Invitation to the Obvious

2005 SSEF "Tripping the Void" Competition

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Precedent and Initiative in Architectural Design:

"The works of the past always influence us, whether or not we care to admit it, or to structure an understanding of how that influence occurs. The past is not just that which we know, it is that which we use, in a variety of ways, in the making of new work…. The typology argument today asserts that despite the diversity of our culture there are still roots of this kind which allow us to speak of the idea of a library, a museum, a city hall or a house. The continuity of these ideas of type, such as they are, and the esteemed examples which have established their identity and assured their continued cultural resonance, constitute an established line of inquiry in which new work may be effectively grounded." [1]

- John E. Hancock

WHEN the requirements of the competition called for a steel-based single span bridge on a site of the designer's choosing, immediately thoughts and images of bridges that I've come across floats through my mind. Why is it that these bridges have made imprinting memories in my mind? As declared in the design statement by the Steel Structures Education Foundation, "*both iconic and fundamental in the worlds of design and construction, bridges bring together engineering and architecture in a unique conjunction: they provide the very essential example of form existing for function.*" In its earliest form, a bridge may very well have been just a fallen log designed to help the crossing of a stream. As time goes on, bridges have developed from mere purpose to an art form in itself. Without the continual precedents of past designs of bridges on display, perhaps the development of both of the structural and architectural aspects of bridge design may not have been such a direct process. As John E. Hancock stated, "*The past is not just that which we know, it is that which we use, in a*

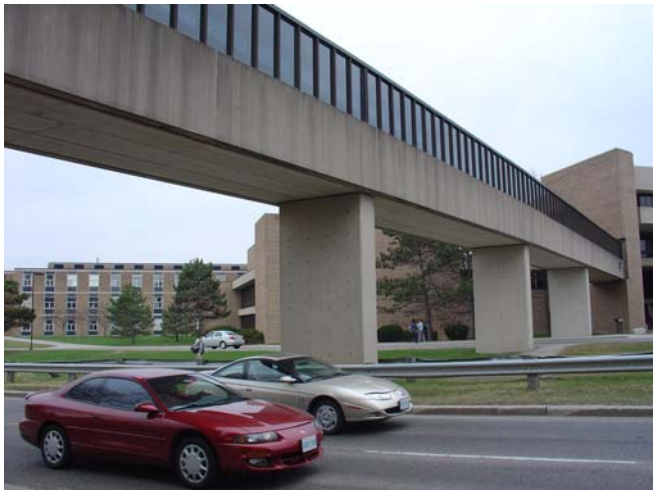
variety of ways, in the making of new work."[I] It is because that in a lifetime, crossing a footbridge is a mere thing so *usual* and frequent that it is easily forgettable. However, crossing a bridge that embodies structure and explicit form in something so pure and effortless to simply accomplish the primary function of any horizontal structure are the ones that truly have the makings of a lasting impression.

Of one of the images that floated across my mind when thinking of bridges that held the most unique impression on me is the Rockefeller University Bridge designed by Wendy Evans Joseph. It stood out the most because I had only seen it once in a magazine a couple of years back and I remembered it to this day. In the March 2000 issue of Architectural Record, under the Building Science section, it was featured on a spread about pedestrian bridges.

