**Topographic Terrain**

**Design Intent**

The history of the St. Kilda Triangle is intriguing in the sense that it is a completely artificial landscape that has been transformed by mankind over time. The site was a naturally marshy swampland until the foreshore was reclaimed in 1884 when the area was settled by Europeans. Because the site currently serves as a parking lot that will become an underground parking garage in the proposed site plan, the soil on the site will undergo a reclamation process so that it can be suitable for construction. This allows for an opportunity to transform the ground condition yet again as a component of the design proposal. The intervention aims to recollect the rich history of the site’s geographical evolution by reshaping the ground to further accentuate the void that was created in the terrain.

The structure consists of a large overhead condition whose form follows the natural topographic contour of the site. This organic form is intersected with a rigid orthogonal and translucent cultural center whose second story is formed by the same overhead structure that wraps around the building. The structure dissolves into large curved social stairs that allow for a gradual descension to the entrance of the building on the lower level, while providing an area for visitors to sit and interact with others. The natural contour of the roof condition juxtaposes the rigid edges of the transparent building envelope. Because the center is composed of an entirely glass façade, the space is naturally lit throughout the day. The roof of the cultural and educational center has 580 photovoltaic panels that are able to generate enough energy to illuminate the space in the evenings and provide thermal comfort. The interior of the building is a primarily open floor space that can be transformed to host a wide range of events and exhibitions with several office and meeting spaces.

The roof condition forms three different levels which create unique experiential ways of inhabiting each manmade layer of the site. The lower layer consists of the parking level which is proposed underground, where most visitors will access the site. The support system for the overhead condition extends below the ground level to the underground parking to accentuate the concept that the site was built up from a massive void of natural land. This gives visitors a sense of the characteristic of the site from the parking level. From the underground parking level, visitors ascend to the main level, where they can observe the site and surrounding context from a glass cavern embedded into the topographic shift of the terrain as they approach the intervention.

Visitors proceed into the open air, conditioned space that emphasizes the design features within the site. This space is occupied below the topographic lines of the site with strategic cutouts that let in natural light and have a retaining area below that captures and stores rain water. This provides an opportunity for native Australian vegetation to be planted to create a botanical garden beneath the massive roof condition.

The conditioned second level is constructed from tallowwood, an Australian native hardwood that grows along the coast. It is a hard, durable wood that can withstand damp environments and has a lifespan of over forty years. It requires minimal maintenance because it has a greasy outer coating that gives it a glossy appearance.

The roof condition is occupiable above, creating the upper level of the intervention. This level primarily serves as a viewing platform to observe the surrounding context of the St. Kilda coastline from a vantage point. It also creates an opportunity to observe the design features of the site from above.

**Energy Generation**

Piezoelectric Effect: LED Illuminated columns

The ground condition of the street level consists of sub surface piezoelectric floor panels that generate energy from the frictional movement of people traversing above them. This energy is constantly being stored and converted to electricity for redistribution as people move above its surface. The kinetic energy produced by the visitors is used to illuminate structural fins on the exterior facade of the cultural center. The LED lights typically glow in a natural white hue but can be manipulated to display different colors for exhibits and events such as concerts or theatrical performances.

 The structural fins contain LED lights that are illuminated throughout the day using the energy generated from the piezoelectric ground plane on the lower level of the intervention. The level of illumination ascends daily as the level of energy generated by the movements of visitors increases. Therefore, the glowing columns are only visible from the shaded lower level initially, but as the day progresses and the sun sets, the columns gradually become fully illuminated to span both levels.

The roof of the cultural center folds down to create a large wall and passageway, leading visitors towards the center. The open face of this wall also contains LED lights that can display an array of designs. Typically, the design morphs and transforms in direct correlation to the movements of people on the piezoelectric surface. Because visitors are able to see the direct impact of their participation in sustainable energy production through the designs illuminated on the LED wall, they become aware of their capability to live a more sustainable life.

The piezoelectric floor panels, which are roughly 3 square feet in size can generate 4 watts of energy with each step. This amount of energy generation may seem insignificant at the scale of a single panel; however, the panels cover roughly 40,000 square feet of ground surface in an area of high pedestrian traffic. Since the site is open to the public year-round and piezoelectric energy generation is not dependent upon natural climate factors, roughly 6 kilowatt hours of energy are generated daily. This is a daily average throughout the year, encompassing days where large concerts and events take place as well as gloomy days where the weather is less ideal and fewer people visit the site. Annually, the piezoelectric floor panels can generate over 2,000 kilowatt hours of sustainable energy annually.

**Environmental Impact**

The primary material being implemented throughout the site is tallowwood, which will have an initial high cost due to the large quantity of material that the project demands; however, once the structure is constructed, it will require little to no maintenance and endure for a minimum of forty years. The wood is being sourced entirely from Australia so the cost and environmental impact of transporting the materials to the site will be significantly less detrimental than if the materials were sourced from around the world. The project also provides opportunity for the introduction of plant species including anarthria gracilis, banksia coccinea, anigozanthos manglesii, and lepidozamia hopei.

Because the cultural center has an entirely glass façade, it is naturally well lit throughout the daytime and the photovoltaic and piezoelectric panels on the site create enough energy to supply all of the power needed to facilitate the center as well access energy that is fed into the city’s power grid.