

## ARCH 384 | Bering Strait Competition

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Actual competition done with Mark(Sung Jun) Kim

The Bering Strait Competition called for a full set of designs that includes a peace park, an interior space to accommodate a memorial, a bridge linking the two islands of Diomedes, and a bridge/tunnel that links the continents of North America and Asia. Due to the extreme conditions of the site, it was necessary to research and utilize the most high-end engineering and technology available to date in order to design all the required components. The ones that called for most attention was the tunnel spanning between the continents, the island bridge(discussed in Mark Kim's paper), and the interior space. Most of the conceptual inspiration came from books, but almost all of the technical information was obtained through internet sources.

### TUNNEL

The main goal of the entire project was to 'connect' the two continents with a strong emphasis on the experiential and visual connection. For example, a tunnel usually gives a banal and uninteresting experience. But the tunnel designed as part of the 'connecting' the Bering Strait, which runs from Naukan, Russia to Wales of USA, has a unique shape of 'weaving' that allows the drivers to feel as if they are driving in a worm-hole to a space unlike any other place on Earth: the Diomedede Islands of the Arctic. Leading to these exotic places, the two vehicle sectors of the tunnel wraps around the train sector, creating weaved thread-like structure. The tunnel is composed of three concrete tubes that are joined to each other at the tangent. The middle tunnel, which is 16m in diameter, will contain two railway tracks, while there will be enough rooms above and below the rail which can be used for service corridors and utilidor. The middle tunnel is 'sandwiched' by two smaller tunnels, 8m in diameter, which will contain two lanes of vehicular roads that goes one way for each side. Periodically, these two tunnels do a helical/corkscrew like turns around the large railway tunnel in the middle, like a screw driver (refer to panel 5). Such form not only provides an extraordinary space to drive through, but is a safety feature also. A study was done to show that a straight road is more prone to accidents due to carelessness of the driver who loses his cautiousness because the road does not 'seem' dangerous.<sup>1</sup> In this sense, a curvy or sloped road is safer since the driver deems it as dangerous and does not disperse his attention to anything else other than driving. The vehicle sector takes this factor into account and gives gentle slopes and curves with its weaving form. This way, the tunnel can be built along a straight line, instead of curvy path which is common for extremely long bridges. The 'twists' also provide further bracing which may enhance the structure. This way In addition, the tunnel, aside from the spatial qualities, has interesting moments of encounter with nature. As it enters and exits the water, the roof portion is made of glass, allowing the driver to fully absorb the light and view of the Arctic, plus the moment of emerging out of the water.

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<sup>1</sup> (ReynoldsGlenn 2009)

A tunnel was chosen over a bridge to connect the two continents for several reasons. Firstly, it is quite low maintenance in comparison to a bridge, which is constantly exposed to various precipitations, high wind, and ice shelves of the horrendous winter months of the Arctic as well as the fluctuation of temperature that may cause even more structural degradation. A bridge also has limited construction time frame since it can only be built during the summer months in the unpredictable climate of the region. In contrast, the floating concrete tube tunnel allows the avoidance of the undesirable weather conditions and construction under a stable temperature range at any time of the year. The proposed method of construction is similar to the Archimedes Bridge, through a submersed construction rig, which allows assembling of the formwork, and pouring and curing of concrete all underwater within a large submarine like structure enclosure.<sup>2</sup> This way, the construction can occur throughout the year without the interference from the harsh arctic weather. The idea is that the rig will allow the tunnel to be 'extruded' as it is built, creating a single continuous tunnel without any joints that connect multiple segments as the concrete work is continued from the ends of the last concrete work. Unlike the traditional method of building a submersed tunnel, which requires prefabricating concrete tubes, lowering them into the sea and joining segments, the seamless concrete tube structure will minimize any weak points and increase structural integrity. All the materials can be safely fed through the tunnel as it is getting built which allows less trouble and coordination of construction.