II. The Rockefeller University Bridge

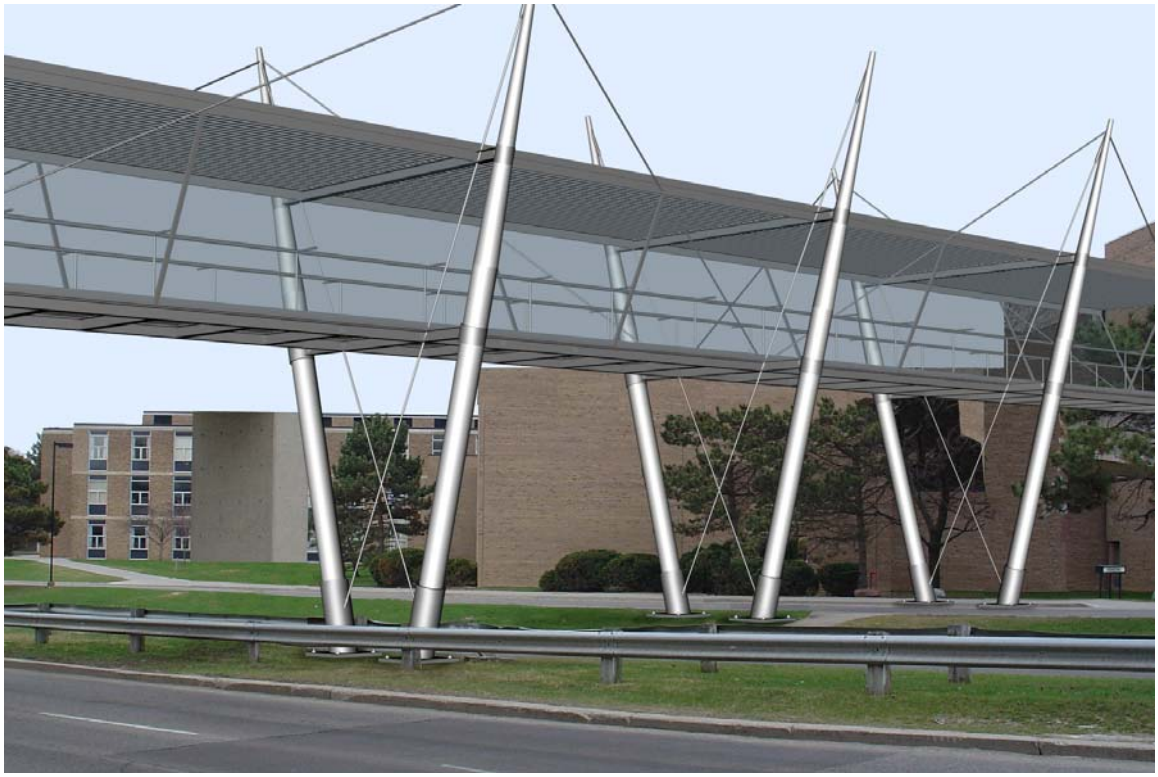
It's a single footpath three-quarters of the way from the South side of 63rd Street to the North, at which point it forks into two narrower paths; one that leads to the connected building, the other that seems to be used only for ductwork. At the point that it forks, there are two towers that jut straight up from the ground and then bend outwards away from the bridge at the point that they intersect the footpath. While it is a bridge that pleasures in looks, it carries a much more fundamental role to the University than just looking pretty. After a series of injuries involving students trying to cross the high traffic road which separates the campus from student residences, officials realizes that a plan to get students and residences off the danger zone is much needed. To provide a safe route for students to walk to the main campus, the 118-foot straight span cable-stay bridge was designed to cater to that very objective. After learning that the university president, Torsten Wiesel, disliked an

earlier proposal of a costly bridge that circled a neighboring building, Wendy Evans Josephs collaborated with structural engineers from Weidlinger Associates and came up with a design that didn't rely on adjacent buildings for support. Eventually, the project was accomplished using only one fourth the estimated cost of the original rejected design. The inspiration of my design and decision to locate the bridge on the University of Waterloo came from this particular project. In a very similar situation, the existing pedestrian bridge currently located at the South-East corner of the campus serves as a connection point for students living in residences across the street to journey safely to an Engineering building. While this is all good, the bridge lacked something which is apparent in the lack of usage. Currently with its dull concrete and brick exterior, it is quite uninviting and isolated. As well, its reflective glass and high concrete sides creates an atmosphere that appears too closed off for students to realize that it is publicly accessible. So it is my intensions to open up this bridge and allow the students to discover the bridge themselves. Therefore, in contrast, my final design utilizes the strength of steel and the technique of tension cables to produce something that is seemingly lightweights and airy, but strong and secure in design. With the angled steel tubular columns as an anchor base for the walkway, crisscrossing tension cables help sustain equilibrium of forces by counter-acting the gravitational pulling forces that the massive steel columns would submit to when angled. This angle then dictates the glazing surface on either side of the bridge which will help in waterproofing the glazing, minimizing on the regulated cleaning to keep the glass clear. In keeping the bridge an open concept and inviting, even to drivers passing



Existing pedestrian bridge at the University of Waterloo

by, full-height glazing would be installed to maximize on visibility while inviting to daylight.



