Crossing the Divide – An Instrument to Sharpen Perception

The proposed design for the SSEF Competition “Crossing the Divide” undertakes two primary investigations, first that of the specific opportunities of the chosen site and secondly, the unique possibilities that steel as a structural material can meet those opportunities. The proposed design seeks to provide more than just a physical connection between two sides of the river – it seeks to provide an opportunity for the users of the park to become more aware of the subtleties of the river that forms the heart of this beautiful shared park.

The chosen site is the Sixteen Mile Creek in Oakville ON (figure 1). This area is home to a large park that is surrounded by vast subdivisions and provides a valuable public amenity. There are several trails on either side of the river and the proposed bridge would connect the trails at the southern end of the park; there is an existing connection at the northern end of the park.

Figure 1

The river is at the very bottom of a large, heavily forested valley. The river, although by no means large, forms the central focus of the park. Despite the primary importance of the river, the existing bridge crossing does little to acknowledge the experience of crossing the river, the short duration of the span (20 meters) and the massive nature of the design serve to overpower the subtly of the river with the end result that joggers may pass over the bridge and hardly realize that they have crossed a river.

The proposed design seeks to explore the notion of the bridge as an instrument for focusing the senses of the user so as to enhance their appreciation of the river. This is done by two primary means: firstly, to capture the users’ attention with the sound of their footfalls on the steel decking, thereby removing them from the existing ambient conditions of the forest, and secondly, through the dematerialization of the experiential structure of the bridge at the very centre of the span.

Rather than allow the ambient sound levels of the forest to be gradually replaced by the sounds of the river, the proposed design turns the space within the structure of the bridge into echo chambers which amplify the sound of the footfalls, creating a sharp distinction between the space of the forest and the space of the bridge. The inspiration for this element came from the steel drums featured in many Caribbean festivals (figure 2), and exploits an inherent property of steel, its ability to vibrate and produce sound when impacted. The echo chambers get progressively larger and larger in volume as one approaches the centre of the bridge,

Figure 2

this increase in volume will bring an increase in reverberation time[1], causing the sound of the footfall to linger longer and become more noticeable.

At the very centre of the bridge, the solid steel decking is replaced with a steel grate, the grate allows direct views of the river below, as well as the direct transmission of the sounds of the river (figure 3).

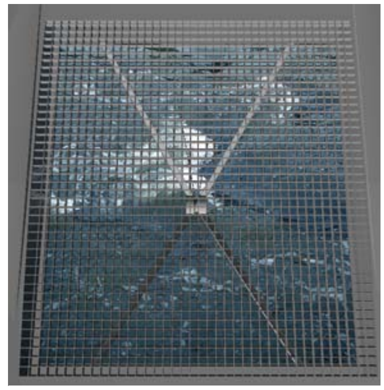

Figure 3

These two techniques (the manipulation of sound and the change in materiality of the decking), when combined in this manner, server to delay the moment that the user fully realizes that he/she is crossing the river until the very moment that they reach the centre of the river. While it is true that users will be aware that they are crossing a bridge, full awareness of the river, the most The bridge has a slight bulge in plan, which will hopefully encourage users to linger at the centre, which is the widest point.

The notion of using sound to define space is not at all a new one. The entrances to most modern theatres utilize what is called a “sound and light lock” (SLL). This is a small room which acts a buffer between the theatre and the world outside. Typically they are dark, soundproofed, and feature two sets of doors so as to completely separate the theatre from the surrounding spaces. The SLL not only prevents outside sound and light from entering the theatre, it also psychologically prepares the theatre-goer for the experience of the theatre. For a brief moment the senses are allowed to rest and recalibrate - the theatre-goer emerges into the theatre ready to fully appreciate all aspects of the performance.

This notion of a “sound and light lock” is reinterpreted here through the introduction of a new sound (the footfalls on the steel deck) that creates an intermediary space between the experience of forest and the experience of the river.

The connection between sound and spatial experience is often a crucial one. Any visitor to the Tate Modern Gallery in London (a massive electrical generation plant that has been converted into an art gallery,) will know that the ever-present hum of the generators that still whir in the building go a long way towards contributing to the unique sense of space created within the massive turbine hall.

Structurally the parti of the bridge is that of the King Truss. A very clear diagram and description of this model is given by JE Gordon in his book “Structures” (figure 4).

