

DOCUMENT RESUME

ED 471 378

EF 006 261

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TITLE Stock Plans for Schools: Three Documents.
INSTITUTION American Inst. of Architects, Washington, DC.
PUB DATE 2002-12-00
NOTE 14p.; For individual documents, see EF 006 103, EF 005 429,
and EF 005 992.
AVAILABLE FROM For full text: <http://www.rainforthgrau.com/news.html> and
<http://www.cashnet.org>.
PUB TYPE Collected Works - General (020) -- Reports - Evaluative (142)
EDRS PRICE EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS *Building Plans; Educational Facilities Design; Problems;
*School Construction

ABSTRACT

This document includes three papers addressing the issue of using stock plans for building educational facilities. The papers are: (1) "Re-Use of Plans: Why It Works (and When It Doesn't)" from the newsletter of Rainforth Grau Architects; (2) "Stock Plans for North Carolina's Public Schools: A Study" by architect Leslie N. Boney, Jr.; and (3) "Why Stock Plans for Public Schools Don't Work," from the American Institute of Architects California Council. The papers raise several potential problems with the use of stock school plans. (EV)

Stock Plans for Schools: Three Documents

Re-Use of Plans: Why it Works (and when it doesn't)

Michael Rainforth

Jeffrey Grau

Stock Plans for North Carolina's Public Schools: A Study

Leslie N. Boney, Jr. FAIA

Why Stock Plans for Public Schools Don't Work

American Institute of Architects California Council

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Re-Use of Plans: Why It Works (and when it doesn't)

The concept of Re-Use of Plans has been politically encouraged for many years and has become commonplace in fast growing districts, especially for elementary schools. Re-Use has now spread to smaller districts who are borrowing and adapting plans developed by others to meet their needs with proven, built facilities.

While re-use has demonstrated value and reduction of risk, it is not always the correct or best solution to new facility development and must be used carefully and only when appropriate.

There are many reasons *why re-use has become so popular and successful*:

Reduced Risk: A plan already constructed has been proven in the field that it can indeed be built without significant problems, thereby reducing risk in constructability. Every plan has some problems, and getting many of them worked out on a prototype project allows the next generation to be better. However, there has not yet been a perfect set of plans (as far as we know) and the expectation that a re-use can deliver perfection is unrealistic and impractical.

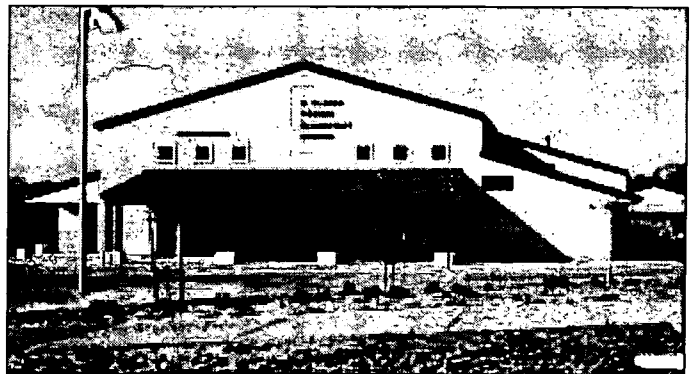
Errors & Omissions: When Should Your Architect Pay?

It was standing room only for this workshop at the 22nd Annual Conference of the Coalition for Adequate School Housing in Sacramento on March 6.

Michael Rainforth moderated and participated in *a lively presentation of Errors & Omissions, and who should be responsible for their impacts*. Participants included Sherry Gongaware, Director, Facilities Development, Tracy Unified School District, and Gary L. Vinson, Attorney, Greve, Clifford, Wengel & Paras, LLP, Sacramento. Gary provides legal services for E & O insureds, including architects and engineers.

Sherry Gongaware stirred the audience with provocative questions, such as: Are Architects responsible for a perfect set of plans?

(Continued on page 4)



Physical Inspection: Prior to constructing a facility, a re-use can be physically inspected and understood. This is much simpler than trying to understand 2-dimensional drawings or models. The user can literally experience the end product before starting the process, and make desired changes before the project is under construction.

Reduced Cost: While there are savings in design fees, they are relatively minor and represent the smallest real savings. The true cost savings lies with the reduction in changes and change orders, as the plans have been modified to account for initial construction conflicts and problems. Cost risk is therefore reduced.

