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ABSTRACT

This newsletter details the efforts of the University of Alaska to develop a systems approach that will provide facilities for higher education in a State with an area more than three and one half times that of New Jersey, Florida, and Oregon combined. The problem involved in providing appropriate facilities in a State such as Alaska are compounded by (1) climate, (2) distance, (3) labor and contractor shortages, and (4) inflation. Fast track scheduling, building systems technology, and management contracting, three innovative design and construction procedures, were devised by the University and its consultants to combat the effects of these factors and were applied to shorten construction time for the six University projects. The first part of this 2-part series on systems on the campus appears as EA 004 974. (Author/MLF)

BSIC/EFL NEWSLETTER

Vol. 4, No. 2 September 1972

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Lawrence Lackey and Associates, p. 5
BSIC/EFL, all others

COVER: Resources Building, Fairbanks, Alaska

BSIC/EFL NEWSLETTER

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BULLETIN

As this issue of the *Newsletter* was going to press, the voters of Alaska approved the $18.0 million dollar capital improvements bond issue in the November 7, 1972 General Election. As a result, monies are available for the 1973 Capital Improvements Program described in the following article.

BUILDING SYSTEMS ON THE CAMPUS PART II

THE UNIVERSITY OF ALASKA

INTRODUCTION

Part I of this series on "Building Systems on the Campus" described systems projects in New Jersey, Florida and Oregon. Part II details the efforts of the University of Alaska to develop a systems approach that will provide facilities for higher education in a state with an area more than three and one half times that of New Jersey, Florida and Oregon combined.

The University of Alaska is responsible for all publicly supported higher education in the state. This means that, in addition to its campuses at Fairbanks, Anchorage and Juneau it operates numerous community colleges throughout the state. Just how scattered and isolated some of these facilities are was brought home to the BSIC staff on its fact-finding trip prior to the preparation of this article. The staff spent one entire day attempting to get to Kodiak from Anchorage —about as far as New York City to Washington, D.C.—and never made it.

The problems involved in providing appropriate facilities in a state such as Alaska are compounded by four conditions: 1) climate, 2) distances, 3) labor and contractor shortages, and 4) inflation. While other areas of the country may have to contend with one or two of these factors, Alaska must find the means to ameliorate the combined effect of all four.

The innovative procedures devised by the University and its consultants to combat the effects of these factors are a result of a willingness on the part of those charged with the responsibility for programming, design and construction to challenge accepted practices and to seek better solutions. Development of new procedures is, however, only part of the solution. The real test comes in getting new procedures accepted by those who are affected and in turn affect the solution.

The University's decision to apply three sets of innovative design and construction procedures at the same time could not have succeeded without the strong backing of Dr. Donald Moyer, Executive Director of the University's Office of Planning and Institutional Studies, architect Richard Holden and construction administrator William King of his staff. The leadership and dedication of these men successfully guided the project through many periods of crisis.

What is presented here is not the final solution to the University's facility problem. It is a promising first step which has already given rise to the development of new procedures which will be used in a second program. It is this quality of dynamic evolution that makes the Alaska program an important one to watch.

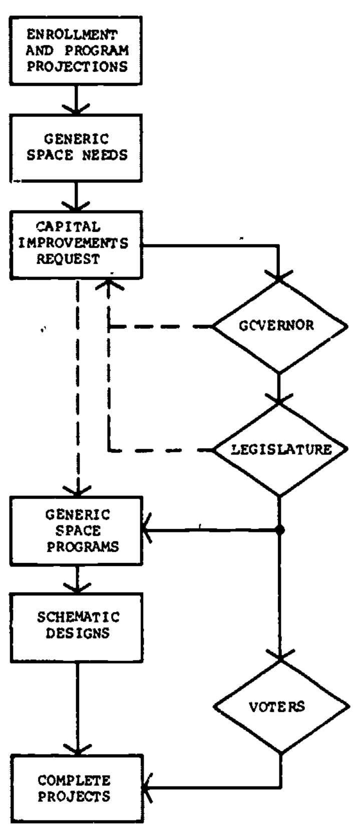
BACKGROUND

The University of Alaska.

In order to serve the higher education needs of the state, the University of Alaska operates University campuses at Fairbanks, Anchorage and Juneau, and numerous community colleges which offer vocational/training programs. Administratively, the facilities are organized into three geographic regions under the University's Board of Regents. Staff functions for the entire system are performed by offices located on the Fairbanks campus.

To serve a state with vast area and sparse population, the University has adopted policies on the location of new facilities. Community colleges will be established jointly with any eligible school district, while new university level campuses will be placed only where population pressure and demand clearly define a need. As a result of these policies, University construction programs contain both large scale buildings loc ed near major urban centers and much smaller facilities located near r mote population centers.

