

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

Session: 3C - Environmental Controls

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Attendees:

Chuck Lagreco, USC School of Architecture
Yo-ichiro Hakomori, USC School of Architecture
Bill Houland, Kazumi Adachi + Associates
Steve Gardner, Gensler
Allan F. Dietel, Kanner Architects
Jorge M. Sotodelbarco, Martinez Architects
David Hopkins, Gonzales Goodale
Kurt Franzen, Gruen Associates
Mahamoud Gharachedaghi, GA Design
Neil Hagigat, GA Design
Duane R. Fisher, Langdon Wilson Architecture
Karen Henderson, Charles T. Bryant + Associates
Rebecca Blum, Carde Ten Architecture
Macdonald Becket, Becket Architect
Diane Becket, USC School of Education
Mahmoud

Key Issues:

The use and implementation of environmental control systems in schools, as with all buildings, is an important aspect that impacts the quality of and efficient use of space. Currently, it was discussed that LAUSD has established a set of guidelines with a propensity for the consistent use of rooftop "package units" for reasons of initial cost effectiveness and current maintenance support. Typically, a number of rooftop "package units" serve various areas of the school. For instance, there may be a single rooftop "package unit" per class room which allows each class room to be controlled separately. There may be other units servicing common areas, such as offices and hallways. Such a system proves economical especially for smaller school buildings where complex ducting can be avoided. Efficiency in terms of energy consumption, however, is not as good for larger projects where a central plant feeding the various areas of the school would be beneficial. It was pointed out by a number of the participants that currently LAUSD has selected, in all examples discussed, the rooftop "package units" over the use of a central plant regardless of long-term economics and energy consumption.

It was discussed, at great length, the desire and need for natural ventilation and light. It was pointed out that environmental control systems should not be just about the efficient use of mechanical systems, but equally about the use of natural elements; heating and cooling using passive systems. For example, this could be as simple as taking advantage of prevailing winds and the opening of windows in a design that allows for cross ventilation, or protection from heat gain from sun infiltration with the use of sun shading devices and correct orientation. It was also pointed out that correct landscaping could be utilized for providing shading in the summer, and facade design should consider including sun shading devices.

With increased concern for utilization of the earth's resources, sustainable design and the increased concern for energy consumption should be a priority. It will be important to educate the decision makers within LAUSD in sustainable design and to consider "life cycle" costs along with the importance of initial cost effectiveness.

Constraints, Problems, and Design Opportunities:

Constraints and Problems:

It is the intention of LAUSD guidelines to promote healthy, physical environments with the use of cost effective environmental control systems. It was discussed in several instances, that there have been problems with the actual implementation and realization of its intentions. First, LAUSD is a governing culture that is entrenched in its own size. The objective of creating better environments for study and learning requires the creation of healthy environments free of contaminants, mold and dust. Although it may be questionable how clean outside air in Los Angeles is, it was strongly argued that allowing natural ventilation provides both physical and psychological benefits in promoting the healthy environments, which is the objective of LAUSD. One participant pointed out that there have been studies to indicate that increasing environmental quality by increasing the amount of natural air and light decreased absenteeism and increased productivity. The problem with the current situation that was expressed by a number of participants is that the current decision making process at LAUSD fosters and supports a culture entrenched in familiar procedures and solutions. It was expressed that the biggest challenge for architects and LAUSD is to create an environment that fosters creative solutions to address comprehensive or "global" issues.

It was also expressed by a number of participants that it is very difficult to work with Project Managers driven primarily with initial costs and schedule.

It was suspected that the use of "easy" solutions that have been repeatedly utilized were selected for reasons of initial economic costs and such solutions allow for the utilization of existing maintenance expertise without requiring retraining. Also, the use of mechanical engineers that have had a lot of experience with the design of schools may result in solutions that have been approved in the past by LAUSD but not necessarily the optimal solution in terms of life cycle costs and energy efficiency.

Design Opportunities:

It can not be stressed the importance that many of the participants placed on intelligent design that works in synergy with natural elements. Some ideas discussed were, taking advantage of natural prevailing winds for natural ventilation, correct orientation, design of building facades that are responsive to sun orientation, use of landscaping to augment natural ventilation and protection from solar heat gain, use of clerestory windows and light shelves to take advantage of natural daylight, and use of single loaded corridors to allow for cross ventilation through the classroom. It was stated by a participant that the LAUSD guidelines recommends repetitive window treatments and facades regardless of orientation. Articulation of buildings differently in terms of the number of openings and types of openings depending on orientation will provide an opportunity to design intelligent buildings which respond to orientation, and "breath" with regards to the natural environment.

