

**Category entered:**

Student Projects by **Clement Cheng**

School of Architecture, Carnegie Mellon University, Pittsburgh PA

Renovation/Addition for McKelvy Elementary School (K-6), Hill District, Pittsburgh PA

**Building Location:**

The Hill District is a community with rich, vibrant people and history. The community has many resources and the potential to develop to a higher level. These resources include a strong connection to the Jazz industry, the advantage of being one of the major centers for African American Culture in the tri-state region, a prestigious topographic location between downtown Pittsburgh and Oakland with spectacular views of the entire city and a series of active visionary human resources. The initial yet comprehensive site analyses illustrated that the location of the site, where the existing McKelvy Elementary School sits, has a high potentiality in responding to its natural environment. The physical character of the sloped site allows for simple rainwater management, great exposure of sunlight and appropriate shading, and uninterrupted view to downtown Pittsburgh. The typical strong wind in Pittsburgh, however, must be kept in consideration because of the natural topography of the site.

**Key sustainable design features**

The final design for the addition and renovation of the McKelvy Elementary School is primarily based on the response to its natural, climatic character in its surroundings. The orientation of the core of the building, where most of the classrooms are, is along the east-west axis that gives greater access to daylight with ease of glare control and reduced heat gain. Hence, south and north windows are maximized in order to provide the students soft- and well-lighted classrooms. Most of the bricked-façade structures are retained not only because to minimize the budget but they carry a consistent language around the neighborhood. However, sun-shading devices are added to these facades to control possible glare and to minimize summer heat gains. The main corridor in between the rows of classrooms is originally the “no-light” interior zone. As a response, openings are added to the interior walls of the classrooms facing the corridor and raised skylights are inserted. Both the openings and skylights are to maximize light penetration into interior zones and to encourage natural ventilation throughout the building. The huge tubes along the atrium wall function as the rainwater collector to be filtered and used in school. The major additions to the existing structure are divided into 2 parts: the atrium and the housing units for 20 interns. The design of the atrium provided a pleasant and welcoming entrance to students and faculty; moreover, the curve-shaped of the atrium allows for a draw-in effect to promote summer breeze drawing into the building during summer. The other curve-shaped retaining wall connecting housing units and the school serves a wind-barrier in re-directing the wind away from the central area. Sitting at the top of the slope, the form and location of the housing units provides privacy and is based on the appreciation of the spectacular view off from the site.

### **Sustainability as a Teaching Tool:**

The design of McKelvy Elementary School does not only respond well to its climatic issues around the site, but many features of the building itself also serves as a teaching tool for K-6 students. The addition of conservatory along the south-facing façade, with sufficient natural daylight, connects to the cafeteria that allows students to grow and consume their own plants/vegetables. The roof garden and ecology classrooms along the north-facing façade, are beside the wooded area to encourage students to learn about their natural surroundings. The tubular, rainwater-collecting walls serves as a teaching tool in understanding of recycle use of rainwater. The curved-form along the atrium area derived not only from the draw-in effect of summer breeze, but also the sun angle path in Pittsburgh. Hence, students can refer the shadow cast on the curve to the seasonal changes in sun angle.

### **Program**

Students-Kindergarden to Grade 6, average 100 students per grade

Interns-various backgrounds, 20

**Gross square footage** = 26,175 sq.ft.

Note: since the project is un-built, both project cost and performance information cannot be provided with accuracy; however, the retaining of most existing structures certainly suggests the minimization of budget. On the other hand, the response to all climatic issues increases the building's natural performance.

### **Design Intent**

Realizing the significant role of school environment in students' learning process, the goal of the renovation is to improve the existing learning condition and environment of McKelvy Elementary School in Hill District, Pittsburgh through climatic issues, such as light, wind, site, topography, view, water management, etc. Moreover, the renovation should clearly express its reasonings and be used as a tool to teach students about sustainability.

### **Strategy**

The project should demonstrate the importance of daylight using architectural elements with considerations of other climatic issues in several stages. First, the requirement of different types of daylighting in each room should be noted and studied thoroughly. Second, the hierarchy, if any, of the different aspects of daylighting, for example, quantity, quality, hue, contrast, etc., should be stated. Third, other climatic issues should be considered as part of the design. These three stages are not in any order; in fact, we should think forward and backward in order to acquire the optimum solution for McKelvy. Such strategy will eventually lead to idealistic orientation and form of building.

### **Task**

- 1) Do a thorough site and community analysis
- 2) Study different types of room and the preference of daylighting
- 3) List the recommended sizes of different spaces
- 4) Prioritize spaces and creates hierarchy
- 5) Analyze all climatic issues, in relations with each space
- 6) Design with all tasks above in thought