Education Through Architecture
An Honors Thesis (ARCH 401)

By
Fiona Cahill

Thesis Advisor
Robert Fisher

Ball State University
Muncie, Indiana
November 2010

Expected Date of Graduation
May 2011
Abstract

I have decided to continue the development of my capstone architecture design project for my ARCH 401 studio course. Located on the northern edge of downtown and the southern shore of Lake Union, the school serves as a link between the city and the residential area surrounding Lake Union as a place for education in school and the natural environment. With a modern feel influenced by the city and a more environmentally aware feel influenced by the park just north of the site, Mercer Elementary School serves to teach students that school can be in an exciting and educational environment while still being safe and secure. I have completed the model to better represent my design in an interactive three-dimensional form, as well as develop certain design aspects regarding the environment, the context, and the interactive and learning capabilities the building has to offer to the students and those who use the building on a regular basis.

Acknowledgements

I would like to thank Robert Fisher for advising me through this project. He provided invaluable guidance, suggestions, and much patience through the long and difficult journey of this design project.

I would like to thank Walter Grondzik for his advice on all things environmental regarding the building design and opportunities of learning through green design.
<table>
<thead>
<tr>
<th>Page Number</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Title Page</td>
</tr>
<tr>
<td>2</td>
<td>Abstract &amp; Acknowledgments</td>
</tr>
<tr>
<td>3</td>
<td>Table of Contents</td>
</tr>
<tr>
<td>4-6</td>
<td>Author's Statement</td>
</tr>
<tr>
<td>7-13</td>
<td>Supplemental Images</td>
</tr>
</tbody>
</table>
Author's Statement

For my Honor's thesis, I have decided to continue the development of my Capstone architecture design project for my ARCH 401 studio course. The project was submitted as part of a national as well as an internal college studio competition at the end of the Fall 2010 semester. I placed in the top 20 within the college competition and was very proud of the work I produced, however, as with every design project, I did not get to fully develop certain design aspects and the model was not constructed to the extent that I wanted it to be. With this thesis, I have completed the model to better represent my design in an interactive three-dimensional form, as well as develop certain design aspects regarding the environment, the context, and the interactive and learning capabilities the building has to offer to the students and those who use the building on a regular basis.

The first major decision made was the location for the elementary school. I chose an urban city block located in an up-and-coming district of Seattle, Washington, and the school is a much needed addition to the South Lake Union area, with its growing residential population and its continuing revitalization of the local waterfront of Lake Union. With influences from the surrounding built environment, the greater pedestrian friendly plan for the city, and the move towards becoming more environmentally aware in building design, the school design poses many challenges to overcome. The site is also very restricted due to busy, multi-lane streets that surround the site as well as a building height restriction due to the desire to be able to provide unobstructed views toward Lake Union. Because the site is on the outskirts of the city, vehicular traffic, air pollution, and a large pedestrian population also pose design challenges to help keep the building occupants safe and healthy both within and around the school building. Along with these challenges, there were other issues, both positive and negative, from the surrounding context that need to be taken into consideration.

Seattle is known for having well-established public transportation, and I wanted to utilize that aspect of the community in my design for a number of different reasons. Having the transportation system already in place helps keep vehicular pollution down while also lessening congestion at drop-off and pick-up time, much like normal school buses. Another environmental aspect of the building is the integration, continuation and transformation of the South Lake Union Area Park to the north or the site onto the site and through the building. The design allows for the park to continue across Valley Street by path and sculpture down the east side of the school building to create different gathering places for school children while they wait for their parents or for the community to use throughout the day. The park then travels into the main atrium of the school to help draw the community in as well as make the space a more open and inviting place. Here, the students are able to show their work, congregate, and the community is able to hold functions year-round, as the space is designed to accommodate a multitude of activities, no matter the weather condition.

It is from these context considerations that I want to focus on making the building and the site a link between the city and park, the students and general public, and the built environment and the natural environment. One link is created between the city and the South Lake Union area by pulling the new park down through the east side of the site and continuing it through the main, east-west atrium while also giving the building a sleek, modern feel to reflect the contemporary lifestyle of the city. While this will draw the general public from the residential area to the north of the site through it by way of the park, and vice-versa, the atrium is also used as an indoor park and exhibition area for the students to display their work for the general public after hours at basketball games, theater productions, or while they wait to be seated at the cafeteria-turned-restaurant after normal school operating hours. Finally, the link between the built environment and the natural environment is shown throughout the building both in the layout of the school with the use of the sun and wind to help facilitate the building as well as the construction and the materials chosen for the building.

Another aspect I want to focus on is using the building as a learning tool for the students so they see it as more than just a building, but something that works with the surrounding environment to create a welcoming and environmentally minded space. Environmental design decisions, daylighting and the use of a second skin are based on environmental impact as well as the future impact on the inhabitants. The daylight allows for less energy to be used for operating electric lighting and also creates a more friendly, healthy, and considerate environment for students and staff within the building. Daylight also helps with way finding and creates dynamic spaces within the classrooms and main hallways.
Starting at the north end of the site, the classrooms are grouped into two columns, with kindergarten classrooms on the first floor and sixth grade classrooms on the fourth floor. In order to bring much needed daylight into the classrooms while mitigating glare, a second skin design approach was used for most of the building. The second skin provides noise control, ventilation, insulation, and shading, while also providing a specific aesthetic to the building. This aesthetic changes throughout the building with a green wall wrapped around the gym in the three foot gap between the two glass walls, or interstitial space, while vertical shading devices are used around the classroom wing to help reflect light into the building. The choice of color in the fins is used as a teaching device because hot air rises so the top of the fins are a much darker color to help draw the air up and out of the space. This is because when the sun strikes the fins, they heat up, causing the air in the interstitial space to heat up. The air is brought into the second skin at the base, rises up through the cavity and out at the top, helping to cool the classrooms and gym, as they open into the cavity to allow for internal ventilation. This movement could possibly be seen by the students, and by placing light-weight, fun devices between the fins to show the air moving as another means of having the building teach and interact with the students.