Value Engineering: During construction, there are often ideas discussed on how to simplify construction, avoid problems and reduce costs. These ideas can be incorporated into future re-use plans, reducing future overall project costs.

(Continued on page 2)

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a look

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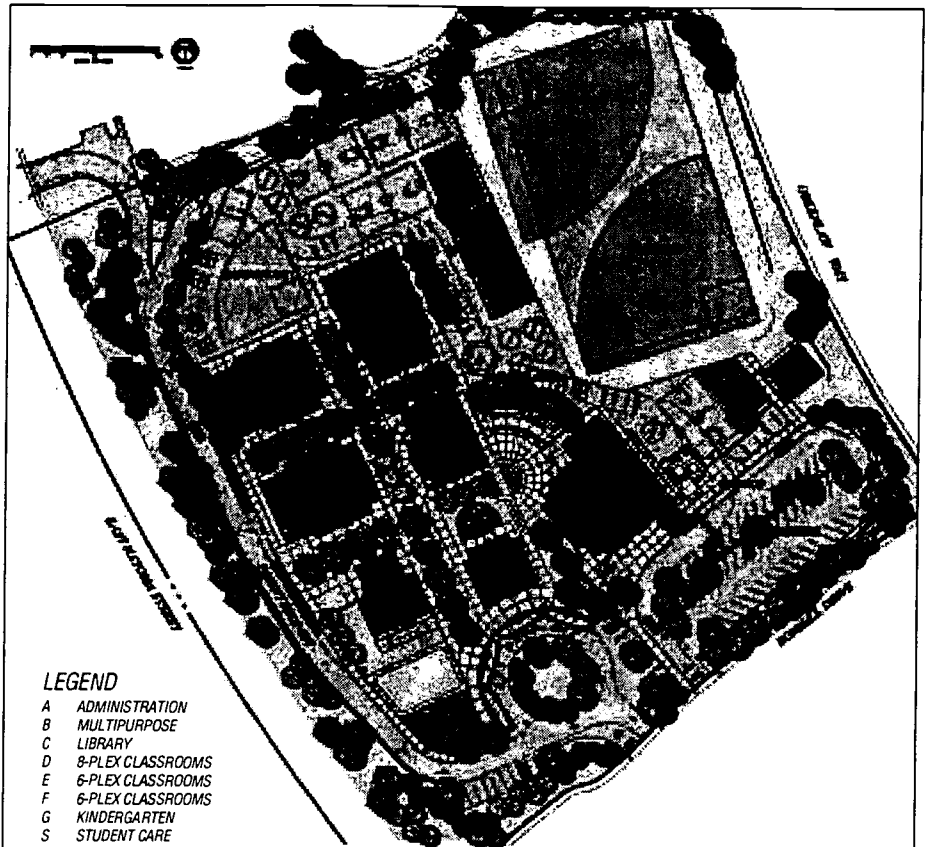
Re-Use of Plans: Why It Works

(and when it doesn't) (Continued from page 1)

Less Time: Re-using existing plans saves time in preparation of plans, DSA review, approvals and construction. Instead of creating new documents, the team adapts the plans to a new site, incorporates desired changes, addresses conflicts and improves the overall package. DSA and approvals can be somewhat expedited, but re-checking is always performed. The savings during construction is again related to the quality of proven documents, which can avoid costly time delay claims for field changes.

Post Occupancy Evaluation: A valuable opportunity to improve plans is by surveying users in a built facility and incorporating those findings into the next design generation. This again relates to incremental improvement of the total plan.

Even with so many advantages, there are still compelling reasons to program, plan and design new facilities. Districts utilizing a great amount of re-use have come to recognize *the need for re-evaluation, exploration, and new ideas.* The reasons for new designs include:

