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Structural Steel, Sculptural Steel, Adaptation, and the School

The S-Bridge was developed with the goal of improving suburban living while providing an elementary school for a suburb and taking into consideration the life cycle of said school and its related community. Schools have two sets of requirements that must be considered when being designed. The first set is of spatial requirements. How large does a gymnasium need to be? How much space is required for a music room? How many classrooms are required? How many students will use each classroom? The answers to these questions are all important quantities to incorporate into a design. The second set of requirements comes from qualities that a school must possess. At the very least it must be safe, clean, organized, inspirational, and accessible. The S-Bridge takes the approach that the design of a school should be driven by the second set of criteria rather than the first.

Figure 1

Figure 4

Leaving structure exposed is one method of creating a positive environment that can contribute to a child's learning of structural systems, creativity, science, and spatial conception. The most important precedents for the design of the s-bridge are schools built with innovative steel structural systems that leave the structure exposed to the occupants of the building.

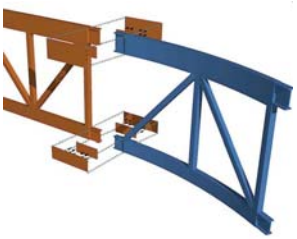

Figure 2

The University of Ottawa SITE building, by the architects Ron Keenberg, Hein Hulsbosch, Don Blakey and Bert Rupert, exemplifies a steel structure that instead of trying to hide all of the structural and mechanical steel systems actually makes an effort to display them. Many of the ideals of SITE run parallel to those of the S-Bridge. One of these is Keenberg's view that a good building must be capable of being "plugged in, plugged out, and then plugged back in" [1], which means that the four main components, defined by Keenberg as the mechanical, electrical, skin and "fitments", should all be easily adaptable after installation. Keenberg states that "permanence is directly proportional to the ability to change with ease and a minimum of cost and disruption. Variability leads to permanence." [2] In this sentence Keenberg has pinpointed exactly what the S-Bridge works to achieve. A system of modular pieces makes the S-Bridge easily adaptable to any suburb and any changes that may occur in a suburb where the S-Bridge may already be implemented. Its adaptability to any form is demonstrated by the site plan shown in **Figure 1** where the S-Bridge has been formatted to fit the chosen suburb. The kit of parts

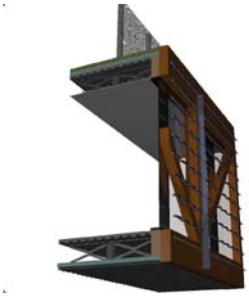

Figure 3

Figure 5

Figure 6

Figure 7

Figure 8

can be seen in **Figure 2** and **Figure 3** and includes everything that is necessary for the construction of the S-Bridge: legs, beams, floor to ceiling height trusses, joists, floor panels, ceiling panels, exterior glazing panels, and interior wall panels. SITE embraces the "plugged in, plugged out, and then plugged back in" method in many ways, one of which is the exposed mechanical system which, due to its exposed nature, is easily removed and replaced when it becomes obsolete. [3]

Not only is this efficient, but the network of ducts and pipes also provides a sculptural steel element to SITE. SITE also embraces having a modular system in the use of its "fitments" which are small enough to be easily manufactured in plants, transported and assembled on site and can be removed, altered, and put back together even after they have been installed. [4] SITE has a successful combination of energy efficient techniques including use of natural light, dynamic exposed structure and simple skins.[5] Easy access to public transit in its southwest corner influenced the inclusion for a monorail public transportation system in the S-Bridge.