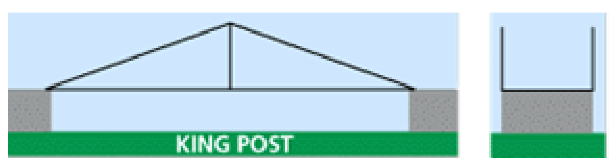

Figure 4

The design proposal calls for a pair of box beams, each braced by a cast steel strut and a tension member of high strength aircraft cable. Through their slightly triangular shape in section, the box beams provide horizontal stability, and they taper so as to be deepest in the middle of the span, where the stresses are the greatest. The fact that steel is strong in both tension and compression means that it is logical to construct the entire structure, beam, strut, and tension member, using steel. Galvanizing the steel allows it to be used in an outdoor environment, close to water, while minimizing the chances of corrosion.

The strut and the tension members are placed below the beams so as to minimize their visible impact and to minimize the physical boundaries that lie between the user and the environment. A similar approach was taken by IM Pei in the design of the Miho Museum Suspension Bridge in Japan (see figure 5).

Figure 5

Although the Miho Suspension Bridge uses an arch with tension cables at one end to create a dramatic entrance to the subterranean museum, thereby celebrating and emphasizing structural and technological aspects of the design, the structure of its middle span is completely out of view to someone who is crossing it. Here the experience is that of soaring high above a deep valley rather than of standing on a well designed bridge.

A similar use of a tension member can be seen the in Gilmore Skytrain Station in Vancouver BC by Busby and Associates (figure 6). The roof of the station is modular and is made up of sheets of Timberstrand, and engineered wood product. The tension member stresses the wood panels, shaping them to drain water and preventing excess movement due to wind and water loads.

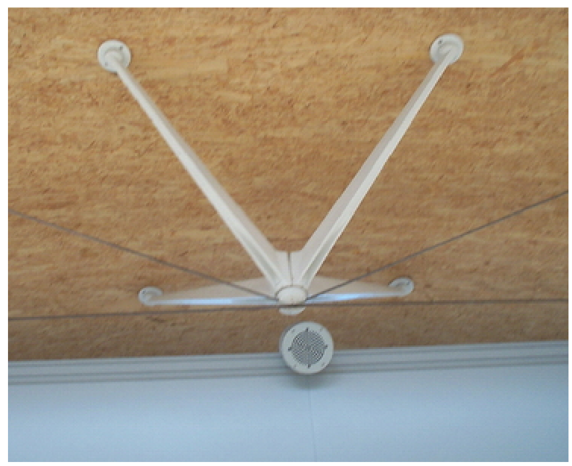

Figure 6

In all cases the use of a tension system increases the strength and efficiency of the structure, and controls the way that the structure reacts to anticipated loads.

There is also the psychological aspect of a structure under tension. Although not exactly functionally analogous to the strings of a violin, the strings of tension structures such as the Gilmore Station or the Miho Museum Bridge bring to mind similar notions such as tunability, precision, and mechanized efficiency. These notions can help to distinguish the proposed design from that of the existing crossings, which is concerned primarily with connecting one side of the river with the other using the most cost-effective means possible.

In Southern Ontario (as in many parts of the developed world) the growth of suburban sprawl continues to influence the lives of the vast majority of the population. These developments are often characterized by a banal uniformity that can dull the senses through the sheer repetition of similar spaces and result in a loss of a distinct sense of place. This design proposal seeks to identify a single marker of a unique and beneficial space (Sixteen Mile Creek and its surrounding parklands) and to increase the awareness of those who utilize it. In this way the proposed design seeks to use structural steel in a way that can elevate the experience of the bridge crossing from that of one that is merely utilitarian to one that enhances the connection between the user and the site.

[1] Reverberation time T= (0.161V)/AS (s)
The volume of the "echo chambers" increase through the rate of the Fibonacci Series, ie 1 1 2 3 5 8 etc so as to exponentially increase the reverberation time of each successive chamber.

Works Cited

Figure 1: Site Aerial
Courtesy of Google Earth

Figure 2: Steel Drums Precedent
Image from Steel Parade website
http://www.steelparade.com/images%20SP/web%20album%20images/steel%20drum_jpg.jpg

Figure 4: Diagram of King Truss
Gordon, JE. Structures: or Why Things Don't Fall Down London: Penguin Press. 1978

Figure 5: Image of the Miho Museum Suspension Bridge
Leslie E Robertson Assoc. (Structural engineers)
http://www.lera.com/projects/mus/mihomuseumbridge.htm

Figure 6: Detail of Gilmore Skytrain Station
Busby Perkins and Will
Image taken from SSEF Image Gallery
http://www.ssef-ffca.ca/skytrain/gilmore.html
for more information see
http://www.busby.ca/clients/9909gilmore/index.htm