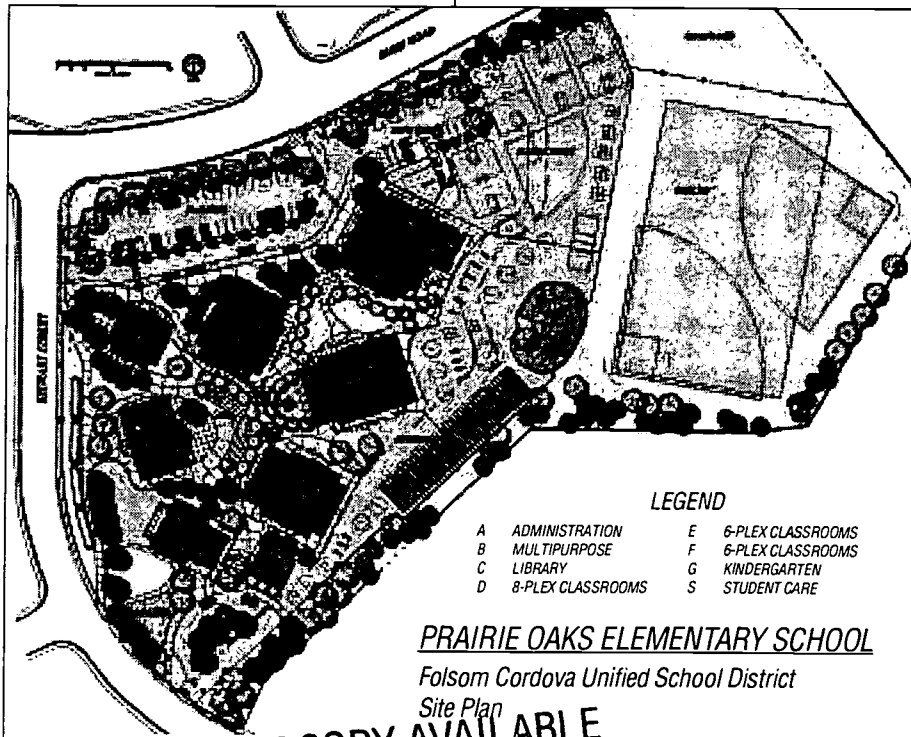


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EMPIRE ELEMENTARY SCHOOL

Folsom Cordova Unified School District
Site Plan



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PRAIRIE OAKS ELEMENTARY SCHOOL

Folsom Cordova Unified School District
Site Plan

Programmatic Changes: Educational programs are continuously changing, affecting how instruction is delivered. Providing facilities intended to meet those needs is a primary concern in every educational specification process.

Technology Demands: New and constantly changing technology continues to make significant demands on buildings, changes classroom use and requires new spaces (labs, technology centers, etc).

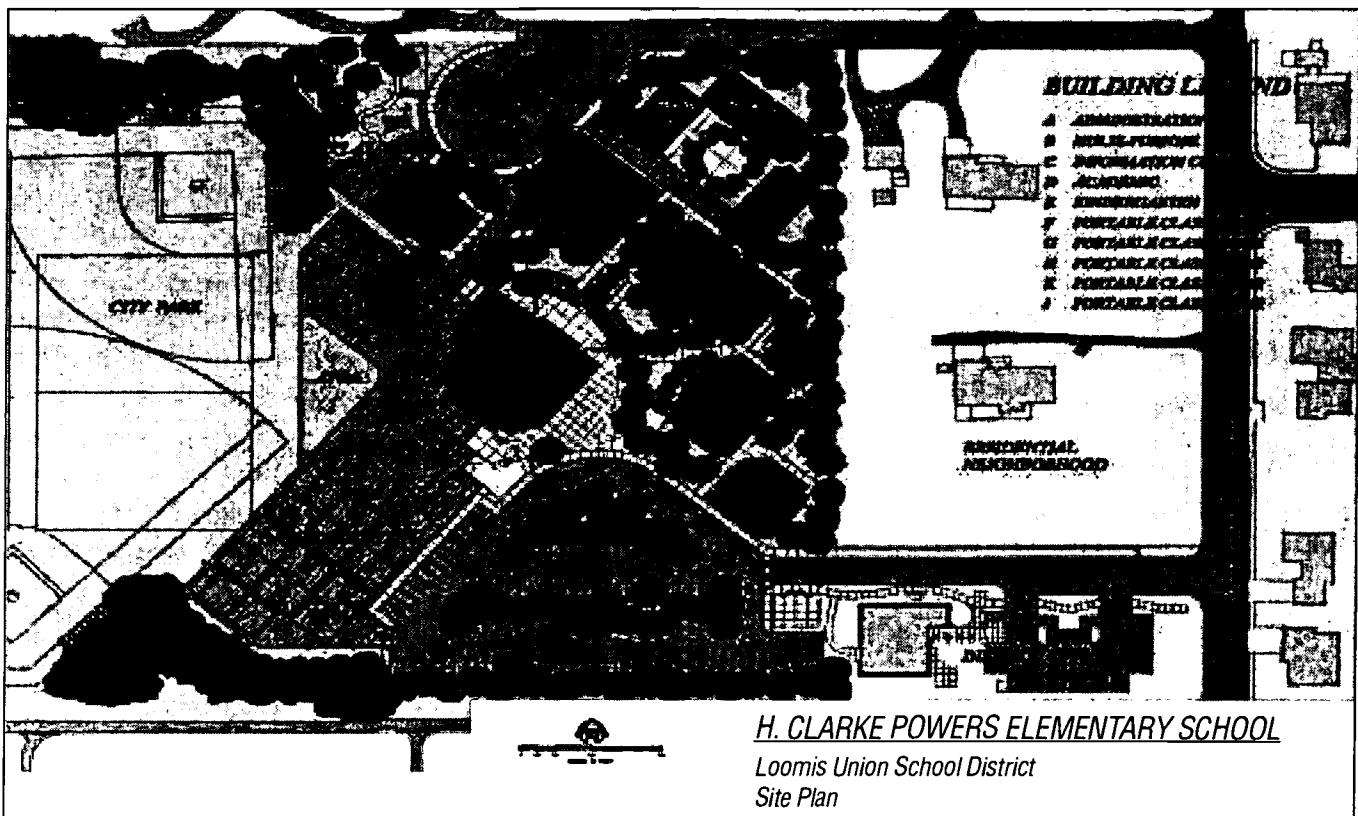
Construction Changes: Changes in construction materials and methods affect economics, durability, safety and maintenance of buildings. New facilities need to incorporate up-to-date construction techniques to maximize effectiveness and efficiency.

