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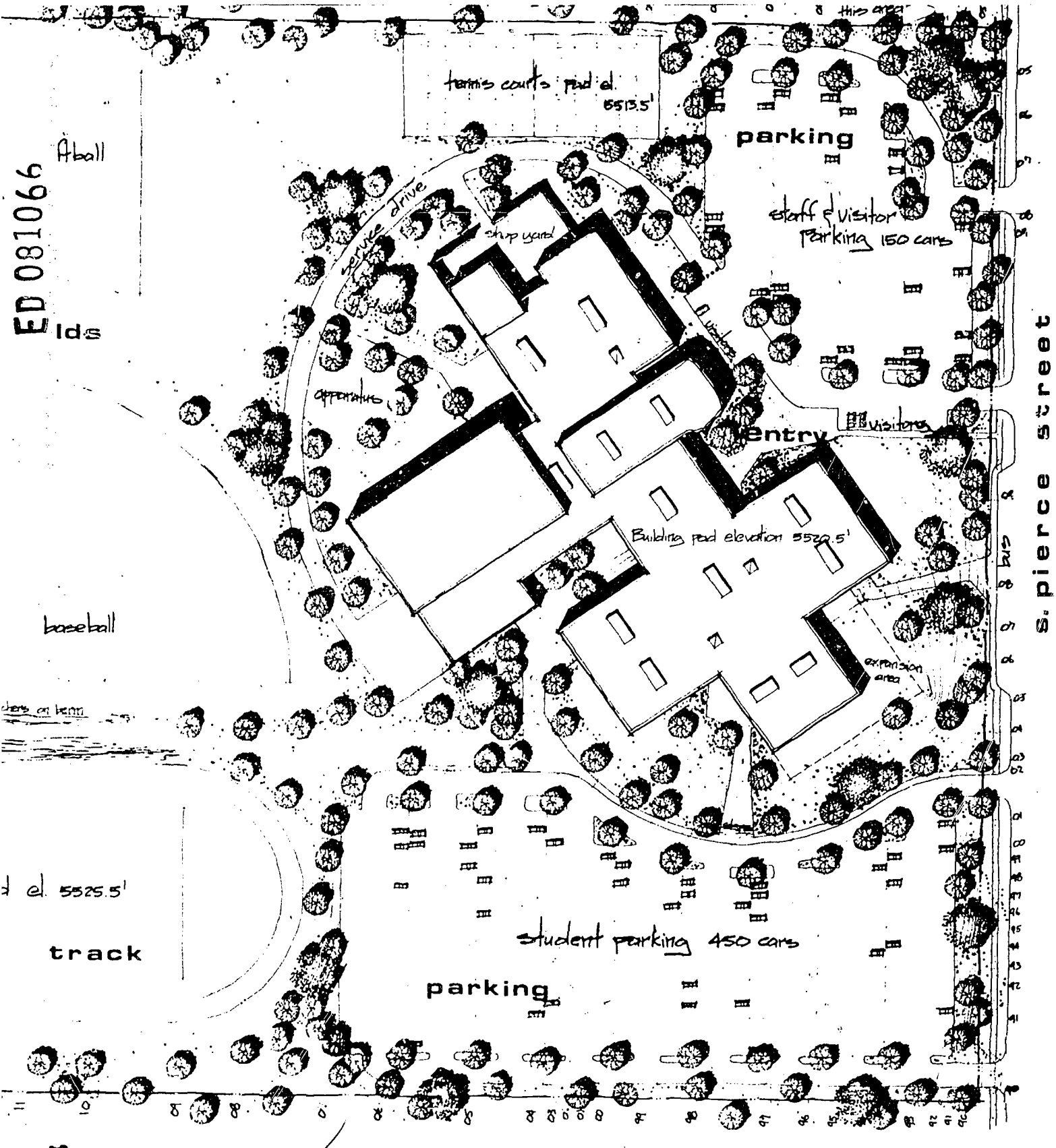
ABSTRACT

In the design/build process, an owner asks an architect to team up with a builder to provide both design and construction services at a fixed price. Design/build procedures, used successfully in Jefferson County, Colorado, to provide facilities that satisfy school district needs in quality, cost, and fast delivery, are described. An editorial comment also attempts to place the Jefferson County experience into the context of design/build throughout the country. (Building plans may reproduce poorly.) (Author/MLF)



BSIC/EFL NEWSLETTER

Vol. 5, No. 1 April 1973

"NEW" RESPONSES TO SOME OLD PROBLEMS

In many areas of the country the failure of the public to approve funds for school construction has convinced school authorities that they must explore new methods of cost and time control. Such techniques as fast-track scheduling, value engineering, construction management, performance specifications, turnkey building, and building systems are all a part of the increased vocabulary of procedures available to the owner.

The design/build process described in this issue of the *Newsletter* is another of the "new" systems approaches which are being tried as a means of controlling cost and time. Certain modified forms of this process have been used in the private sector for many years so it is not really a new process. Often used in the college and university housing field, design/build has more recently been employed by a few public school districts as a means of solving their facility problems.

The introduction of the design/build process comes as a direct result of owner dissatisfaction with the ability of the architect to control project costs and delivery time using traditional procedures.

Unlike most of the new procedures aimed at achieving the same results, design/build requires a significant realignment of the relationships between the major participants: owners, architects, and builders. The brunt of this role change has fallen upon the architect. He is being asked by the owner to team up with a builder in order to provide both design and construction services at a fixed price. Only the successful team will receive compensation for their efforts. Since most architectural firms are not organized to participate in this fashion, leadership and control of many of the design/build projects has been in the hands of the builder.

The effective use of the professional in this process will depend on whether architects decide to get involved or sit on the sidelines while others perhaps less professionally qualified attempt to fill the void. The opportunity for the architectural profession to play an expanded role in the entire building process is there. Whether the profession will seize it remains to be seen.

The role of the owner in the design/build process becomes one of increased responsibility for setting the performance and technical criteria which will control the project. Since he no longer has a design architect upon which to rely he must either employ consultants for this purpose or rely upon the talents of his own staff. Very few school districts are in a position to retain a staff of the professional quality required to successfully carry out all of the functions required of the owner in the design/build process. If the owner recognizes his own limitations at the onset and supplements his own staff with competent professionals where necessary, he can successfully avoid many of the potential problems that are inherent in this process.

