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

Session: **2D - Special Construction**

Scribe:
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Attendees:
- Marv Taff, *LAUSD*
- Chuck Legreco, *USC*
- Kate Diamond, *USC*
- Karen Henderson, *Charles T. Bryant*
- Tom Cestarte, *Berman Bertoliniade*
- Eric Brossy DeDios, *Perkins and Will*
- Sherri Cho, *Langdon Wilson*
- David Hopkins, *Gonzalez Goodale*
- Stan Shipley, *WWCOT*
- Andrea Cohen Gehring, *WWCOT*
- Yong Ku Kim, *Clerkin and Clerkin*
- Leigh Christy, *John Friedman/Alice Kimm Architects*
- Rebecca Blum, *Carde Ten Architects*
- Richard Prantis, *Rios Associates*
- Grant Kirkpatrick, *Kirkpatrick Associates Architects*

Key Issues

The application of *Special Construction* has become more prevalent due to increasing restrictions and decreasing envelopes that architects are encountering when approaching the design of new schools within the Los Angeles Unified School District. The purpose of this session was to articulate intentions or goals for special construction outside the traditional category of classrooms and supporting facilities, including, but not limited to, responses to unique site conditions, while identifying the constraints encountered while achieving these goals.

New learning environments are being sacrificed as a result of unrealistic budget constraints placed on these projects. The fortunate architects who were selected to participate in the design of these new schools are professing that the restrictive budgets are limiting them to short life-span construction. This is truly an unfortunate situation when such noble goals are at stake. It is disappointing that after this enormous amount of money, creative knowledge and energy is spent that we will be returning to solve this identical puzzle just decades down the road.

Constraints, Problems, and Design Opportunities

The architects for these new facilities were presented with many challenges during the process of developing these new schools. Included in this lengthy process is the determination of the most appropriate structural system to properly engineer the building in order to address today's stringent code requirements as well as to ensure public safety. The options to fulfill these requirements are typically plentiful. Though in Southern California, author of the some of the most emulated seismic building codes throughout the world, the proven structural options become more limiting and exponentially more expensive. The structural issues with regards to schools are simple: Utilize a structural system that allows flexibility in design for multiple program requirements, capitalize on natural lighting, and most importantly, as this panel has discovered, meet the project's budget requirements.

Although unfortunate, it is understandable that these goals can not always coexist. In fact, the reality is that most often the client and architect must choose between budget and any other functional or aesthetic benefits or requirements. In support of this we can generally assume that the least expensive structural systems often mandate the use of valuable space, both in plan and in section. The more costly structural systems typically afford the architect more design freedom in order to respond to programmatic goals and requirements, and to create inspiring and innovative learning environments.

"Can we consider how we would recommend to the client to improve their system to allow innovation that improves the approach to structuring these schools?" This enthusiastic solicitation for recommendations, which came near the end of this session's discussion, goes to the heart of the problem confronting architects and the local school board, and ultimately effecting the youth of this community. The ambitious LAUSD program, with its admirable intentions of having eighty successful new schools designed by Los Angeles's most notable architects, is in danger of finding itself host to campuses of buildings with limited forty year life-spans due to these project's tight budget constraints.

It was a unanimous declaration by this panel that, due to budget restraints, these schools are not being built to last the LAUSD pre-determined goal of one hundred years. Rather the majority of these school buildings are uniformly being built out of Type V, wood stud construction.

"What is the driving force of your structural solution?" In the case of the LAUSD it is clearly the budget restraints that have driven the architects to depend on wood stud construction. It is the durability, not the flexibility, which frustrates these architects. History suggests that these new buildings will have similar life spans of modern day tract homes composed of essentially the same materials and structural methodology. This short-term solution, to this long term, and very consequential problem is one that generated a substantial amount of confusion among these concerned architects as it was understood that a collective budget of over two billion dollars had been established to strengthen the Los Angeles Unified School District.