(Continued on next page)

Project Example: The Life of a Re-use

Originally designed as a proto-type YRE elementary for Folsom Cordova Unified School District, the Natoma Station Elementary School has a history of re-use of the entire school and various parts:

- Natoma Station Elementary School: Initial plan, completed in November 1995.
- Library and Administration buildings at Kirchgater Elementary School, and Library at Mack Elementary School, Elk Grove Unified School District: Adaptation of buildings to two existing campuses, 1996
- Empire Ranch Elementary School: Modified re-use by FCUSD, opening 2001
- Prairie Oaks Elementary School: Modified re-use by FCUSD, projected opening 2002.
- H. Clarke Powers Elementary School: Loomis Union Elementary School District: Partial re-use, adapted to program, opened 2000.
- Placer Elementary and Franklin Elementary Multi-Purpose Buildings: Loomis Union Elementary School District, M-P adapted re-use, open 2000 and 2001.
- Art Frieler Elementary School: Modified re-use by Tracy Joint Unified School District, projected opening 2001.



Site Conditions: Unique sites require unique solutions. Plans developed for one geographic location or climatic condition probably will not transfer well to different conditions without significant re-work.

External Influences: The effects of external influences often demand new responses in planning and design, such as the problem with energy costs and availability. Providing alternative designs to address these issues is critical in maintenance and operational costs.

Stimulating Environments: The search for good planning and design is never over, and the goal of providing better environments for students is continuously being pursued.

Re-using plans over and over without considering how environments can be improved is poor planning.

Re-use of plans is a valuable and proven option in the school facilities program. However, program changes, site constraints and varying conditions may make re-use difficult, expensive and impractical. *It is therefore critical for any re-use to be appropriately used and carefully evaluated to assure a final product, which will serve the educational needs as well as the site conditions.*

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Stock Plans for North Carolina's Public Schools

A Study

Leslie N. Boney, Jr., FAIA
Architect

May 24, 1995

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**NOTES ON STANDARD SCHOOLS
THROUGH USE OF STOCK PLANS
22 MAY 1995**

The good intentions of the Legislators are recognized in seeking to reduce education costs. Stock plans could be seen as a device to eliminate the architect and save some 6% of the cost of all of the State's school construction.

But, it is not that simple. First, let us put the architect's role in school planning in some perspective.

Cost of Planning Versus Operation

The following is an example of the cost of the architect's planning as it relates to the lifetime cost of a 600 student elementary school.