Is design/build THE answer? Certainly it should be obvious by this time that there are no universal solutions that will apply in every situation. Design/build is but one of the many procedures that can be employed *if* the project conditions are appropriate.

A comparison of the Jefferson County experience with that of Vigo County School Corporation, Terre Haute, Indiana, is a case in point. Everyone we talked to in Jefferson County cited the necessity to have a large volume of construction in order to successfully use design/build. They pointed to the failure of their single middle school project to achieve the target cost as an example. Yet in Terre Haute they had ten bidders on their single elementary school and six for an addition to a junior high. Obviously project conditions were not the same.

Project procedures must be developed in response to a specific set of circumstances which require solutions based on the unique conditions of a particular project. Any approach must have as one of its objectives providing a means for tapping the creativity and judgment of a broad assortment of relevant technical and professional disciplines in order that the best solution possible may be achieved.

We would do well to remember that the process is only a means to an end. It is not an end in itself.

BSIC/EFL NEWSLETTER

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JEFFERSON COUNTY DESIGN/BUILD PROGRAM

"The laws of economics and competition have borne good fruit for the school district. The obvious criticism of the design/build concept comes from the seller of the product who has to go through considerable effort to present his proposal."

DR. ALTON COWAN, *Superintendent, School District R-1*[1]

Faced with loss of a critical bond referendum brought about by a taxpayer revolt over what they felt were high construction costs, School District R-1 of Jefferson County, Colorado, turned to a design/build method as a means of providing badly-needed facilities at reduced costs. Able to pass a $22 million bond issue in late 1971, the district embarked on a large scale construction program which will place fifteen new school plants in service by September of 1973.

BACKGROUND—JEFFERSON COUNTY DISTRICT R-1

School District R-1 serves Jefferson County, Colorado, a suburban area lying between the City of Denver and the front range of the Colorado Rockies. Stimulated by Denver's burgeoning economy, the area has seen a rapid population growth since 1950, composed largely of higher-than-average income families with children. These immigrants have been active in school affairs and have helped to form district policies, both in curriculum and, as will be seen, in construction of new facilities.

The district is physically very large, covering over 785 square miles. District enrollment has grown from about 10,000 students twenty years ago to over 75,000 at present. Because of citizen opposition to large scale transportation of students, the district prefers to construct smaller facilities located near their enrollments rather than large central schools.

To permit greater local involvement in the schools, the district in the late 1960's created nine school "areas" based on the then-existing high school attendance areas. Each of these areas has its own superintendent and advisory councils and is able to determine its own needs to some extent in programs and curriculum. In general this program has been highly successful in encouraging community participation.

A setback to the district policy of keeping construction ahead of need came in 1970 when voters refused to approve a large bond issue for the building of a number of school facilities needed for the school year 1973–74. A reading of voter attitudes led district staff to conclude that voters thought that they were paying too much for schools.

At about the same time, the district concluded an experimental project involving the use of relocatable facilities purchased with performance specifications. The low cost and apparent serviceability of this solution gained community acceptance.

[1] Quoted in *The Arvada (Colo.) Citizen Sentinel*, Vol. 6, No. 51, August 10, 1972, p. 1.

THE DESIGN/BUILD PROGRAMS

A second appeal to the voters in 1971 resulted in the authorization of a $22 million bond issue to finance a construction program which included fourteen badly needed new facilities. To insure passage of the bond issue, the district committed itself to lowering the cost of the new facilities. Faced with severe time and cost constraints the district turned to a design/build methodology, soliciting competitive proposals for packages of schools, based upon performance specifications.

In order to attract bidder interest and to justify the investment required to prepare a proposal, the district grouped the projects into four bidding phases—two five project elementary school packages, a single junior high school, and a package of three high schools. Table I shows the size and content of each of these packages.

TABLE I

DESIGN/BUILD PACKAGES,
BOND ISSUE 7, JEFFERSON COUNTY SCHOOL DISTRICT R-1

		Base Bid		Alternate			
Phase	*Contents*	*No.*	*Capacity*	*No.*	*Capacity*	*Contract Awarded*	*Completion Date*
I	Elementary Schools	3 2	650 450	5	650	March 6, 1972	August 15, 1972
II	West Jefferson County Junior High School	1	350[a]			June 8, 1972	July 31, 1973
III	Senior High Schools	3	1250[b]	3	1500	August 1, 1972	August 15, 1973
IV	Elementary Schools	3 2	650 450	5[c]	650	January 23, 1973	August 15, 1973

[a] Includes core facilities for 500.
[b] Includes core facilities for 1500 at each site.
[c] Number increased to 6 after selection of contractor.

Contractor Selection Procedure

With slight modifications resulting from increased district experience, the procedures used on the four bidding phases were identical. In all cases, the general procedure was to solicit design proposals with bonded prices from contractor-architect teams. The basis for these proposals was a performance specifications document containing educational and technical requirements.

Following release of the document, proposals were prepared during a design period that lasted from four to seven weeks. At the end of this period, proposals with guaranteed prices were submitted to the district and subjected to an extensive evaluation process. The working of this process resulted in the selection of the three most advantageous proposals and a set of recommendations for the revision of each. These three bidders were then given ten days in which to incorporate the changes into their designs and to resubmit their proposals. A final selection was then made and a single contract signed with the successful contractor.

Performance Specifications. For all four phases of the program, the basic document was the district's performance specifications, containing both educational and technical requirements. This document was developed by district staff from the performance specifications for the 1970–71 relocatable building project.

As stated in the specifications, the objective of each program was to obtain the solution which represented "in the School District's evaluation and judgment, the most advantageous combination of value to be delivered per dollar bid."[2]

To insure the bidders freedom to select and use those materials and techniques which they felt to be most useful and economical, the performance specifications were intentionally left general. In the words of Director of Planning and New Construction Henry Podzinski, they were "to tell the bidder enough so that he knew what the district wanted, but not so much as to clutter the specs with too many restrictions."

By treading this thin line, the district felt that it could make its choices on the basis of cost and quality tradeoffs which could not be formalized in a document. The district staff was prepared to meet with any and all bidders to further develop its needs as expressed in parts of the specification. Thus, the district sought to feel its way to desired levels of building performance through dialog with its candidate designers rather than spelling these levels out in great detail.

