the water cube and hence, this shows the working and understanding of the people when they are working for the same cause and a better accomplishment2,3.
* Economic Achievement : According to the article [4], by the end of 2013, Water Cube had received more than 13.5 million people , host 800 activities which includes business, sport, art, local event and competition as well. These activities allowed to achieve more than 820,000 people to have social and economic benefits. Water Cube has various facilities including swimming pool. One of the famous place in Water Cube is multi-functional hall. Multi-functional hall has a capacity of 1000 people seats and 3 indoor tennis courts. The place is allowed to have any kinds of activities or events. Hence, Water Cube had received lots of promotion and marketing exhibitions from huge companies.
* Build up Reputation : According to IOC ( International Olympic Committee) President Jacques Rogge [4] , Water Cube is “a perfectly equipped, widest open and best operated Olympics swimming venue.” Moreover, this article cited that the Water Cube won 16 architecture awards. During the swimming events in Olympic [4], the records fell suddenly about 24 times. Due to the reason, Water Cube has been reputed as “magic water cube” and “Aquatic Hall of Fame”.

References

[1] Carfrae, Engineering the Water Cube , https://architectureau.com/articles/practice-23/nt.

[2] R. G. Eccles, A. C. Edmondson, and D. Karadzhova, “Building the Water Cube,” no. May, pp. 1–21, 2010.

[3] Association for Project Management, “APM Project Management Awards Winner’s - Case Study,” no. Ccdi, pp. 1–8, 2008.

[4] Water Cube official website, “Introduction of the Water Cube”, http://www.water-cube.com/en/ ,