With the understanding that stud construction is the dominating structural system of these new facilities the discussion then turned toward analyzing the use of wood studs verses light gauge steel studs. The factor of durability and precision certainly makes steel studs the preferred of the two systems. With an on-site steel stud system we will find that there is a fifteen to twenty percent cost increase over the use of an on-site wood stud system. In addition there is an insufficient amount of research with respect to the integration of wood sheer panel systems with this steel stud system. The costs related to light gauge steel stud construction becomes closer to that of on-site wood stud construction if you are to use a factory constructed panelized steel stud system. This prefabricated system still allows an enormous amount of design flexibility due to fact that these panels are computer generated based on digital drawing files. The computer generation of these panels eliminates the requirement that the entire facility be based on a panel of a size determined by the manufacturer. Ideally since it is computer based every section can be different without incurring a premium cost, opposed to the traditional statistic that quantity of equal parts equals economy.

Although the structural discussion primarily focused on the inferiority of Type V construction in school design, the reality of steel member construction was also examined. Within the realm of steel construction the discussion was centered on the economical advantage of brace framing versus the spatial advantage of moment frames. The use of a brace framing system typically burdens the shell of the building with thickened walls, reduces available floor area, and reduces the available vertical surface area for penetrations. The use of a moment frame system is much more flexible and conservative of space, but it is economically burdensome. The conclusion to this disputation was simply that there has not been enough research to resolve which is most economical and efficient.

When dedicated to a brace frame system the question arises, "how do you deal with braces that take up space?" WWCOT responded to this with two solutions they sought on their East Valley Area High School. Burying these frames within the wall was their desired solution when possible. This solution still held with it the limitations it puts upon penetrating the shell of the building for natural light. Their second response to the brace fame was to separate it from the shell of the building. By pulling the brace frame from out of the shell of the building they were able to free large amounts of floor area while resolving the restrictions put upon penetrations.

The use of this exposed brace framing was only made possible after the DSA accepted the exposed framing as a secondary structural system and therefore not requiring fireproofing.

The use of concrete as a building system was not represented by any examples discussed in this session due to its economical implications. It was concluded though that if the next phase of facilities were to extend above four floors that the use of concrete should be seriously examined as a viable and economical structural system. This would help address the argument that "with the large scale construction plans that not only is it important to try innovative alternatives, but it actually, ultimately, helps the process by not concentrating into one particular market." (Legreco) There is belief that there is economy to be found if the next phase of designs do not all exert pressure on the same markets/trades.

Although in the example mentioned above the DSA played a significant role in the innovation and execution of design by accepting the brace frame as a secondary structural system, it was acknowledged during this session that the DSA might indeed be an area of concern. With budget established as a key factor in the equations for these new schools an enormous amount of weight is then placed on scheduling. The biggest concern with the DSA is then "how do we get the project through in the shortest amount of time?". With the length of the DSA review being an obstacle this forced the architects to utilize systems that the DSA were more comfortable with in order expedite the process and remain on schedule. This trail of design being determined by the expedition of the DSA process has proven to be a hindrance on potential innovative design and special construction types. "This new construction phase is an opportunity to explore new paradigms for solution types. So we have to find a way of breaking down the institutional constraints against doing anything differently."(Legreco) This includes dissolving constraints with the DSA process.

In addition to dissolving these constraints it has become evident that preconceived reputations of certain building materials also need to be dissolved. Although it was stated that these reputations are part of an "evolutionary process with personal prejudices" which are believed to be changing, this is currently a constraint on the architects ability to use certain materials innovatively and economically. This can be represented by the resistance architects are feeling against the use of concrete masonry units and corrugated metal. It was agreed that there is a psychology against certain materials because they have been used so poorly in the past. It was suggested that we might dissolve this psychology toward these materials through their innovative use creating lively spaces that remind students that schools can be exciting places for learning.

Solution Types

Structural

- Stud Construction
  - On-site wood stud construction
  - On-site light gauge steel stud construction
  - Prefabricated panelized steel stud construction
- Brace Framing
  - Brace framing within thickened shell wall
  - Brace framing separated from shell wall (secondary structural system)
- Moment Frame Construction
- Concrete Masonry Unit (CMU)
- Concrete

Examples

- East Valley Area High School
  Architect: WWCOT

This 250,000 square foot, 2,200-student facility rests on an 18-acre site in Panorama City, and is intended to relieve overcrowding of nearby Van Nuys and Monroe high schools. The project includes 89 classrooms, a 6,130 square foot library/multi-media center, 12,000 square feet of indoor athletic facilities, and more then nine acres of outdoor athletic facilities.