Preparation of Proposals. The district required no formal structure of the design/build team other than that the bidder be a licensed contractor, capable of obtaining

[2] Jefferson County School District R-1, *Performance Specifications for Columbine Senior High School, Green Mountain Senior High School, Pomona Senior High School, Phase 3, Bond 7*, p. 1–i.

bonding, and that the team contain a licensed architect and consultant engineers. Organization of the team was left in the hands of the bidders with the result that the composition of the teams varied considerably.

During the design period, each team had to prepare and price a basic design, apply the design to each of the phase's sites, and prepare three alternatives. In each phase, the alternates were:

1. Increase the number of students housed.
2. Fully air-condition at the base occupancy.
3. Fully air-condition at the alternate occupancy.

In addition, each proposal had to have the approval of the Safety Inspection Branch of the State Department of Labor and Employment before submission.

Each team assumed financial risk for the preparation and submission of its proposal, anticipating repayment only if the proposal was accepted. Actual arrangements for taking this exposure varied from team to team. Completeness of the proposal submittals was also left to the teams, with some teams submitting advanced schematics and design development drawings, and others, completed sets of working drawings and specifications.

Evaluation of Proposals. After an initial screening to eliminate those proposals which did not satisfy cost constraints—and even these were given substantial review—the proposals were submitted to a three part evaluation process. This process consisted of independent evaluation of each proposal by three groups:

1. District professional staff, curriculum specialists, and area superintendents who assessed the educational effectiveness and flexibility of each proposal.
2. District staff and consultants who assessed the costs and technical merits of each proposal.
3. A team of architects from the faculty of the University of Colorado School of Environmental Design who assessed each proposal independently, applying the basic evaluative criteria.

The basic evaluative criteria used to determine which proposal gave the "most advantageous value per dollar bid" were: cost to the district, technical quality and aesthetics, and educational effectiveness and flexibility. Since detailed evaluative criteria were not developed, considerable reliance was placed on the competence of the evaluators. Although acting independently, the three groups were generally in concurrence on the selection of proposals.

The purpose of the first screening was to select the three most advantageous proposals and to make recommendations for their revision and improvement within the established bid prices. Proposals were then returned to the bidders and the three candidates asked to modify their submittals within ten days by either incorporating the suggested changes or showing why they could not be included.

The three proposals were then reviewed again by the three evaluation teams who agreed on a single proposal to recommend to the board for contract.

Results and Costs

In three of the four phases, the prices received were so favorable that the district was able to choose the alternatives of larger size and full air-conditioning. The junior high school project was not so successful, receiving only three bidders—all over the project target. The results of the bidding programs are presented in Table II.

William Blurock, architect of the Phase III high schools, compared the costs of these schools with those of Aurora High School, a Denver-area project designed by his firm under conventional contractual relations. Blurock feels that the schools built under the two projects are comparable in quality and cost when allowance is made for district supplied items in the design/build programs. He feels the major savings of design/build to be time. The process not only allowed the district's schedule to be met but saved on the order of $1500 a day in cost inflation.

TABLE II

RESULTS OF BIDDING, THREE DESIGN/BUILD PACKAGES, BOND ISSUE 7, JEFFERSON COUNTY SCHOOL DISTRICT R-1

Phase	Proposals Received	Selected Proposal		Building Cost	
		Contractor	Architect	Target	As Bid
I	19	Joint Venture: Craftsmen Construction and Developers-Constructors, Inc., Englewood, Colo.	Seracuse-Lawler and Partners Denver, Colo.	$18.60	$16.22
III	6	Mead and Mount Constr. Denver, Colo.	Wm. E. Blurock and Partners Corona del Mar, Calif.	$21.48	$19.39*
IV	7	Joint Venture: Craftsmen Construction and Developers-Constructors, Inc., Englewood, Colo.	Seracuse-Lawler and Partners Denver, Colo.	$18.60	$16.14

* Phase 3 As Bid Cost does not include $0.55 per square foot for district supplied floor covering.

An unexpected benefit of the program came to the district in the final elementary school program. After examining the selected proposal of Craftsmen Construction/Developers-Constructors, it was decided that, in spite of quality improvements in the team's design over its Phase I proposal, the solution was economical enough to allow the addition of a sixth school to the contract.

Costs and Benefits to the District. Assuming that nothing happens to delay the three construction programs currently under way, the design/build methodology has enabled the district to meet its two objectives of fast delivery and lowered costs. In addition, the district was able to select from among the variety of cost and quality level combinations submitted, those which were most satisfactory to them.

Henry Podzinski of the district staff added that the implied performance nature of a design/build contract is definitely to the owner's advantage. Placing the architect on the contractor's side makes the builder and not the owner responsible for any errors and omissions. Except for valid owner changes, there are no change orders from the bonded price given by the contractor in his proposal.

Although there may be some hidden costs—staff members admit to "working like hell" during the program—the cost of district staff and consultants for administration and supervision of the program remained at about its normal level of 1½ per cent of project costs.

What Made It Work? Vern Heaston, Assistant Superintendent for Supporting Services for District R-1, feels that there were two conditions present that contributed to the success of the programs. These were: (1) a community climate in which there was a desire for less expensive schools; and (2) the ability of the district to generate sufficient volume—a number of schools to which one basic design could be applied—to interest contractors and justify their participation.

Members of the district's Office of Planning and New Construction feel that much of the success is a result of the teamwork between designer and builder required by the method. William Coppock, Architect/Supervisor of Construction for the programs, cites the success of the Craftsmen Construction design/build team as an example. This team had gained design/build experience together in private market work over the past six years.

The man most concerned with the Jefferson County projects at Craftsmen Construction, Vice-President Tom Mitchell, said that this teamwork is the first of three keys to success in design/build projects. The other keys are being cost-conscious from the start—putting nothing on paper that is not cost acceptable—and presenting completed working drawings and specifications as the priced proposal. An important element in obtaining lower costs is the use of identical plans and specifications for more than one project during the same construction period.

DESIGN/BUILD IN JEFFERSON COUNTY—PRO AND CON

The extensive application of the design/build method in Jefferson County has caused considerable discussion and criticism of the process. Major criticisms of the program fall into five categories:

1. The financial exposure of the participants in the competition.
2. Possible loss of the architect's identity.
3. Loss of the architect's professional services during the construction phase.
4. The quality of the district's performance specifications.
5. The apparent exclusion of small firms from the process.