---	72,000 sq.ft. @ \$78/sq.ft. =	\$5,600,000
---	Architect's fee 6% x \$5,600,000 =	\$ 336,000
---	Average per pupil, per year, expenditure for operating and maintenance of plant	\$ 350*
---	Cost per year - \$ 350 x 600 students =	\$ 210,000
---	60 year life cycle cost 60 x \$ 210,000 (no inflation is figured) =	\$12,600,000
	Construction	\$ 5,600,000
	Architect's Fee	\$ 336,000
	Land and Other Costs	\$ 793,200
	Total Cost of Building Operation and Maintenance	\$19,339,200

*Source N. C. D.P.L

The architect's services at \$336,000 are a very small portion (1.7%) of the total life cycle cost of \$19 million, and yet the design skill and care which he brings to the individual project has a major effect on the ultimate cost of the \$15.5 billion spent on operations and maintenance.

Plan Changes

If stock schools were planned by the State the school board or the State would still be required to spend money to have the designs changed to adapt to:

- (a) Local desires and community interest. Most take pride in their schools and would prefer some individuality in their design and colors.
- (b) The type of school and the grade breakdown (see below)
- (c) The local needs as to space and program. These do vary.
- (d) The site configuration, orientation, and zoning.
- (e) The heating and cooling requirements of the area.
- (f) The service points for electrical and plumbing connections.
- (g) The foundation and grade conditions.
- (h) The code structural requirements which vary in different areas of the State.

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Site Adaptation

No two sites are alike in shape, topography, soil conditions, orientation, availability of sewer water gas electric service, site access - all vary. *Every school will require adapting plans to the site. Sometimes it will cost more in site work to fit a stock plan on a unique site than it would to redesign.*

Supplementary Work Required

If a stock plan is to be used someone must also:

- (1) Secure some 13 agencies review and approval. This requires a major time and effort in today's maze of offices who have some oversight before a school is occupied. It is becoming more complex each year. These reviewers do not accept previous approvals without checking each project for current compliance.
- (2) Secure bids.
- (3) Prepare contracts.
- (4) Observe construction for compliance with contract documents.
- (5) Review material submittals and shop drawings.
- (6) Approve payments to contractors.
- (7) Secure occupancy permits.
- (8) Prepare close-out documents.
- (9) Assume responsibility for the contract documents.

Modifications

The plan may be almost right for a school, but there is a need for more special education classrooms or a bigger gymnasium - or different vocational programs or a performing arts program. Modifications must be made and the design must be changed.

Professional Liability

The Architect or Engineer's liability insurance will be questionable.

Obsolescence

Educational programs and theories are rapidly changing. Stock plans must be adaptable or be replaced often.

Savings Through Design Duplication

In our experience, when an identical new school need is established by a school board, there can be a saving of 20% to 25% of the normal fee when the second, or subsequent schools; are a prototype of the original. If extensive changes are made, as they often are, the saving is less.

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Number of Stock Plans Required

The idea has many implications. Stock plans would be required for typical new school; using the following student capacities:

Elementary K-5	Middle 6-8	High 9-12
300	550	600
450	650	800
600	800	1,000
750	950	1,200
900	1,100	1,600
		2,000

Listed above are 16 sizes and types. Less common K-8 and 6-12 schools would require special plans.

A plan would be needed for each size/type with ability to add or delete class rooms to "provide for the in-between size. If the climate and wind conditions of the three distinct regions in North Carolina are to be considered, there could conceivably be a need for 48 stock plans. (16 sizes x 3 regions)

Stock Plan Not Applicable For Majority of Schools

In North Carolina there are 8 times as many additions and renovations as new buildings according to the Department of Public Instruction. These account for 60%-70% of school construction cost.

Stock Plan Idea Has Not Worked

Over the years, a number of states have attempted to develop a standard plan which could be used for different types of schools. I made an in-depth study of this matter many years ago. The conclusion was that it did not work and the states who initiated the system abandoned the idea. No state that had tried it recommended it.

In early 1960's, the New York State Legislature appropriated \$1 million to develop 18 stock plans. Nine plans were developed but only two schools were ever built using the plans. One involved 40 addenda and 58 change orders to modify the plans.