Programmatic zoning of this 18-acre site was the initial exercise by the architects. This was executed in order to group program elements that were compatible (i.e. food service, lockers, gymnasium) while separating out other elements that were spatially/structurally distinct (i.e. classroom blocks). This exercise concluded in an integrated courtyard parti. There is a four-story classroom block with the library separated by a courtyard from the other programmatic features. These other features are housed in a building that is composed of the food service, dining facilities, and lockers on the first floor and both the small and large gymnasiums on the second. These gymnasiums are then linked to the physical education classrooms in the main classroom block.

Andrea Cohen-Gehring, design principal, stated that they realized early in the design process that due to the shortage and value of the land, the facility wanted to be composed of multiple level structures. The approach was then taken to ensure that the aesthetics would be true to the function and the program. Architectural and structural elements are expressed and exposed. Every design move was to reflect its programmatic function "creating a compositional courtyard building".

An element of the design of this school that was discussed was the open dining area that was nestled under the small gymnasium. This design move responded to the requirement of a covered dining area while "playfully lifting up the building", enhancing the programmatic and aesthetic depth. The elevating of the gymnasium over the lunch shelter was indeed more costly then having the shelter as a free standing structure, but more economical then attempting to marry two elements that were not easily accepting of each other's structural systems. In this case the two elements were structurally united freeing precious area for outdoor facilities. This is an example of what Cohen-Gehring refers to as "layer upon layers" of design within this facility.

- Central LA Area Middle School
  Architect: Gonzalez Goodale

The design team of the Central LA Area Middle School utilized the opportunities presented by Southern California's mild climate by incorporating outdoor learning areas on the rooftops of the classroom buildings. These were not required program elements of the project but were proactively proposed by the designers as advantageous additions. Chuck Legreco stated, "as a typology these outdoor rooftop courtyard spaces are important, but there are undeniable conflicts of making them desirable spaces". Conflicts which arose in the design of these rooftop learning areas included an increase in structure and waterproofing. They also proved to be problematic when attempting to relocate typical rooftop elements, such as air conditioning units.

Recommendations

The following was one of many principles outlined within the *White House Initiatives: Design Principles for Planning Schools as Centers of Community,* authored in 1998. This initiative typifies the current struggle that the LAUSD and it's architects face. "To effectively serve this changing world learning environments must be able to adjust to a variety of conditions and strive for education of high quality in a variety of ways. The designs of learning environments need to accommodate diversity and local flexibility. They cannot afford to lock in too firmly on any permanent notion of facility, but rather remain open to a whole array of ideas about what constitutes school. They can not afford to become too set on a fixed notion about the use of space." Due to constraints and other unique opportunities that this next phase of schools is going to present we must not limit ourselves within fixed notions. We have to overcome resistance and prevail with innovation. The following are suggestions that surfaced from the discussions during this session that could potentially improve the product, as well as the process, of the next phase of schools that the LAUSD develops:

- Consider prioritizing the approval process (DSA) to be based on, in part, the determination of the right structural system according to a series of previously agreed upon goals. Including:
  - Mandatory one-hundred year life space
  - Choice of pre-approved systems for particular programmatic functions
- Systemize the structural approach with pre-approved systems arrangements with materials suppliers/subs. (i.e. commitment and strategic alliance with steel stud fabrication manufacturer in order to improve quality at no extra cost)
- Organize a system of General Contractor input and pricing (engaging the most qualified contractors to input as to best systems approach)
- 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. The guidelines would include requirements for achieving appropriate learning environments and would include specifics for the quality of the architecture and structure.
- Assist LAUSD in assessing the validity of the current budgeting process and its effect on the life-cycle cost of these buildings.
- Develop a forum (i.e. web site) to continually share information gathered by architecture firms with regard to feasibility studies and pricing for different structural systems. Ultimately include post-construction and occupancy reports that have detailed historical budget information.
- We must understand the difference between short term utility, and long term strategy for setting the bar higher and improving the longevity and success of future schools and the impact they will have on the Los Angeles Unified School District.

LAUSD Comments and Clarifications

How do you bring change?

"You bring change by continuing to bring evidence that supports the consideration." (Marv Taff)

"New facilities designed today, which will serve us into the twenty-first century, will incorporate a number of new designs, new types of technology, new concepts of space, and new construction techniques."