Financial Exposure—Can Anyone Afford to Play?

Estimates of the cost of preparing a proposal for the first five elementary schools, reported to the *Arvada Citizen Sentinel* by the nineteen firms involved, range from $10,000 to $50,000.[3] Of these bidders, only one, the selected design/build contractor, received compensation for these expenses. In total, Phase I participation represents a combined risk by these firms of an estimated $750,000 on the $3 million project.[4]

The attrition of bidders from the first phase to the last may represent an awakening awareness of the cost of losing. From nineteen bidders on Phase I, the number of bidders declined to six for the high schools, and seven for the second elementary school package. The junior high school, located on a rugged site difficult of access, attracted only three bidders.

Unlike contractors, architects are not accustomed to this kind of financial exposure. In this process the major portion of the risk is the architect's design work. By the time a proposal is ready for submission, the architect has completed about three-fourths of his work, i.e., in most cases the submission consisted largely of completed working drawings and specifications. Unless he has a reimbursement arrangement with the contractor, the architect is out most of his project costs if his team does not succeed.

As a result several architects, including both successful and unsuccessful program participants, have questioned the process. Victor Langhart of Denver's Rogers/Nagel/Langhart, which prepared a proposal for Phase I, has suggested that the district pattern its competition on procedures and practices recommended by the

[3] *Arvada (Colo.) Citizen Sentinel*, August 10, 1972, p. 1.
[4] *Ibid.*

American Institute of Architects. Langhart feels that AIA procedures covering design competitions could be extended to cover design/build.

A school board member, Mr. Paul McEncroe, feels that the district should do something about the situation in order to keep good relations with contractors and architects. Mr. McEncroe believes that the district should pick three or four teams to work with and pay all of them, limiting the payment to losers to a figure such as $15,000. He feels that the large scale cost savings of the design/build approach permit such expenditures.[5]

Whom Does the Architect Serve?

Area architects have expressed concern over the loss of the architect's role as owner's agent when made a member of the profit-oriented design/build team. These concerns relate largely to a possible weakening of the architect's ability to control design and insure high quality when under contract to the builder.

The experience of the Jefferson County programs shows that this contention is not necessarily true. A number of area firms with excellent reputations and high integrity participated in the various phases as parts of design/build teams. Opinions of some of these participants show a greater objection to the vagueness of some district procedures and documentation than to possible loss of design prerogative.

The architect of the successful high school proposal, William Blurock, feels that far from representing a loss of prerogative for the architect, the design/build process can be a new opportunity. Blurock feels that contractors are willing to allow architects to develop criteria and designs as long as the design is cost conscious and that this additional discipline is useful to the designer. His Phase III schools received an award of merit at the 1973 AASA meeting.

Some of the contractor participants feel that making the architect profit-oriented may do him good. Cal Radach of Mead and Mount expressed this view when he said that under traditional procedures the architect tries to get as much as he can for the owner; with greater cost-consciousness he tries instead to give the owner the best value for his money.

Who Provides Construction Contract Administration?

Early critics of the Jefferson County programs expressed concern that the procedures used resulted in the loss to the district of the construction contract administration services of the architect and his consultants. Many of these criticisms were aimed at apparent gaps in these services which arose during the first phase.

In the Phase I contracts, the district intended to have its staff do many activities traditionally the responsibility of the architect, including checking of shop drawings and on-site inspections. The district found that it had the capabilities but not the manpower to effectively carry out these activities. Rather than take on additional manpower on a short term basis, the district chose to return these responsibilities to the design/build architects through their contracts.

The district feels that the architects can be expected to behave professionally whatever their contractual relationship. This is clearly expressed in the requirement that the architect and engineers certify the buildings for conformance to design and specifications prior to district acceptance.

Were the Specs Too Loose?

The district intended its performance specifications to form the basis for a dialog with the various architect/contractor bidders in which more definition would develop. Because in most cases this dialog did not develop and the document had to stand alone, there has been considerable criticism of it.

Although some of the successful bidders, including Tom Mitchell of Craftsmen Construction, feel that the specifications were good, many participants have criticized them as vague and subject to too much interpretation. Cal Radach—whose firm, like Craftsmen, has both won and lost in the bidding process—feels that the documents allowed too much opportunity for interpretation and that more exacting specs would create a better relationship between the district and the design/build contractor.

William Blurock, architect on the high school program, was perhaps the only participant to make full use of the potential for establishing a dialog with the district. Blurock feels that the specifications combined with dialog are good, but that they require a very sophisticated kind of client, such as Jefferson County, to be effective. He feels that many important details of educational planning and technical quality were developed in meetings with district personnel.

It is clear that if the district's intention was to stimulate an active dialog with candidate teams it failed to make this point clear to all concerned. Whether the specifications and dialog system would have worked if *all* rather than almost none of the bidders had sought to establish dialogs is a moot point.

Is Design/Build for the Big Guys Only?

Both contractors and architects have raised the objection that the size of the program precluded the participation of small firms. Although the program in the district's view had mechanisms which permitted the participation of small firms, few were able to participate effectively.

Continued on page 12

[5] *Ibid.*, p. 22.

COMMONS · AUDITORIUM (expanded to 1200 seats)

PHASE III

School District R-1
Jefferson County, Colorado

Design/Build Team:

CONTRACTOR: Mead and Mount Construction Company
ARCHITECT: William E. Blurock and Partners
STRUCTURAL ENGINEER: John A. Martin and Associates
MECHANICAL ENGINEER: Becket, Harmon and Associates
ELECTRICAL ENGINEER: Garland Cox and Associates
INTERIOR CONSULTANT: Intermountain Specialty Equipment Company

Schools:

Columbine High School
Green Mountain High School
Pomona High School

Building Size:

Each school 129,130 square feet to accommodate 1500 students.