Georgia's National Study Concludes Stock Plans Impractical

The Georgia Department of Education did an excellent study of stock plans that was completed in January 1992. They surveyed all 50 states and every school district in Georgia. The following was the conclusion of their study:

"... the feasibility of using this approach as a means of reducing costs or shortening the time required for design and construction of new schools does not appear to be practical nor economical over a period of time. Therefore, it is recommended that the proposal to develop and use standard (or stock) plans and specifications for new school construction be rejected."

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Previous Legislative Consideration

This idea has been proposed to previous legislators as a simple cost saving measure. After due consideration and study it has been given, the plan has always been abandoned.

Local Control For Schools

Today, the trend in education is to have more "local control" and direction. To legislate stock plans by the State moves in a counter direction.

Conclusion

The development of stock plans to create standard public schools is not in the best interests of education and the State of North Carolina.

Leslie N. Boney, Jr.

AIA California Council

The American Institute of Architects

WHY STOCK PLANS FOR PUBLIC SCHOOLS DON'T WORK

Overview

25 states have used standardized plans for school buildings and abandoned the idea. Why? Because there were no savings and school districts received an inferior product. Stock plans are not economical, not efficient, and not flexible.

California has studied the use of stock plans repeatedly, including in the 1950s when we were building to accommodate post-war immigration. The concept was raised again in the 1960s and 1970s when we needed to accommodate the baby boomers and is currently under discussion in response to new immigration and population growth. Each time, the California Department of Education and the Legislature have determined that stock plans do not answer individual school district or curriculum needs, can add to construction costs and do not save design fees.*

Are there such things as stock plans?

1. Site conditions vary widely across a state such as California and even within individual communities. For each project, a stock plan would need to be modified to adjust to terrain, soil, site north-south, east-west orientation, and weather conditions. "Stock plans" is a layman's term. Professional architects, planners, and engineers know that no two school buildings can be built with identical plans and specifications. Architects already use many stock details from their own previous work, and others' work in order to draw up the plans at all. No matter how similar two structures are, architects and engineers must still prepare:

- Civil engineering surveys and contour maps of existing and proposed grades. Drainage must be engineered to the site.
- Site plan showing access roads, curbs, sidewalks, paving, outdoor physical education facilities, and general landscaping.
- Foundation plans designed for the soil bearing ability, site contours, and earthquake requirements of each site.
- Structural drawings and calculations for any school with conditions varying from the original school plans, such as snow loads, earthquake values, wind conditions, climatic requirements for energy savings, etc. . .

* Although California has had a stock plans program for rural schools of nine classrooms or less on the books since 1977 (Education Code Section 39111), and some sort of stock plans program since 1959, no school district has ever utilized the program. In addition, schools which have attempted to reuse plans after fires, did not experience any significant savings, due to changed building codes and advances in building technology.

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- Plumbing plans for each site condition. Each site has different service distribution and metering requirements.
 - Heating and ventilating plans will vary in different climatic zones, with different fuels, etc...
 - In addition, district curriculum requirements, population type, future additions, site orientation, or other unknowns affect the architectural drawings. For instance, one would not want west facing windows on the desert.
2. Stock plans don't create standard schools but "minimum schools" designed on a minimum budget to an imaginary physical and educational program. Stock plans do not consider the specific needs and requirements of a school such as curriculum, vocational and security priorities. Even if schools attempt to re-use plans, often changes based on programmatic concerns must be made.
 3. By standardizing design and specifications, the eligible pool of building product manufacturers and suppliers will be severely limited. Stock plans will increase building product costs by limiting competition.
 4. By using only specific building materials, products and techniques, which are quickly outdated by new technologies, schools are precluded from the use of new and improved products. *Stock plans set up a system of built-in obsolescence.* In addition, availability and cost of building materials vary in different areas of the state, necessitating an efficient designer to match construction materials specifications to each site.
 5. Plans would be prepared by persons not responsible to the school district who is buying the facility. Non-educators would decide what is good and what is bad. Stock plans would increase state control at the expense of local control.

How does clouded liability affect project cost?

The question of liability becomes extremely cloudy when stock plans are modified. When a stock plan is modified (as it must be to fit every individual project), an architect must be hired to perform the modification. Architects could easily be held liable for building failures to which they did not contribute, because their required stamp and signature on the documents make them responsible to the final product. Professional liability insurers agree that the use of stock plans may result in poorly adapted designs resulting in an increase in litigation and higher insurance premiums in an area where premiums are already very high. Inevitably, the high cost of insurance adds to the total project cost.