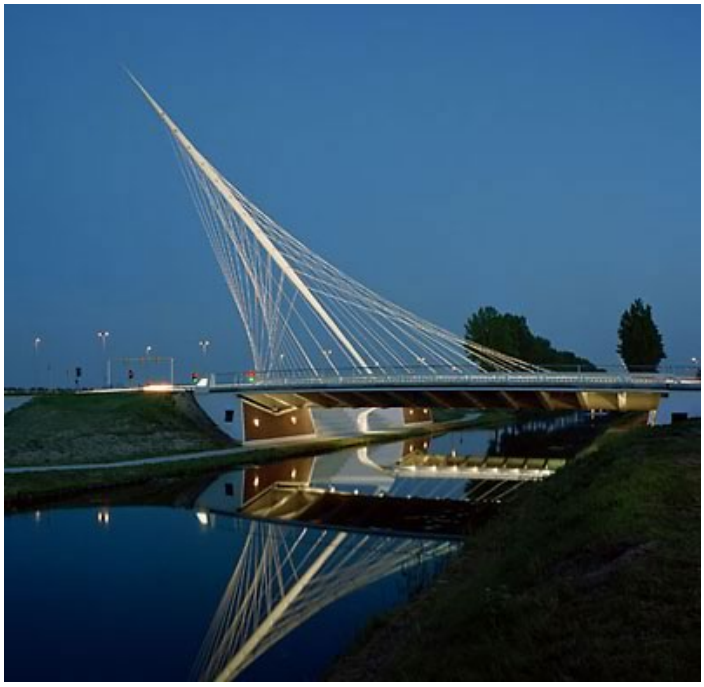
2005 SSEF – 'Tripping the Void' design entry

Another tension cable oriented bridge that comes to mind, but on a much grander scale, is I.M. Pei's Miho Museum footbridge in Japan. This bridge is delicately designed and is situated in a surreal setting which emerges from a dark tunnel and opens out into a 400-foot span over a canyon approximately 100 feet deep. Used to bring visitors from the parking area, a half-mile away from the site across a sacred canyon to the front entrance to the museum, this bridge is not only a necessity, but also a continuation of the procession through the natural sacred splendor of the surroundings. The bridge combines key elements of three different structural systems to produce an elegant and highly efficient design. While it is cantilevering, it is cable-stayed and then post-tensioned, bringing together and displaying the beauty of the structural nature of steel.

III. I.M. Pei's Miho Museum Footbridge

However, the feat of engineering should be focused on the underside of the bridge, where a second post-tensioned cable system connects to a 'king post' beneath the free-spanning portion of the bridge. This system limits deflection in the mid-section of the bridge, creating a slight upward bow in the middle which enhances the sense of arrival and also deflects water off the bridge. While my bridge does not resemble I.M. Pei's ingenious design in any way, it is my objective to try to mimic his intentions. Although the University of Waterloo campus is nothing remotely sacred, however, the transition from inside the Engineering building to bright open space elevated off the ground is quite an important threshold. In this sense, it is easier to relate to the Miho Museum Bridge. As this bridge is open-air, my design is kept light and airy not only to promote a sense of safety and awareness, but also to enhance the transition between dark and light. I must admit that the University Avenue of the City of Waterloo cannot even begin to compare to the canyon surroundings of the Miho Museum Bridge, but all the same the impact can be similar, if not on a much smaller scale. As for the more practical side of bridge design, as unromantic as it may be, it cannot be over-looked. Water plays an important role in the damage in the structural design of steel, so the goal of guiding water along a harmless path is imperative to being structurally sound. While my design did not call for an open-air structure, if the detailing between the joints in the steel and the glazing is not done properly, water leakage will not only harm the structure, but it will also spoil the overall experience of the journey through the bridge as repair work will definitely be in order.