Subsystems:

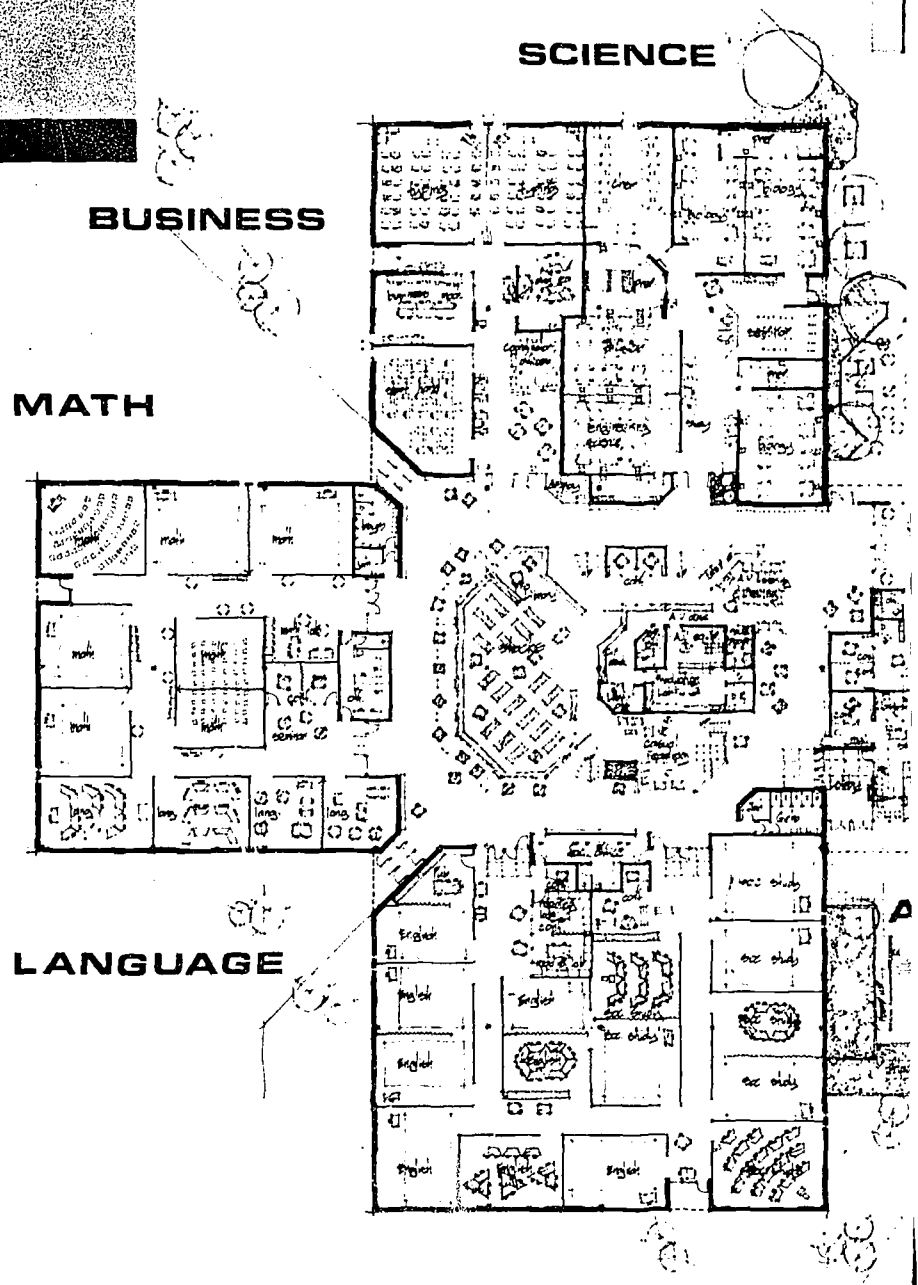
All subsystems designed to systems performance and dimensional criteria.

