

**Lessons Learned: A Symposium on School Design  
LAUSD / USC School of Architecture / J . PAUL GETTY Trust**

**Session: 4D - Sustainability**

**Scribe: Grant Kirkpatrick**

**Attendees:**

- Marv Taff, LAUSD
- Frank Dimster, USC, DAC
- Mark Rios, Rios Associates, DAC
- Richard Prantis, Rios Associates, DAC
- Arpy Halzikiam, Gensler, DAC
- Hraztan Zeitliam, Johnson Fain Partners
- Daynard Tullis, Morphosis
- Ken Vermillion, AC Martin
- Magdalen Yen Hron, DMJMH+N
- Carolina Waldheim, Carde Ten Architects
- Pamala Ku, Carde Ten Architects
- Cecily Young, Steven Erlich Architects
- Tom Cestarte, Berman Bertolini & Cestarte
- Stephan Olson, Arquitectonica
- Stephan Kanner, Kanner Architects
- Neil Hagigat, GA Designs
- Greg Villanueva, Villanueva/Arnon
- Tania Van Herve, Fields Devereaux
- Mahmaud Gharchedaghi, GA Designs
- Grant Kirkpatrick, Kirkpatrick Associates Architects

**Key Issues:**

*"We say 'We want to save energy'. They say 'We can't afford it'". (Gharchedaghi)*

The focus of this session was Sustainability within the design of educational facilities. The discussion articulated addressing sustainability, while identifying the constraints encountered while achieving these goals.

While there are many obvious ways to reduce energy usage, designing an energy-efficient and environmentally sensitive school facility is a multi-faceted effort, demanding close coordination among the school district, architects, and engineers. Although there is no one formula that will suit all facilities, following certain guidelines, energy efficiency and sustainability can be within the each of the Los Angeles Unified School District.

Marv Taff closed this panel discussion with a thought that expressed a collective recognition of the value and significance of sustainability within architectural design, in particular within the LAUSD: "You can argue about aesthetics, you can argue about teaching programs, and you can argue about the size of classrooms. I don't think you can argue against the logic of sustainability."

**Constraints, Problems, and Design Opportunities:**

One of the first decisions that an architect of any facility needs to confront is the orientation of a building on its site. A building's orientation can be one of the most influential decisions responding to energy efficiency and sustainability. Unlike the other proactive measures that were discussed during this session, there is no cost associated with the careful determination of a facility's orientation on a site. There can be no dispute as to the importance site orientation as the rewards are instantaneous.

In addition to the orientation of the buildings themselves, many architects are realizing the important role that site landscaping plays in the energy efficiency of a facility. Often the victim of budget restrictions, landscaping and its

"ability to control an environment" has been continuously overlooked. The focus on the use of landscape elements ranged from the familiar use of deciduous and evergreen trees to control light and wind, to the use of coarse concrete paving to maximize storm water infiltration, to the investigation of collection cisterns on larger sites, reusing urban storm water for site irrigation purposes.

Frustrations are being felt in the early stages of the designs of these facilities, as the architects are being handed a site and a program with little ability for adjustment. As these architects are discovering the increasing amount of constraints and the decreasing amount of flexibility with the sites that the LAUSD has supplied, they are typically forced to depend on their responses to sustainability to exist within the constraints of the building. Fortunately, in this discussion many of these opportunities were brought to the table.

Equally as important as a campus's orientation on its site, is the programmatic organization and massing of the buildings themselves. There are a number of design decisions that can respond to efficiency with positive results, including organizing the programmatic spaces for efficient operation. This includes the clustering of elements of the program that are to be used outside the normal hours of the school. This allows for a limited amount of the campus to be climatically controlled while the remainder of the campus can be in 'unoccupied mode'. In addition, the spaces of the facility that do require controlled heating, humidity, and lighting can be located in the interior of the massing where controlling the environment is easier. Minimizing the ratio of perimeter exposed wall to overall building square footage also advantageously effects the energy efficiency of the school.

The selection of materials used for these facilities can be an active approach to energy efficiency. Material selection is an option that is available to all architects. Many opportunities exist for the use of recycled material within these new facilities. These opportunities range from the reuse of building material that was acquired from site demolition, to the use of recycled material for such things as carpeting, tack boards and acoustical tile.