There are eight classrooms on each floor, excepting the first floor due to the music and art rooms, which allows for integration between grades and special education classes on each floor. A sense of community is created throughout the classroom wing with a large lightwell extending down to the first floor and the use of open hallways that serve as bridges to open the space up. Two gathering spaces are created on each floor between classrooms to give teachers the option of combining two or three classes, of any grade, to meet and work together. The third floor has two special features with a lounge for the students as well as access to the playground, which is located at the other end the building, on top of the gym. This creates a safe and secure environment for the students to play, another opportunity to teach the students about the building and using green roofs for water retention, and mitigating heat island effect while also opening the site at street level to be a public park for the city.

The area between the gym and the classrooms is both a transitional space as well as a destination space with the administrative suite divided across the main north-south axis and the cafeteria and library located above them. Access to the cafeteria and the library is from the second floor in the classroom wing or the main stair located in the atrium. These two rooms create a fun, busy atmosphere for the students, administration, and visiting parents with two balconies that extend into the atrium that allow students to read a book or eat. Also, during the day, the cafeteria serves only the students but at night it serves as a restaurant that the community is encouraged to use.

The administrative suite is split between offices on the east and busier rooms, like the clinic and mailing room, on the west along with the main reception area. These both open to the atrium as well as the main north-south axis for easy navigation and way finding for young students. Just to the south of the middle block of rooms is the main atrium that serves as both an informal meeting hall for the school, a large interior park for the students and the community, and a place for students to display their work for the community and the rest of the school to view. The atrium stretches across the east-west length of the building to allow for two main entrances into the building, which also creates a safer environment for the students who will be approaching the site from all directions. Structural glass walls allow for the space to be well lighted during peak hours and a large trellis supported by structural columns, mimicking ‘trees,’ creates an inviting and interesting space to hangout in at all times of the day. The trellis also helps with ventilation by creating an air space between itself and the glass above it which pulls heated air up into the space and moves fresh air into and through the atrium, while photovoltaic cells integrated into the glass on the east and west walls help the building produce a percentage of its own energy.

On the south side of the atrium, a visually stunning, large green wall separates it from the gym. The wall creates an interesting canvas of grasses and metal squares for the students to study and learn from while also providing a sound buffer between the loud gym activities and the rest of the quieter school activities during school hours and a buffer between the noisy atrium and the performances after school hours. The green wall wraps around the entire gym but on the east, west and south sides, it acts as a shading and air filtering device within the aforementioned second skin design. The design of the wall is a mixture of grasses in five foot squares placed amongst five foot squares of perforated metals and canvas to allow filtered light into the gym.
The second skin will also ventilate the gym by drawing air from the gym up the interstitial space between the outside glass and the green wall to the top of the space due to an increase in air temperature and filter it out onto the roof. On this southern end of the building, closest to the busy roads and downtown noises, the second skin acts as a noise buffer to keep city noises out and the green wall acts as a billboard for the school.
Aerial view of Mercer Elementary School.

**Supplemental Images**

**SHADING**
A combination of vertical and horizontal shading is used throughout the building. The vertical shading (east and west facing) for the classrooms helps bounce light deeper into the space.

**MAIN LIGHT CHANNELS**
The main atrium, hallway, and light well in the classroom wing help bring indirect light into the building and give it a more open and connected feel.

**GREEN SURFACES**
A combination of green roofs, green walls, and plaza greenery account for much of the surfaces on the site.
Aerial view of surrounding context.

Approaching east entrance of school with a view of Lake Union.
Wall Section
A. Glass Second Skin
B. Air Cavity
C. 1" x 1" panels
   Grass Panels and Metal Panels
D. Steel structure for grid
E. Steel Structure for Building

Roof Structure
F. Vegetative Roofing
G. Lightweight Soil
H. Filter Fabric
J. Retention Layer
L. Drainage Layer
K. Sheet Barrier
I. Waterproof Membrane
M. Concrete Roof Structure
N. Open Web-Steel Joists

View of atrium with gym to the left and administration to the right.

View of classroom with the Seattle skyline in the background.

Wall detail of gym.
Section cut through building looking west.

CIRCULATION
The main vertical circulation occurs in the classroom area with open 'halls' that revolve around the light well. There is also an elevated walkway to get to the playground on the third floor that travels through the atrium.

PUBLIC AREAS
The atrium, library, cafeteria and administration suite are the more public areas of the school. The cafeteria turns into a restaurant at night with atrium access.

CLASSROOM WING
Located on the northern end of the building the classrooms create a four story column centered around a light well with open hallways that converge at breakout spaces at the end of each hallway.
Mercer Elementary School
Elementary School for Seattle, Washington
A DESIGN COMPETITION SPONSORED BY HUNTER+CONE ARCHITECTS