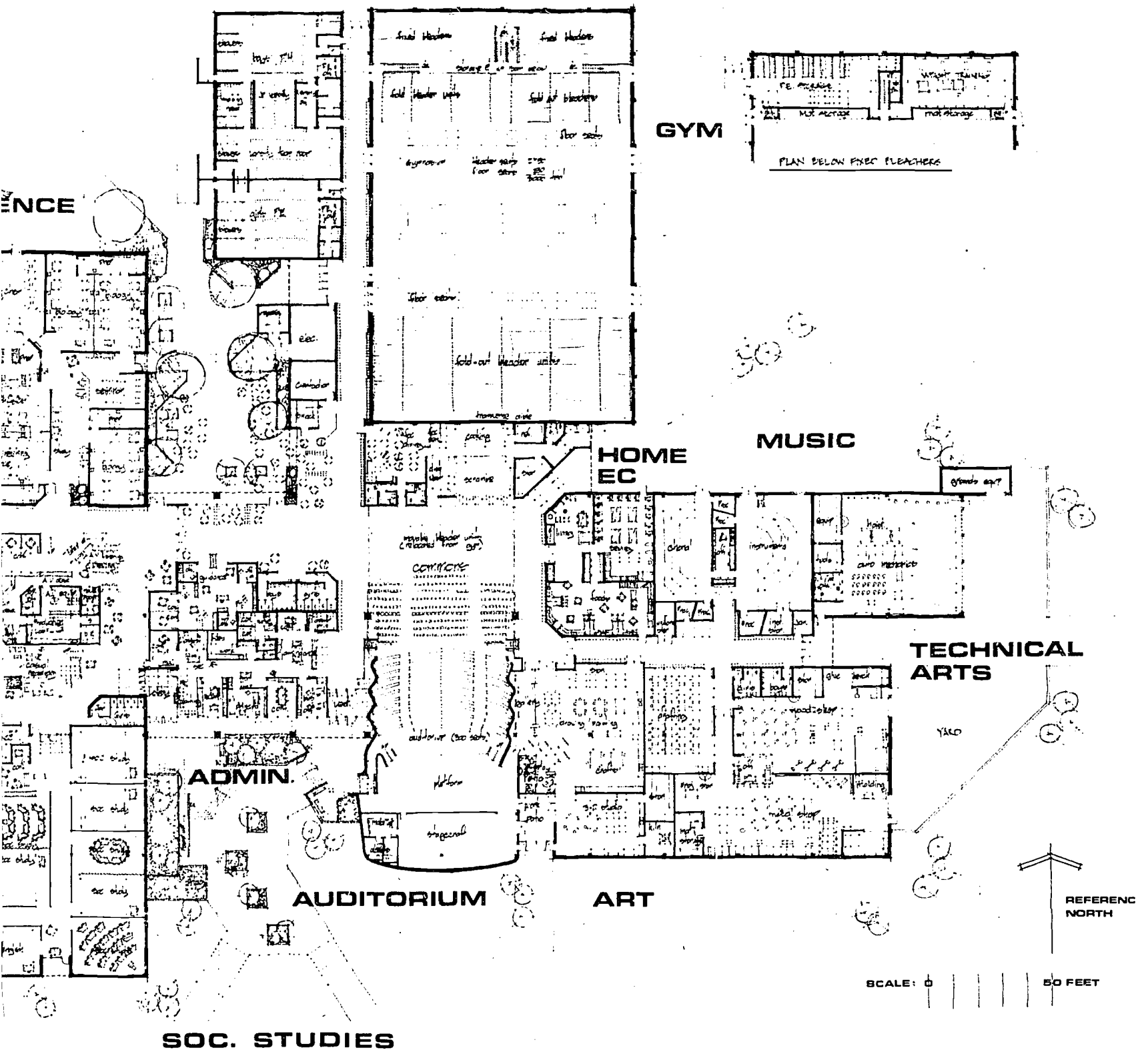
Project Costs: for each school

BUILDING COST: $2,503,830, or $19.39 per square foot
CONSTRUCTION COST: $2,601,970, or $20.15 per square foot

Project Schedule: for all schools

COMPETITION BEGUN: May 19, 1972
CONSTRUCTION BEGUN: August 12, 1972
CONSTRUCTION COMPLETED: August 15, 1973 (estimated)