The use of windows in school design is an issue that has been approached and argued from many angles. Many believe that windows give people a sense of orientation and visual contact with changing weather and other parts of the school and neighborhood. Others will argue that it is exactly these distractions that should be eliminated from classrooms. It is typically without hesitation though that an architect will side with the earlier of the two arguments. In fact, maximizing the amount of glazing within these classrooms is commonly the goal among these architects. With this goal comes the weighty requirement of addressing efficiency and sustainability. Orientation of the glazing becomes the biggest issue. Maximizing the amount of glazing to the north, and avoiding glazing to the west is typically advantageous. Although south facing windows typically generate concern, these issues can be treated with eyebrows or other shading devices, allowing for the advantages of solar design in the winter when the sun is low. It was unanimously stated that windows should be placed as high as possible, this allowing for deeper penetration of light into the classroom. Additional light can be bounced into the room through the use of light-shelves and clearstories.

In addition to the benefits of daylighting, solar energy can be capitalized on through the use of photovoltaic arrays. These arrays are not intended to serve the entire load of the school but are rather intended to shave demand during peak hours. The arrays will typically account for approximately 5-10% of the facility's load. It was established that there are two possible incentive programs through the DWP encouraging the use of photovoltaic arrays. The first option is that DWP will actually pay for the structure that these arrays rest upon (i.e. lunch shelter), in return they own the arrays and the energy produced by them. The second option is that DWP will allow you to buy the array units at a reduced rate, and the school district owns the energy that is produced by them. The district would design the system, DWP would detail it, and the district would provide the roof and facility for the equipment to convert the energy. The energy that the district owns is technically pumped back into the main grid while the school's meters are reversed according to the amount of energy produced by them. A benefit of this system for educational facilities is that their meters are gaining credit on the weekend when they are generating energy but not requiring any. According to Gharchedaghi these arrays are being quoted at \$10-12 per square foot, of which the DWP will pay up to 50%. There has been a great amount of hesitation toward this system, due to the fact that the "people involved didn't want to come out of the box they were in, they didn't want any changes from what they had before" (Gharchedaghi). The DWP is attempting to reverse this manner of thinking by proactively looking searching for projects and architects to implement this system of photovoltaic arrays.

With the opportunities of sustainability continually increasing, the issues will, unfortunately, always remain: "What

does it cost, how do you get it and how quickly you are going to be able to pay back? (Taff)".

### **Solution Types:**

- Site Orientation
- Site Landscaping
- Building Organization
- Building Materials
- Natural Lighting / Daylighting
- Artificial Lighting and Controls
- Water Collection / Reclamation
- Photovoltaic Arrays
- Energy Efficient HVAC

### **Examples:**

- Tania Van Herve, representing Fields Devereaux, cited an example that was a catalyst to much discussion based on the topics addressed above. The gas company established this facility as a "showcase school". Acting as an energy model for this utility company, the company provided funds for in-depth research and analysis of this facility.

The primary element, and a healthy portion of the budget went toward establishing an effective daylighting strategy based on a multitude of daylighting studies. The goal of these efforts was to maximize daylighting in this three story, type V construction, classroom building. This was ensured through an ambitious 160 square feet of daylight for each classroom. This was accomplished by eliminating the need for suspending ceilings through the use of gypsum board lids with exposed ducts, allowing for a much higher head height for their glazing system. The exposed mechanical ductwork also allowed for greater efficiency through the use of larger ducts, decreasing the required velocity of the system. The original mechanical system was designed as a central chilled system but was value engineered from the project. A split system on the first floor and upgraded high efficiency package units on the second and third floor replaced this system. The calculations generated through the use of an energy model determined that the majority of this facility's efficiency came from the use of insulated, double pane, low-E glazing on all facades, integrated with a diversity of shading devices. These shading devices were designed based on a study that analyzed each classroom during the solstices, and how each performed. Based on this study three different shading systems were incorporated into the design of the facility.

