**QUARTZ ROAD**

Quartz Road investigates the possibilities of incorporating piezoelectrics into structures and walkways for the purpose of generating electricity in a collaborative and interactive way across the Mannheim site for BUGA ‘23. Inspired by the openness and fluidity of the site, Quartz Road encourages users to explore all areas of the site while creating energy along the way.

Piezoelectricity is an electric charge that accumulates in certain materials such as quartz in response to applied mechanical stress. With the site stretching to the size it is, we aimed to incorporate technology that could encourage exploration. For this reason, we incorporated rose quartz, the in all the walkways and structures included in Quartz Road. We avoided having a central attraction to encourage site exploration and to allow for additions to the site in the future. Our site is developed much like a theme park, where you have to wander to discover all its aspects.

1. **Aspects of Quartz Road**

The proposed design incorporates three different types of attractions laced throughout the site with piezoelectric pathways interlacing through them, acting as a guide for its users. The three attractions consist of a piezoelectric pavilion shelter, a piezoelectric flower garden, and a piezoelectric sculpture. All three of the attractions will utilize the rain to generate piezoelectricity with their rose quartz materiality.

1.1 Pavilion Shelter

The piezoelectric Pavilion can be found three separate times throughout the site. Organic in form, the Pavilion harmonizes with the site's fluidity and our intended goal to encourage wandering. The Pavilion’s structure itself is made out of rose quartz and is supported by an aluminum structure system. The quartz panels are angled in a way that allows the raindrops to repeatedly hit multiple panels, generating the most electricity. The pavilions are intended for a place of rest. With such a large site to explore, we wanted to give the users multiple locations to take a minute to catch their breath if needed.

1.2 Flower Garden

The Flower Garden, much like the Pavilion, utilizes rain to generate electricity. The flowers, which are 16 ft tall piezoelectric structures, are intended to catch rain, filter it down through their necks, and distribute it out to the surrounding pond. Piezoelectric plates will guide users across the pond and through the flower structures. The flower structures were intended to harmonize with BUGA’s flower garden and carry that theme through the rest of the site.

1.3 Sculpture

The last sculpture we have incorporated into our design is the sculpture. Located at the entrance to the site, the sculpture is intended to act as a gateway or transition point to the site. With its big open structure, the sculpture most clearly demonstrates how electricity is generated when it interacts with rain. When users walk underneath it, they will be able to see and hear the raindrops making contact with the structure, which immediately sets the tone for the rest of the attractions.

1. **Community Engagement**

With sustainability at the forefront of everyone’s minds, knowing there is a site where you can go make an impact and help to generate electricity just by walking will attract a large audience. A lot of times, the things we do seem minimal and meaningless in the grand scheme of things. Being able to walk around and see how much electricity you're generating gives an actual tangible and conceivable number to the effort you’re putting in. It’s one thing to switch to metal straws, but being able to see how many plastic straws you’ve saved brings your efforts into a whole new light. Being able to quantify your efforts to help generate electricity is what will keep bringing users back to the site.

2.2 Interactive App

In order for users to quantify their efforts, we created an app that tells users how much energy they’ve generated walking along the pathways. This gives the site an almost gamelike feel and allows the users to know they’re contributing in a positive way. This interactive aspect could encourage permanence and make the site a community destination for other events like marathons.

1. **Energy Generated**

The amount of energy generated on the site will depend entirely on how engaged the community is. Without community interaction, the energy generated from rain alone amounts to XXXXXXXXXX, but that is just the baseline. In reality, the electricity generated could be 10 times that amount if the community stays engaged.

1. **Scaleability**

Piezoelectric technology can be used at any scale. It can be used to span miles of sidewalks in a crowded city, or be used as stepping stones in someone’s backyard.

1. **Environmental Impact**

**Materials:** All materials will be locally sourced besides the Rose Quartz. Our design’s simplicity allows for materials to be limited to aluminum and rose quartz. Aluminum has a long lifespan of 30 years and is able to be easily 95% recyclable, creating little to no waste.

**Transport:** There is a quarry that supplies Rose Quartz in Lower Bavaria, Germany, which is roughly 280 km away from the site. Other than that, transport will be minimized through the use of local resources for all materials and other aspects of the design.

**Self-Sufficiency:** Our design will produce all electricity needed on site and could possibly help to support the city of Mannehiem if enough people utilized the site.

**Lifespan:** Aluminum is one of the most abundant metallic elements on Earth and is known for being lightweight. It has a lifespan of over 30 years, but can also be easily recycled and reused. Rose Quartz, if taken care of, can last up to 100 years.