GYM
PLAN BELOW FIXED BLEACHERS
HOME EC
MUSIC
TECHNICAL ARTS
ADMIN.
AUDITORIUM
ART
SOC. STUDIES
REFERENC
NORTH
SCALE: 0
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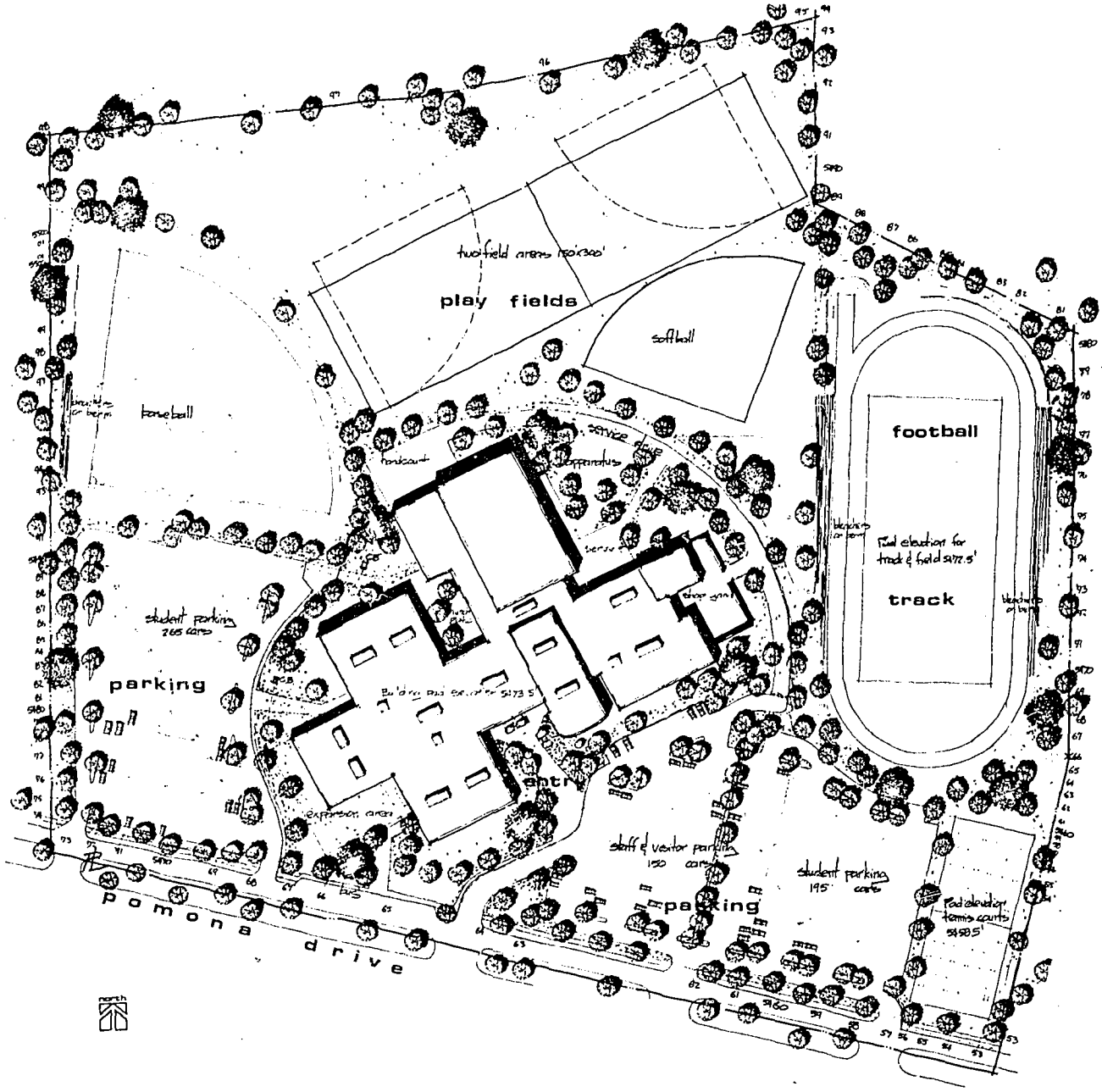
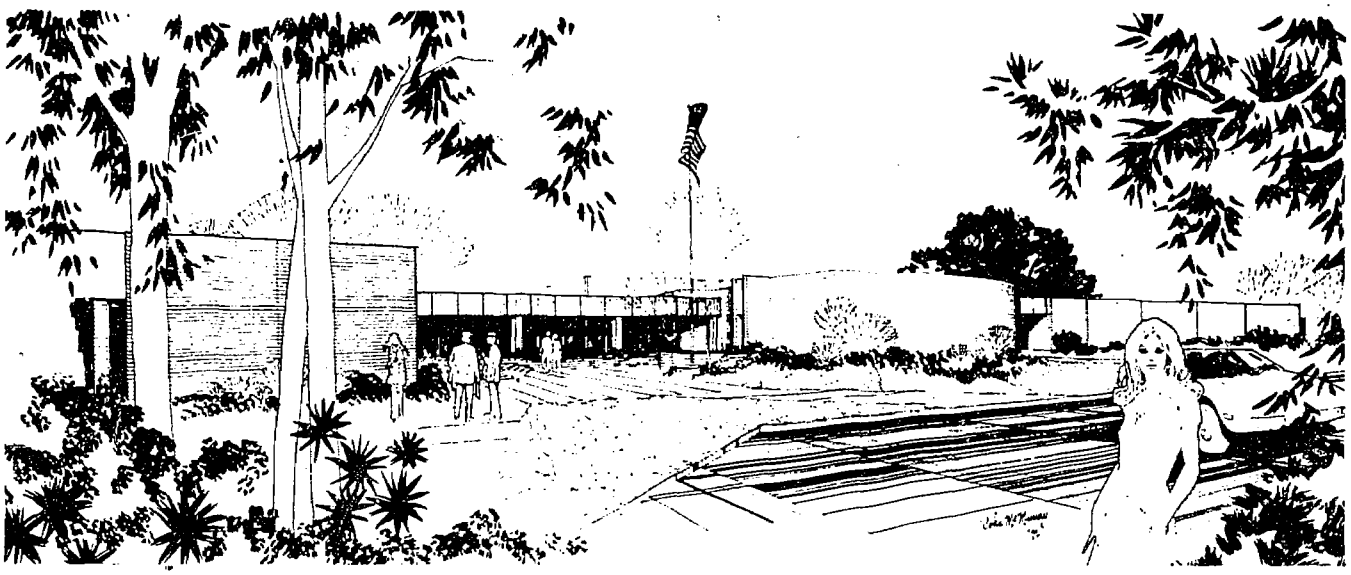
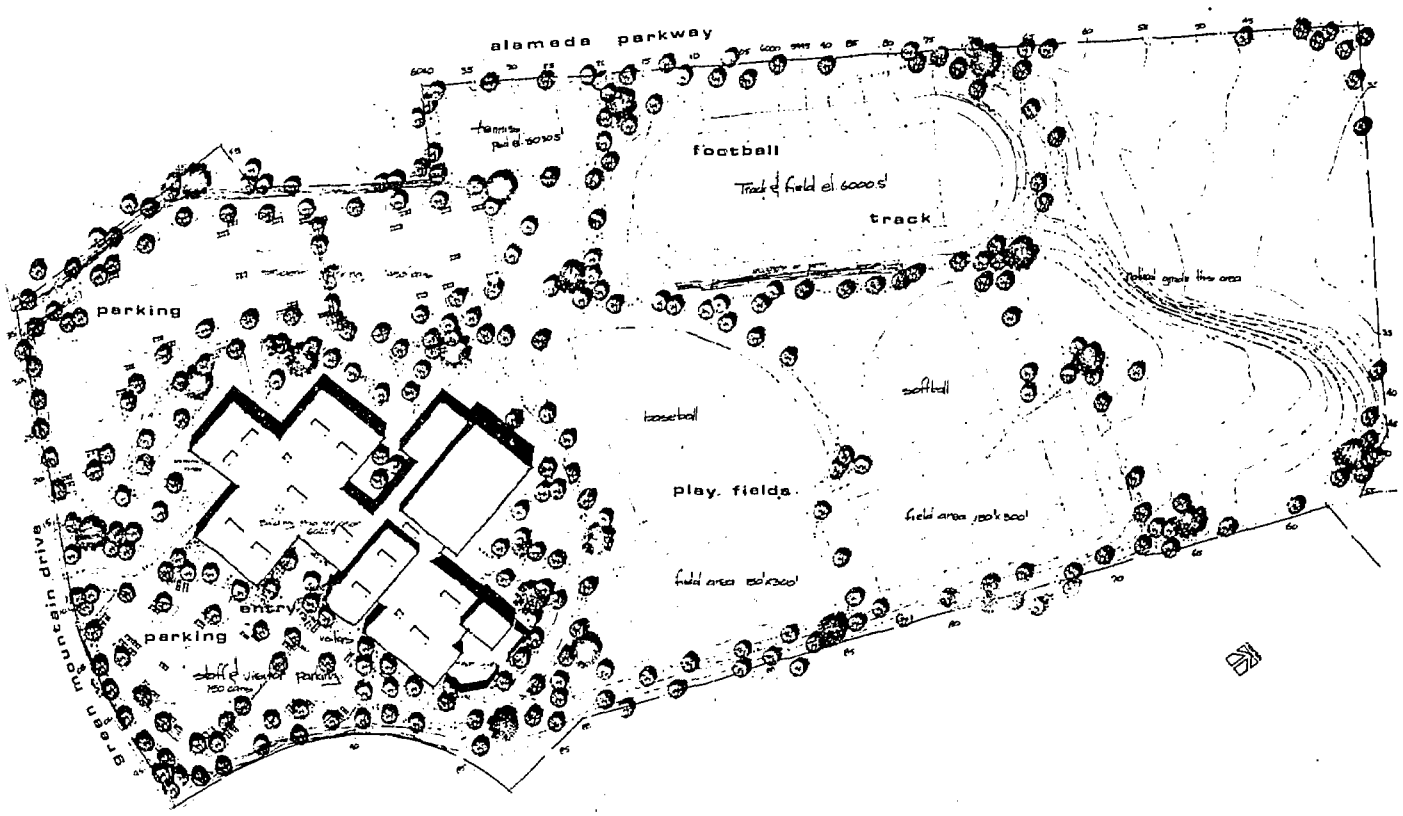


Pomona Senior High School

scale



The "volume" principle of the Jefferson County design/build programs is to apply a single plan to several sites. How one designer used his basic plan is illustrated in the two site plans on these pages and in the site plan of Columbine Senior High School on the cover. The designer's schemes make use of the terrain features and site opportunities of each site, resulting in varying building orientation and distinctive appearance.



Green Mountain Senior High School scale SITE PLAN

Jefferson County Programs

Continued from page 7

According to Henry Podzinski the program was a good opportunity for architects who had not previously worked with the district to obtain work. He feels that this was also an opportunity for small architectural firms to ally with a contractor and take on a job- only one basic design was required in each phase—that they might otherwise not be capable of handling.