It is clear that SITE greatly embraces the modernist style of exposed structure, but it also displays a taste for traditional, classical, and elegant structural methods. This shows in the southeastern façade which mimics a large classical colonnade entrance. [6] Another key characteristic of SITE is the glazed elevators which add too the accessibility and exposure demonstrated throughout. This is mirrored in the glazed elevator and stair cores leading up to walkways which connect to the S-Bridge. Not only is the structural steel system of SITE displayed to the inhabitants of the building, but it also exhibits itself to the public by way of the wide flange beams, painted red, which rest upon an exterior arc of tapered concrete columns seen in **Figure 8**. The surfaces of SITE, like the surfaces of the S-Bridge, are simple, maintenance free, and as easy to clean as possible. SITE achieves this through using many of the inherent textures and colours of the materials instead of trying to give them an artificial finish. The skinning method of SITE involves much glazing, about 85%, which is believed by the architects to be a very efficient. This is because the triple glazing shows when a seal has been broken by the formation of condensation on the window surface and then is easily replaced because of its modular nature.[7] The S-Bridge has a similar glazing system on all exterior walls. Finally, SITE has a two storey glazed space, referred to as the "tiara" [8], seen in **Figure 7**, which sits on nine 50ft-high tapered columns and offers an excellent view of Ottawa and the University of Ottawa campus. This concept of an elevated glazed space to create a pleasing interior space with a great view was adopted into the scheme of the s-bridge and leads into the next precedent with the study of how to use steel structural systems to raise this space.

Figure 9

The Ontario College of Art and Design by Alsop Architects with Robbie/Young + Wright provides a successful precedent for the leg system that is used to hold up the S-Bridge. The legs of OCAD hold

Figure 10

up a large rectangular space, similar to how the legs of the S-Bridge support all of its programmatic spaces. Both building's legs touch down between other buildings as seen in **Figure 9** for OCAD and **Figure 10** for the S-Bridge. The grounding of the OCAD legs, seen during construction in **Figure 11**, is inspirational to the grounding of the S-Bridge. The OCAD leg system uses 3 caissons attached to each pair of legs and connected below grade to support against lateral forces coming from the building above. [9] The S-Bridge uses a poured concrete foundation as its main support which can be seen in **Figure 12**.

Figure 11

Figure 12

SITE and OCAD were two of many influential buildings to the S-Bridge. The structure of OCAD had a strong impact on the resolution of the S-Bridge while SITE was influential in its design principles and steel techniques. Of all of the influential works for the S-Bridge, these two were essential to developing the base of what is important to its mission: improve the suburbs through the implementation of a new and flexible elementary school.

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[1] Phillips, Rhys. "Plugged-in SITE." Canadianarchitect.com - Canadian Architect - 5/19/2009. 19 May 2009 <http://www.canadianarchitect.com/issues/ISArticle.asp?aid=1000128723&issue=07012003>.

[2] Ilbd.

[3] Ilbd.

[4] Ilbd.

[5] Ilbd.

[6] Ilbd.

[7] Ilbd.

[8] Ilbd.

[9] Meyer Boake, Terri. "Steel Project Case Study Gallery: OCAD Ontario College of Art and Design Addition, Alsop, Robbie/Young Wright, Toronto." WA - Waterloo Architecture Cambridge. 11 Jan. 2006. 10 Mar. 2009 <http://www.architecture.uwaterloo.ca/faculty_projects/terri/steel/ocad.html>.

Figure 1, 2, 3, 6, 10, and 12: Images from ACSA Steel Competition entry by Emily Balaban and Samantha Oswald.

Figure 4, 5, 7 and 8: Meyer Boake, Terri. SITE. 19 July 2005. Steel Project Gallery: SITE, Http://www.architecture.uwaterloo.ca/faculty_projects/terri/steel/ikoy_it.html. SITE: Information Technology Building University of Ottawa. 19 July 2005. 10 Mar. 2009 <http://www.architecture.uwaterloo.ca/faculty_projects/terri/steel/ikoy_it.html>.

Figure 9 and 11: Meyer Boake, Terri. OCAD. 11 Jan. 2006. Steel Project Gallery: OCAD. Ontario College of Art and Design Addition. 11 Jan. 2006. 18 Apr. 2009 <http://www.architecture.uwaterloo.ca/faculty_projects/terri/steel/ocad.html>.