In aesthetic terms, the ideas come from the works of Santiago Calatrava. As a personal favorite, he possesses incredible knowledge of the human skeletal form which helps him find a path to his designs. Along with being an engineer, his expertise allows him to create critical points in his designs. *'This is translated in the idea of the "pregnant moment," the figure that represents through its form both past and future states of a body.'* [III] If you always wondered what it was about Calatrava's work, especially his bridge projects, that makes it so interesting; perhaps it is because each structure appears to capture the exact moment of falling, when it is not. Or is it the opposite, being drawn up and rising from the ground, but it is not? Caught in such debate, one begin to fill with wonder how it is that a structure is able to combine two contradictory state into one, *"leaning on the brink of imminent collapse and on the verge of standing up."* [III] Calatrava's work on the Three Bridges over the Hoofdvaart Canal in Holland would be a good example of this not so easy designing feat. There are three parts of this bridge that can be seen separately but designed to be read as a continuous sequence alongside the canal. Local residents refer to the separate parts as the Lyre, the Harp and the Lute. Located immediately to the west of the Amsterdam's Schipohl Airport, in the municipality of Haarlemmermeer it has become a focal point of the city especially within such close proximity to an international airport. The striking masts of Calatrava's bridges pulls on the cables and appears to be close to teetering to a collapse, just like a frozen image of a second before the cable snaps. It is these principles



IV. One of the Three Bridges over the Hoofdvaart

that make Calatrava's structures so intriguing and engaging. In an attempt to try to imitate these qualities in a different perspective, I chose to exploit the structural properties of steel in combination with the forces of gravity in a self-sustainable structure that seemingly should fall, but the thin tension cables which appears to disappear off at a distance saves it from the 'fall'.

It is sometimes hard to accept our society as a materialistic and superficial, however true it may be. The exterior and interiors of a structure develops directly into the sensations which visitors or users will experience. If a place is dark and uninviting, would someone be readily interested in exploring the space even if it is something as ordinary as crossing a bridge? The answer would be no. The bridge may eventually even be considered unsafe to cross because of the environment that is created, which is quite ironic because a footbridge's original objective would be to get pedestrians across in a safe manner. Therefore an invitation is called for; not so much as an actual invitation, but just an appealing and engaging exterior, along with some thought into the overall sensation of its users. With intriguing qualities, not only will people be drawn to use footbridge, in the end the safety of pedestrians will be ensured.

Credits

I. The Harvard Architectural Review. Volume 5. 1986. “Precedent and Invention. Between History and Tradition: Notes Toward a Theory of Precedent.” John E. Hancock.

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III. Day shot of I.M. Pei’s Miho Museum Footbridge. http://www.lera.com/projects/mus/mihomuseumbridge.htm

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VI. Tzonis, Alexander. Calatrava Wins the Gold. May 2005 Architectural Record, The McGraw-Hill Companies, Inc.

VII. Koplos, Janet. The hidden museum - I.M. Pei-designed Miho Museum in Japan - includes related information on the museum's collection. November, 1996. Copyright © 2005 FindArticles.com. http://www.findarticles.com/p/articles/mi_m1248/is_n11_v86/ai_21257946

VIII. S, S. Calatrava Works his Magic at the AIA Convention. May 30, 2005. Copyright 2005 The American Institute of Architects. http://www.aia.org/aiarchitect/thisweek05/tw0527/0527conv_calatrava.htm

IX. Calatrava bridges in Haarlemmermeer, the Netherlands. 2004 Arcadis. http://www.arcadis-global.com/service+types/infrastructure/projects/calatrava+bridges+in+haarlemmermeer,+the+netherlands.htm

X. Miho Museum & Bridge. By: LERA Leslie E. Robertson Associates. http://www.lera.com/projects/mus/mihomuseumbridge.htm

XI. The Campus Community Bridge in honor of Torsten Wiesel. Copyright © 2005 The McGraw-Hill Companies, Inc. http://archrecord.construction.com/features/bwarAwards/archives/01footbridge.asp

XII. The Rockefeller University Pedestrian Bridge + Plaza, by: Wendy Evans Joseph. http://www.wejarchitecture.com/RockBridge.html