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ABSTRACT

Building systems can be traced back to a 1516 A.D. project by Leonardo da Vinci and to a variety of prefabrication projects in every succeeding century. When integrated into large and repetitive spatial units through careful design, building systems can produce an architecture of the first order, as evidenced in the award winning design of Foothill College. (Author/MLF)

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BUILDING SYSTEMS: PASSING FAD OR BASIC TOOL?

Architecture has often been discussed as a combination of certain distinct factors. Early writings most frequently deal with these factors in groups of threes. For example, Vitruvius considered architecture the artful joining of convenience, construction, and beauty. Vignola and Cotten called these same traits commodity, firmness, and delight. In the present century Corbusier mentioned serenity, efficiency, and joyfulness, while Saarinen spoke of structure, function, and contemporary form.

No matter how broad these characteristics may seem, there are constant new demands placed on building which expand the list of factors contributing to architectural expression. As rapid technological advances increase the rate of change in everyday living patterns, there is greater need for flexibility to accommodate new and evolving functions. Always an important factor, cost has become more and more critical as sources of tax support disappear and as stagflation takes its toll. Costs of construction labor, building materials, and life-cycle operations have come under close scrutiny. Increasing effort has been expended toward reduction of construction time, particularly time required for on-site labor. It is no longer common to think of building for the ages, so why should construction itself last an eternity?

Flexibility, reduced costs, faster construction - all have been cited as major reasons for the evolution of building systems.[1] This is particularly true in the field of school facility construction. If they are considered to have originated in British postwar projects, building systems have a history of thirty years at best. But this span becomes far more extensive when they are defined in their true role as groups and subgroups of interrelated parts designed to

a. combine without modification into wide varieties of relatively complete buildings
b. maximize economic use of materials, factory fabrication, ease of transport, speed of erection, and interchangeability of components
c. provide adaptability of purpose, flexibility of interior space arrangements, and expansibility of the area enclosed
d. meet various combinations of structural, mechanical, electrical, illumination, acoustical, space division, interior furnishing, and other physical demands.[2]

At least one writer traces them back to a 1516 A.D. project by Leonardo da Vinci and to a variety of prefabrication projects in every succeeding century.[3] A major milestone in this succession was conceived and built near the middle of the last century: the Crystal Palace at the Great Exhibition of 1851 in London. Although some individuals might deny its status as an educational facility, strong arguments could be made that more people learned far more about a wider range of subjects in less time here than in any school building of its age.

No other structures of the Nineteenth Century come close to the Crystal Palace in their significance to the evolution of building systems. Just consider the circumstances at the time it was conceived. London wanted an outstanding and distinguished display hall to be completed early in 1851 for the Great Exhibition. However, in June 1850 it was reluctantly decided the £300,000 required to build the design proposed could not be raised. Rather than cut back on size, the building committee asked a different architect to make some new proposals and to alter structural systems if necessary. This architect, Joseph Paxton, not only came up with a satisfactory scheme using glass panels in iron frames, he also completed preliminary drawings for the entire design by the end of June. Much of this rapid progress was made possible by Paxton's use of a repetitive 24'x24' structural bay and standardization of nearly all components. Special machinery had to be built to join many of the components, which came from over 250 manufacturers located throughout all of England.[4] Still, when all parts arrived on the site, everything went together as planned. The entire 408'x1848' hall was completed in less than six months - and cost of the project had been reduced to £160,000. A remarkable demonstration of the building's inherent flexibility came in 1853 when it was dismantled and transported out of London. It was reassembled at Sydenham and would probably still be there if it hadn't burned down in 1936.

Some major progress in prefabrication of building components was made before World War II, particularly by Buckminster Fuller and Walter Gropius, but little of this related directly to school construction. It was again in London, almost exactly a century after the Crystal Palace, that the next significant development in building systems took place. This was a series of some 175 school facilities built from standardized components which combined in numerous arrangements. The culmination of this effort was a group of projects known as CLASP (Consortium of Local Authorities Special Program). Many of the latter facilities were strikingly handsome and highly functional, so much so in fact that in 1960 England's CLASP system was awarded grand prize at the most famous of all international design competitions, Milan's Triennale.

Unlike most American school building systems which came later, CLASP also provided standardized exterior cladding units. These include many sizes of windows, doors, louvers, wood siding, concrete, tile, and porcelain enamel panels. Design with these components was distinguished by careful selection of units to be fitted on a 40"x40" plan module. This design process has humorously, and sometimes derogatorily, been referred to as a kind of "hardware selection". As has been noted above, however, it has produced many examples of outstanding architecture when used by talented design professionals.

