**Cactus Legend**

**Pioneer Base**

Burning Man is the pursuit of yearning and freedom, and the goal of sustainable development is the continuous pursuit of all mankind. In order to prevent the resources from being wasted, the Burning Man Festival organizers hope to build sustainable infrastructure in the ranch base, which itself also reflects the pioneering spirit of the American West.

To achieve growth and development in the desert, the first classic example we can think of is the cactus. Cactus can withstand the hot light externally and has full juice internally. It is a perfect pioneer in itself. We hope to use cactus as a prototype, and bring cactus’ superiority into full play. Since the site is located in the desert of Nevada, enough daylight source offers the opportunity for solar energy storage utilization. The solar energy storage can absorb sufficient daylight in the dry and hot external environment for whole building using. Meanwhile, for the internal structure, the aquaponics symbiosis system creates a wet environment for balance whole building temperature, which achieves the result of the comprehensive development of external heat and internal cooling through new technology construction.

**Community Goal**

To achieve the goal of long-term development here, and provide continuous energy supply for the future Burning Man Festival, the cactus building community is equipped with electric power and vegetable planting systems.

The most crucial problems for a desert living is water and food supplies. The citizens of Burning man every year have to prepared necessities of living on their own. The new “cactus building” can relieve the predicament in the desert to some extent. The citizens of Burning man, the new citizens of the fly ranch, and visitors can obtain the fresh vegetable from the “vegetable frame” inside the cactus buildings. The goal of the cactus buildings community is to establish a public space development network by accumulating energy and agricultural products and attracting tourists to come and travel through new agricultural methods. The new circulation of necessities of living encourages citizens to settle down in the fly ranch and create their own culture of the community.

**Land Selection**

We chose the gap spring area with abundant resources as the design land, because the mild climatic conditions and the plenty of water resources can provide us with a suitable environment to cultivate cactus legends. By combining abundant solar energy storage shells and a self-circulating zero-pollution green agricultural system, we realize the vision of establishing a sustainable infrastructure in the desert for the development of Burning Man's Day in the next 30 years. Due to the foundation of the building under the ground, we have to insert the steel into the ground. However, the single building GSF is not huge( 1774SFT) for the site, the impact of environment can be smaller than the normal building.

**Architectural design**

We hope to show our artistic understanding of the Burning Man Festival and the Flying Ranch site through the installation. Using cactus as the prototype that represents the beauty of rough in the desert corresponds to the Burning Man Festival characteristic. The solar panels wrap the structure and interior equipment forming the pure and conceptual cactus shape. Meanwhile, the cactus buildings community becomes a place of stay and shelter for tourists and citizens. In addition, the entrances from four different directions improve the accessibility of the whole building as well as the circulation of the community.

**Aquarobics Symbiosis System**

On the one hand, we hope to meet the infrastructure construction the organizer wants. We started from the aspect of providing food. After a thorough investigation of the site, we found that the aquaponics symbiosis environmental protection system is suitable for local conditions. We hope to introduce the aquaponics symbiosis system to achieve a clean production method from the aspect of biotransformation and achieve recycling of water resources. Three goals of crop production and zero emission and zero pollution.

Aquaponics is a new type of compound farming system, which combines aquaculture and hydroponic cultivation, two originally completely different farming techniques to achieve synergetic symbiosis. In the fish-vegetable symbiosis system, the water discharged from the aquaculture pond enters the vegetable cultivation system in a cyclic manner after being treated by the nitrification bed microorganisms. After the biological absorption and filtration of the vegetable roots, the treated wastewater is returned to the cultivation pond. A closed loop is formed between the cultivation pond, the nitrification bed, and the planting tank. The symbiosis of fish and vegetables allows the animals, plants, and microorganisms to achieve a harmonious ecological balance relationship, which is a sustainable, circular, zero-emission, low-carbon production mode.

Fish and vegetable symbiosis requires three prerequisites: sufficient and suitable water sources for fish survival, stable temperature and the establishment of a closed loop system. The Fei Ran area has dozens of hot springs and cold springs, three interstitial springs, and 640 acres of wetland. We choose the three closest to the wetland water source within the scope of the site as the water source extraction site. The water is rich in minerals and is filtered through sedimentation tanks. The degradation treatment of the organic substrate finally merges into the fish-vegetable symbiosis system.

The original fish culture liquid absorbed by the fish and discharged from the fish pond is drawn from the fish pond by a water pump, and after solid-liquid separation and biodegradation, the ammonia is converted into nitrate that can be absorbed by plants and then fed into the planting tank. Aquatic vegetables are cultivated without soil, or some insoluble particles with a larger specific surface area (such as pottery for planting flowers) are used. These ceramsites can fix vegetables on the one hand, and can be used as biological filter materials for circulating water fish on the other hand. Numerous bacteria attach and breed on it, which can form a stable biological decomposition system. After the plants absorb nitrate, the absorbed water is drawn out to the sedimentation tank by setting up a siphon tank and using gravity, and finally re-injected into the fish pond for recycling, ensuring a clean system with zero pollution.

It is worth noting that the water source in the site is rich in cyanobacteria, and the water itself can provide food for fish and plants, but it needs to be in a dark state to prevent the cyanobacteria from producing a lot of oxygen. Therefore, the water transportation pipe inside the device needs to be made of opaque material.According to local climate and system requirements, the types of vegetables inside the device can include lettuce, tomato, spinach, water bamboo, cress and water spinach; fish can include tilapia, crucian, catfish, sea bass, etc.The planting trough is 22 floors high, the total planting area is 3202 square feet, and the estimated output is 3210 plants/period.

**Solar Panel System**

In order to store enough solar energy, except for four entrances, the facade of the cactus building is covered with triangle solar panels including the roof. Extraction of the skin texture of the cactus, and setting up an openable silvery solar energy storage panel in the shell can achieve rotation in different directions under different sunlight conditions and maximize solar energy storage.

The solar panels play the role of absorption sunlight. The interior facilities of transmission collect and transmit the energy to the collection tanks outside the buildings. The collection tanks will be resembled the equipment room of the whole community. The equipment room is designed to transfer the sunlight into usable electricity and store. The water pump system of the aquaponics symbiosis system can be launched by continual electricity, which means the driving force of the aquaponics symbiosis system in the cactus building can be obtained from a solar panel system. The solar panel system also services other functions in the meantime. The surplus energy can support the other functions for the fly ranch community such as residential buildings, offices, entertainments.

The annual capacity of solar energy for a single cactus building is 988.5MWh. The capacity can be improved as the number of buildings increasing. The rendering drawing shows that four cactus buildings can offer 3954MWh annually.