Architects must demonstrate that paying attention to these issues and the implementation of passive systems can save money in the life cycle of a building and it does not necessarily increase costs. It was clearly agreed that it is important to quantify and analyze life cycle costs rather than simply the first cost of building. It was stated that the difficulty at this time of considering the life cycle cost of buildings and funding for the long term can be attributed to the fact that construction costs and maintenance costs are paid from separate pools of funds. Thus, it is difficult or impossible for moneys allocated for maintenance and operations to be rolled over to initial construction costs. Thus, there is not an incentive to make integrated, informed decisions in a comprehensive manner and because of bureaucratic insulation, there is little or no collaboration between LAUSD decision makers, project managers and the architects.

It was also pointed out that the architects need to get more proactive with environmental control issues at the beginning of the design process and to work with mechanical engineers to insure that correct decisions are made in selecting the type of environmental controls and the opportunities and possibilities of natural ventilation are considered. In some instances, architects have been very involved with structural engineers to arrive at a viable structural system. There has been less involvement by architects when considering environmental controls.

Solution Types:

All solution types discussed involved the use of rooftop "package units" as mandated by LAUSD.

Examples:

As previously mentioned, most all solution types for new LAUSD schools involved the use of packaged "rooftop units". An example discussed was the Nevin Avenue Elementary School designed by Kanner Architects. At this school, there are single rooftop units for each class and four others to service offices and corridors. Each unit that serves the classrooms are controlled separately for optimal control. Because the design of the building facades of the second and first floors facing north, east, south and west had varying amounts of glazing, it was important that each room could be controlled separately. Also, having a larger number of smaller units rather than a fewer number of larger units proved to be less costly.

In an example cited by Gonzalez Goodale, a larger High School - Middle School of approximately 350,000 s.f. was considered ideal for the construction and use of a central plant because of the schools large size and efficient use of space and energy that a central plant would provide versus packaged "rooftop units". In the end, it was the decision of LAUSD that there was not the funds available for the construction of a central plant and it is more cost effective to use rooftop "packaged units". Also it was a consideration that maintenance staff do not know how to maintain a central plant facility and would therefore require retraining, a process that was considered too costly.

Recommendations:

It was stated by many that it would be important to quantify and analyze life cycle costs as opposed to considering only the first cost of building. Such a comprehensive view would allow for decisions based on the long term use of a building. Directly related to this long-term view is recognizing the importance and use of natural ventilation and sunlight, as a way to augment mechanical means for light and ventilation. It was discussed that it would be of critical importance to consider the design and use of passive systems and sustainable practices. One important step in the prioritizing of these systems would be the general education of LAUSD decision makers by conducting seminars or lectures related to sustainable architecture. It was stated by one of the participants that such an educational approach had been successful in the past to allow for those people critical in the decision making and policy making positions to consider alternative possibilities as economical, viable solutions.

It was acknowledged that modifying the types of environmental control systems used would require the education and retraining of maintenance staff. It would be important to clarify to representative unions that jobs would not necessarily be lost, but altered.

It was stated that it is a documented fact that absenteeism declines and productivity increases with the increase of natural light and ventilation. Architects must demonstrate in a quantifiable way that the health and well being of students and faculty will be better with the increased use and careful implementation of natural ventilation and light. Scientific evidence or quantifiable results might prioritize the use of such systems as important.

It was pointed out that the efficient use of energy and the use of active solar systems may be partially funded, for instance, by DWP or Edison through design incentive programs. State and Federal funding may also be available for the funding of active solar systems. The writing and creation of bonds to fund the next wave of school construction could incorporate the mandate for effective use of energy.

It was stated in a variety on contexts within the discussion, that LAUSD should be more open to suggestions and innovation, and avoid becoming complacent in its decision making process and policy implementation. It was stated that in many instances, decisions were made either as a strict adherence and interpretation of the guidelines or based on economic expediency and lack of foresight. The current guidelines and standards are well intentioned, but the standards are much better written than the actual implementation and practice of the guidelines. It was suggested that perhaps a review of the guidelines should occur every two years.

Finally, it was stated that the mantra of many projects managers are schedule and costs. Perhaps it would be beneficial if the spirit of the guidelines could filter down to the project managers in the field, creating a more collaborative environment with shared objectives between the architects and LAUSD project managers.