Succeeding American school building systems also differ from CLASP by increasing the plan module to 60"x60" and by providing structural members capable of spanning greater distances. These characteristics are first found in the pioneer SCSD (School Construction Systems Development) project begun in 1961 at Stanford University's School Planning Laboratory. SCSD's other innovations include an advanced heating, ventilating, and air conditioning system of integral rooftop units with flexible diffuser connections. In most respects, however, the California project relied on previous British experience with prefabricated schools as well as on Ernest Kump's earlier work with basic space modules, a matter to be dealt with later in this presentation.

Several large school building systems projects were derived largely or in part from SCSD work. Florida's Schoolhouse Systems Project (SSP) used SCSD performance specifications, contract documents, and finished subsystems with only minor modifications and soon exceeded the California effort in terms of districts involved, buildings under contract, and professional design firms retained.[5] On a qualitative basis the two projects are roughly equivalent. Their individual facilities bear marked resemblance to each other physically - and in the fact they have been built for well under costs of conventional construction.

Of all the school building systems inspired by early CLASP and SCSD success, the largest in terms of human resources and the most original in technological development is Toronto's School Board Study of Educational Facilities (SEF). Where SCSD relies on only four major subsystems, SEF has ten. Its structural subsystem is designed for a maximum of five stories, more than twice that required by either SCSD or SSP. Its exterior cladding and electric-electronic distribution systems are also unique. When first bid, SEF attracted tenders from 36 contractors who bid the ten subsystems in over 13,000 different combinations, all of which met project specifications.[6] In terms of comprehensive and innovative subsystem design, Toronto's SEF project represents the epitome of school building systems work to date.

At this point, rather than go into further detail on elementary and secondary school developments, mention should be made of Ernest Kump and his work with what he calls basic space modules. These differ from plan modules in being complete three-dimensional units, and they have been used in various projects for all levels of education. In concept they are repetitive combinations of rather large enclosures whose ability to accommodate widely varying program requirements has been determined from careful design study. They provide thorough standardization and still permit great freedom in plan, design, and structure. Rather than producing monotony, they gently impose order and harmony.[7] And by virtue of repetition, they are inherently economical.

Kump's best known use of basic space modules is in his Foothill College at Los Altos Hills, not far from the same School Planning Laboratory which spawned the SCSD project. Architecturally, everything seems to have gone right at Foothill. It was given the AIA's First Honor Award in 1962 and has received numerous other recognitions. A followup study of the college was made after twelve years of operation. The study begins "Everyone likes Foothill," and then continues "it forms a benchmark against which other designs are measured; for architects everywhere it has helped the case for artistically serious, all-of-a-piece campus design." [8]

Foothill's basic space module measures 60'x68' and is the largest unit Kump has used to date. It appears singly and in various combinations in all but one of the college's thirty structures, each of which contains its own mechanical services. Seven modules are joined in the large H-shaped library, but most of the other buildings use only one or two of the units. Despite the uniformity of these modules, their overall effect is far from boring or monotonous. This is true in part because of the college's dramatic location, the fine siting of its buildings, and the excellent landscaping of its campus.

The large space module at Foothill is adaptable to a wide variety of uses, is mechanically self-contained, is relatively quick to erect, and is economical. It meets all of the criteria listed early in this discussion, but it transcends other building system projects in design rationale and aesthetic effect. There seems little question it will rate highly on any list of landmark projects from the Twentieth Century.

Now, let us return to the fundamental question of this discussion: are building systems just another fad or are they destined for a place among the main determinants of great architecture? On the basis of experience to date, it is safe to state that use of building systems for mere hardware and subsystem design results in transient significance at best. But when integrated into large and repetitive spatial units through careful design, building systems can produce an architecture of the first order. The eternal impulse to organize, to rationalize, and thus to economize is inherent in many of the arts, perhaps most of all in architecture. It is the element which gives classic distinction to both the Crystal Palace and Foothill College.

1. Griffin, C.W. Systems, an approach to school construction. EFL, February 1971, p.8

2. Rezab, D.J. Physical characteristics of selected school building systems. Unpublished doctoral dissertation, Indiana University. June 1970, p.7

3. Ibid., pp.18-19

4. Chadwick, G.F. The works of Sir Joseph Paxton. London: The Architectural Press, 1961 pp. 115-122

5. Cramer, H.L. Florida's systems schools. CEFP Journal, January 1970, p.15

6. Robbie, R.G. The flexible future of architecture. AIA Journal, November 1969, p.65

7. Kump, Ernest. The space module school. Architectural Forum, December 1957, p.125

8. Montgomery, Roger. Most popular campus. Progressive Architecture, June 1973, pp.113-114