## PEACE PARK

The toroidal shaped building on the Big Diomedede Island is a peace park that has a resort, a conference hall, and a research facility within its premises. Coming up from the escalators from the underground station, the user will experience the lightness created by the atrium like experience as large portion of the floor plates are removed around the escalator. Upon coming up from the escalators, visitors are treated with a wide panoramic view of the ocean as well as the other Diomedede island on the other side. Once reached the park, the user will see the eco-friendly resort and research facilities made from shipping containers with reclaimed wood facades. The unique stacking of the versatile containers allows for extraordinary views of the 260m long park, each level and each room with a different perspective<sup>3</sup>. The shipping containers used to build the hotel and the research facility were selected for their environmentally friendliness and modularity. First of all, they are easily accessible and reclaimable. Countless companies have shipping containers they need to replace and these can be reclaimed as pre-fabricated, modular building material. All they require is little touch ups and slight modification according to the design. While the outer concrete shell of the is being constructed on the island, the containers can be refitted with necessary elements, such as electric and plumbing, as well as furniture that is appropriate for various programs, such as hotels and research labs from different parts of the world. Once they are reclaimed and modified to the desired state, they can be easily transported to the site by trucks or trains when the tunnel is completed. And on site, the assembly of the containers does not require any heavy equipment which is beneficial to obtain minimized site disturbance and cost-effectiveness. By using modular construction, using shipping containers, various buildings and programs can be built simultaneously.

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<sup>2</sup> (Discovery Channel 2009) (waldyrious 2008)

<sup>3</sup> (Urban SpaceManagement 2007)

The peace park is a combination of advanced technology by economic, efficient, and effective construction as well as environmentally conscious means. The building is inspired mainly by the Eden Project in England, and designed with similar structure and material<sup>4</sup>. It is toroidal shaped to minimize the surface area, which therefore minimizes wind resistance and snow load. The roof of the building is almost entirely green roof of indigenous Arctic plants. The green roof and the concrete shell create highly insulated structure that would keep the building warm during the cold winter months. All the glass is also triple-glazed to minimize any heat loss. If that is not enough, the retractable roof facing the Little Diomedede Island is made with ETFE (Ethylene Tetrafluoroethylene)<sup>5</sup> and steel truss system to allow more light and view. ETFE is used for the glazing of the retractable roof to reduce the weight so that it is easily opened during the summer. The toroidal shape allows seamless movement of the retractable roof, where the two middle glazing slides behind the two other glazing on the side.

This project requires a combination of the innovative materials and the new and old building techniques to design a comfortable and memorable place in the one of the world's harshest climates. Because there is no one profound precedent that could be followed nor has anything like it was actually done before, such project is a great opportunity to fiddle around with all the super high-end technology to come up with the most feasible solution possible. From Archimedes bridges to the Eden Project and its ETFE to the average shipping containers, the project tried to utilize whatever that is available and push the limits of human boundaries on how far we can go in terms of architecture, construction, and engineering.

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<sup>4</sup> (WhalleyAndrew, PearmanHugh 2003) (Fernandex-GalianoLuis 2003)

<sup>5</sup> (CravenJackie 2009)

## Bibliography (CravenJackie 2009)

Craven, Jackie. "What Is ETFE?" *About.com: Architecture*. 2009.

<http://architecture.about.com/od/construction/g/ETFE.htm> (accessed March 28, 2009).

Daily., Shanghai. *China to build world's 1st 'Archimedes Bridge'*. Oct. 23, 2007.

<http://english.sina.com/technology/1/2007/1023/129041.html> (accessed Feb. 25, 2009).

Discovery Channel. *Transatlantic Tunnel*. 2009.

<http://dsc.discovery.com/convergence/engineering/transatlantictunnel/interactive/interactive.html> (accessed Feb. 26, 2009).

Fernandex-Galiano, Luis. "AV Monographs." *August: Eccentric Albion*, 2003: 182-5.

Reynolds, Glenn Harlan. "Does High-Tech Highway Design Make us Less Safe?" *Popular Mechanics*. April 2009.

<http://mail.live.com/default.aspx?wa=wsignin1.0> (accessed 03 18, 2009).

Urban Space Management. *Container City*. 2007. <http://www.containercity.com/container-city-one.html> (accessed April 02, 2009).

waldyrrious. *What is the Archimedes Bridge?* Jan. 28, 2008. [http://www.youtube.com/watch?v=YmD-cFfEi\\_w](http://www.youtube.com/watch?v=YmD-cFfEi_w) (accessed Feb. 25, 2009).

Whalley, Andrew, and Hugh Pearman. *The Architecture of Eden. With a foreword by Sir Nicholas Grimshaw*. London: Eden Project Books, 2003.