California law prohibits an architect from signing and stamping construction documents which he or she did not personally prepare or directly supervise. An architect who violates this law is subject to disciplinary action, including citation, fine, and/or possible suspension or loss of license. (Business and Professions Code Section 5586) Given these two considerations, an architect hired to use existing documents would essentially disassemble the plans and re-calculate each element in order to be assured they are designed to his or her own standard of care. The costs and time involved in such a task are considerable, and could easily outweigh many of the benefits anticipated through use of stock plans.

Can architectural services and fees be eliminated by using stock plans?

First, it should be made clear that the issue is not the desire to eliminate service so much as the desire to eliminate fees. It is difficult to obtain one without paying the other. California law requires that a licensed architect prepare plans and supervise the construction of schools.** Architects are usually hired to assume responsibility for architectural work plus coordination and supervision of all professional services.

In addition, to basic design and professional supervision, the architect is also expected to provide assistance with state forms and applications, as well as provide construction administration services for the school district. None of these basic services would be eliminated with stock plans. For example, regardless of whether stock plans are used, the architect must:

- Prepare cost estimates and documents for various state agencies.
- Process all drawings and documents through state, county and local government agencies having jurisdiction.
- Prepare contract documents which provide a complete description of the construction contract. (This includes: instructions to bidders describing all bidding conditions; preparation of bid forms; preparation and execution of contracts between the school district and various contractors and suppliers; preparation of addenda; and review of insurances and surety bonds.)
- Supervise the contract. (This includes: assisting the district in the selection of job inspectors; interpreting the plans and specifications for inspectors and contractors; and helping to coordinate the work of contractors.)
- Review and approve shop drawings for mill work and sheet metal work.
- Investigate, recommend and approve substitution of materials and products where requested or required.
- Select finish materials and colors as required by the specifications.
- Prepare change orders as required during construction; check all items of cost occasioned by such change orders; and secure approval of owner and various state agencies.
- Check and transmit the inspector's bi-monthly reports to the owner and the Division of the State Architect (DSA). Prepare and submit quarterly affidavits of the "progress of work" to DSA and the owner.
- Check material test reports for the soundness of concrete and steel materials being installed, and report deficiencies to the Division of the State Architect and

** Even California's existing stock plans law for rural schools requires that an architect or structural engineer be hired by the district for necessary structural engineering and supervision of construction (Education Code Section 39115). In addition, these stock plans must comply with all requirements of the Field Act, including Division of State Architect approval (Education Code Sections 39113 and 39114).

the contractor. (It is also the architect's job to see that deficiencies are corrected by the contractor.)

- Check the contractor's monthly requests for payment, and prepare the "architect's certificate" which advises the owner that the contractor's request is correct and ready for payment.
- Perform final inspection of the building and advise the owner that it is ready for acceptance.
- Prepare "notices of completion". Secure guarantees for roofing, mechanical and electrical equipment, etc. . . from the subcontractors. Obtain the "one-year guarantee of work" from the general contractor.

What is the real cost of design?

Proper design can lower construction costs and help lower the life-cycle costs that occur once the facility is in operation. A public school should be built to last and remain functional for 40 years or more. *The true cost of a school is not the construction price but the life-cycle costs in terms of maintenance, up-keep, energy use and practicality.* In short, a facility that is not properly designed for its function, use and environment will cost much more to operate.

What are other benefits of site and community specific design?

Traditionally, California public schools have been designed and built to operate as crucial local disaster shelters during earthquakes, such as the Loma Prieta Earthquake in 1989 and, more recently, the Big Bear/Landers and Cape Mendocino Earthquakes of 1992. In addition, many schools now double up as community centers, and directly link with parks and other community recreational facilities. Without significant modification, stock plans could never anticipate and attain the efficiencies of joint community facility use.

Conclusion

Although stock plans may seem a panacea for saving time and money, experience in California and across the country has shown that these hopes for stock plans are a myth. In reality, stock plans prove to be an inefficient, costly, and inflexible method of designing schools. A stock plan, instead of providing a simple path to constructing a facility, almost invariably provides only a series of obstacles that must be fully recharted before an acceptable design outcome can be reached. Stock plans are the classic case of a "penny-wise, pound foolish."



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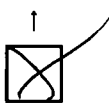
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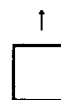
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