With all of these issues being discussed, and commended, the question arose of how the up-front costs of these sustainability measures were economically feasible. Fields Devereaux negotiated a ten percent (of design fee) bonus with the district based on the performance of the buildings. They admit that even with the expertise within the office that this negotiation took a giant leap of faith of their part. However, within the gas company's life cycle analysis of the facilities they reported that the additional costs dedicated to sustainability will pay for themselves within a year and a half. With the understanding of the budgetary constraints on these projects the question arose of how many of these sustainability measures were actually going to make it into construction on this project. "There are always going to be things that are negotiated out, and that is why you want to be above that 28 point threshold by a certain percentage to afford yourself some flexibility. (Van Herve)"

- Hraztan Zeitliam, representing Johnson Fain Partners, cited an example where the objective of the school design was to enable its student to use the facilities as a textbook. This textbook, or first hand experience of sustainable design, demonstrates to the students how sustainability can be successfully achieved. This approach included a concrete superstructure as an architectural feature to generate sustainability. This primary concrete structure was capitalized on by extending its floors slabs, cantilevering them up to four feet, using them as devices to control the sun. Also noted was the facilities use of open air corridors, and stairways, capitalizing on Southern California's mild climate. These corridors and stairways helped in reducing heating and cooling loads by eliminating the corridor shell which typically restricts the positive natural elements (i.e. day-lighting and fresh air) from penetrating deeper into the building and into the classrooms. These areas were then protected from the negative

natural elements through the use of lifted corrugated metal canopies. Zeirliam also discussed the implementation of a landscape system that collects urban run-off to be reused by the site's irrigation system. This was one of many actions toward sustainability that is documented in the comprehensive guidelines that Johnson Fain Partners has internally established.

#### **Recommendations:**

- Establish a "LAUSD Project Mission Statement" as a requirement for each project prior to commencing design. The mission statement would be created in a joint session with the appropriate entities from all parties and would have a series of guidelines to follow in the session:
  - .Include a collective set of sustainability goals that apply to all new facilities.
  - .Include requirements for achieving appropriate learning environments.
  - .Include specifics for the quality of the architecture.
- Assist LAUSD in assessing the validity of sustainability and of the current budgeting process:
  - .Initial cost increase for sustainable measures/devices should be considered with regard to its relatively quick payback.
  - .Increasing current bonds/budgets dedicated toward sustainability would allow for an increase in available funds in the future based on efficiency, and cost savings over the life span of these facilities.
- Systemize the approach toward sustainability with pre-approved systems arrangements:
  - .Establish a commitment and strategic alliance with utility companies and/or manufacturers. Given the volume of work it is important that the LAUSD continue to strengthen their relationship with the utility companies. The school district must embark in negotiations with these companies to establish further programs that would benefit the school district and the given utility company.
- Develop a forum to continually share information gathered by architecture firms with regards to feasibility studies and pricing for different sustainability actions. Include basic components of sustainability that would be easiest to accomplish without resistance or having to modify the current specifications outline. Ultimately include post-construction and occupancy reports that have detailed historical budget information.
- Establish an orientation program to inform incoming architecture firms of the shared knowledge with regards to established "budget relief valves" (i.e. CHIPS, LEAD, "Showcase Schools", "Cool Schools" programs).

#### **LAUSD Comments and Clarifications:**

Marv Taff insisted that there are indeed individuals working with the project managers to make them more aware of the importance of sustainable design. He states that "there are a lot of forces at work, but, there are some things that can not be changed over night". Taff ensured the panel that the school district was indeed being educated on the importance of sustainability. "Sustainability is an issue that you will find that we will have less opposition with."

Marv concluded with a narrative that embraces the bureaucracy that stands between successful sustainability in school design and future development within the Los Angeles Unified School District. "I had just come back from a meeting on a school where the DWP had agreed to pay for the lunch shelter. I was so excited that I went back and told Kathy and one of the project managers. This project manager happened to have some clout, and when I told him about this he immediately shrugged his shoulders and said, "oh, we've dealt with them before?" Now this is the kind of thing that we are dealing with. It's engrained, old-school thinking, and we have to work on that, because you can't argue about sustainability."