To encourage participation of smaller contracting firms the district allowed small firms to group themselves to take a phase contract. Although their bid was not competitive, this was actually done by three firms on the first phase. Where small contractors were used was in some of the subcontract categories. In some categories there was too much work going on at one time for one sub to handle, so the design/build contractor let different sites to different subs.

In fairness, it should be noted that the difficulty of participation for small contracting firms has little to do with the design/build method *per se*. It is rather a function of the ability of a small firm to obtain bonding for a large program—design/build or otherwise.

In Conclusion

Design/build procedures have apparently been used with success in Jefferson County to provide facilities which satisfy the school district's needs of quality, cost, and fast delivery. On the following pages, the facilities constructed under Phases I and III are presented. Elsewhere in this Newsletter, there is an editorial comment which attempts to place the Jefferson County experience into the context of design/build throughout the country.

PHASES I AND IV

School District R-1
Jefferson County, Colorado

Design/Build Team:

CONTRACTOR: Joint Venture: Craftsmen Construction Co. and Developers-Constructors, Inc.
ARCHITECT: Seracuse, Lawler and Partners

PHASE I

Schools:

Leawood Elementary School
Westgate Elementary School
Stott Elementary School
Kyffin Elementary School
Pomona Lakes Elementary School

Building Size:

Each school 35,360 square feet to accommodate 650 students

Project Costs: for all five schools

BUILDING COST: $2,867,696, or $16.22 per square foot
CONSTRUCTION COST: $3,088,696, or $17.47 per square foot

Project Schedule:

COMPETITION BEGUN: January 13, 1972
CONSTRUCTION BEGUN: April 1, 1972
CONSTRUCTION COMPLETED: August 26, 1972

PHASE IV

Schools:

East Hackberry Elementary School
Lake Arbor Elementary School
Ravine Park Elementary School
Westfield Park Elementary School
Columbine West Elementary School
Club Crest Elementary School

Building Size:

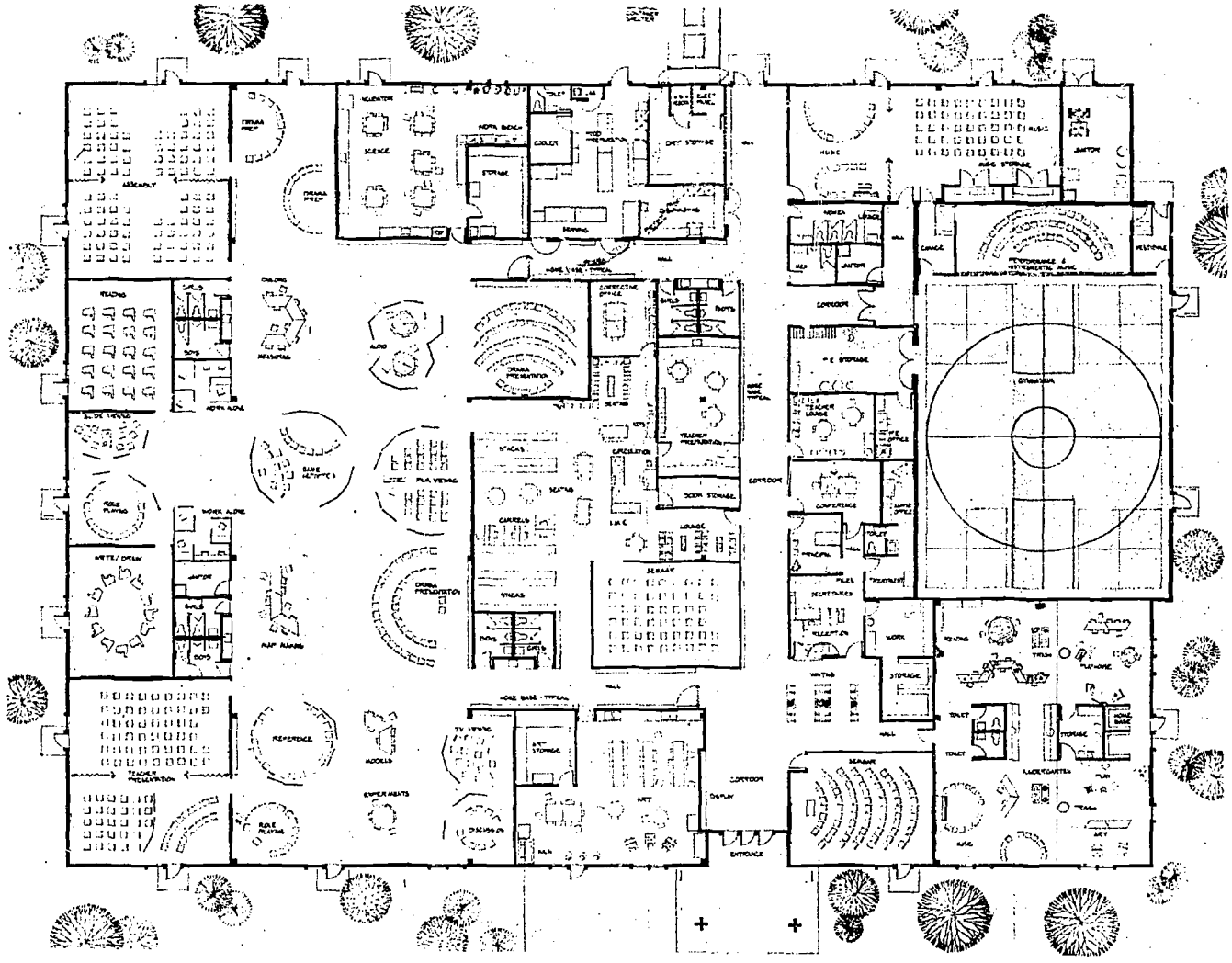
Each school 33,773 square feet to accommodate 650 students

Project Costs: for all six schools

BUILDING COST: $3,270,577, or $16.14 per square foot
CONSTRUCTION COST: $3,485,374, or $17.20 per square foot

Project Schedule:

COMPETITION BEGUN: November 8, 1972
CONSTRUCTION BEGUN: April 1, 1973
CONSTRUCTION COMPLETED: August 25, 1973 (estimated)



The basic building plans of Phase I and IV (shown here) are nearly identical. In spite of its considerably greater cost, brick masonry was used for the exterior wall in Phase IV instead of the tilt up precast tees of Phase I.