The Office of Planning and Institutional Studies. All University construction programs, including those for the community colleges, are administered by the Office of Planning and Institutional Studies under Dr. Donald Moyer, Executive Director, located at Fairbanks. This office combines the functions of institutional planning, physical planning, and construction administration under one head (see Figure 1). The small size of the staff of this office makes possible close cooperation between its three divisions and a high degree of personal interaction.



Advanced Planning and Project Funding. The Institutional Studies section prepares enrollment and staff projections, program development studies, and analyzes existing space utilization on each campus. Under the generic space planning method adopted in the 1971 Capital Improvements Program and described in detail later in this article, the Facilities Planning Section converts these projections into campus by campus generic space needs. From these two sets of studies, the Capital Improvements Request is derived.

Funding of University construction programs comes from the sale of state bonds, authorized by the voters of the state at biennial general elections. In order to place a bond issue on the ballot, the University must submit a Capital Improvements Request to the Governor. The Governor may reject the request, or approve or modify the request and send it to the Legislature as a request for a bond authorization. If the legislature approves placing the bond authorization on the ballot, and it may also reject or modify the request, the authorization is submitted to the voters.

Programming and Construction. While the legislative process is going on, the Facilities Planning Section converts the various projections into generic space programs and construction budgets for each campus. If the bond issue succeeds, the generic space program, the budget, and other information provided by the University, are formed into a design manual for each project. These design manuals are released to the architects and schematic design begins.

Before turning to the processes and procedures developed by the University and the Office of Planning and Institutional Studies, it will be useful to briefly discuss some of the problems facing the Alaskan construction industry.

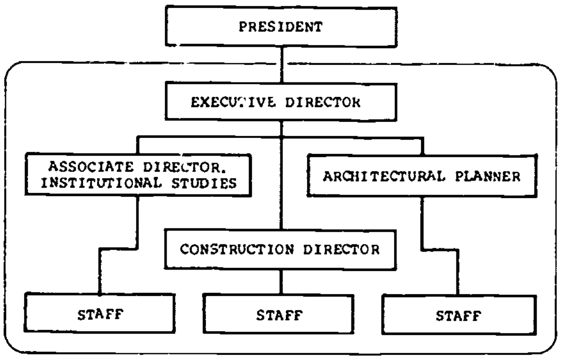


Figure 1
Office of Planning and Institutional Studies

Problems of Construction in Alaska.

Alaska's location and environment present a number of problems to its construction industry. Key among these are: 1) the climate; 2) logistics; 3) labor and contractor shortages; and 4) construction cost inflation. While none of these problems is unique to the state, they are exaggerated by its remoteness and extreme conditions.

Weather—the Number One Problem. Alaska is a land of climatological extremes: in virtually every area there are mild but short summers and long, bitterly cold winters. During the winter season it is nearly impossible to work outdoors within existing construction technologies. Where outside work is essential, it is costly and unproductive. As a result, outside construction work is confined to the summer period of mild weather.

Although there is some variation, outside construction is typically scheduled to start about the first of April in Anchorage, and about a month later in Fairbanks. In both areas, frosts and cold weather are anticipated by the first of October, ending the season.

Logistics—the Problems of Distance. Most construction products used in Alaska are manufactured "outside" in the "lower forty-eight" and shipped into the state. With the exception of concrete products which are available locally in the major cities, construction products require considerable lead-in time for fabrication, shipment and delivery to the construction site. Communication between designer and manufacturer, for example in the submission of shop drawings, is made more difficult because of the distances involved.

Practically all shipments into the state come via Seattle, where many consultants and contractors employed in Alaska are also located. Most construction products go from Seattle to Alaskan ports via water transport, often with destination at a port near the construction site. In the summer months, some construction items are shipped by road over the Alaska Highway. Shipping delays and transshipment problems are a recurrent part of Alaskan construction.

Labor and Specialty Contractor Shortages. As in any frontier area, skilled labor and specialty contractors are in short supply in Alaska. Many workers spend only the summer season, when sixty-hour work weeks are standard, in the state. As a result of short supply and high demand in the four summer months, labor costs are high.

Inflation of Construction Costs. The combined effect of long distance shipment of materials and products, high labor costs, and other factors is to drive Alaskan construction costs up to 140 to 200 per cent of Seattle costs. For Fairbanks and Anchorage, construction costs are about 1.7 times those in Seattle.

In addition to these increased costs, inflation takes a killing toll of budgets. The University estimates that its construction costs inflated:

4.5 per cent a year through 1966
5.5 per cent in 1967
9.0 per cent in 1968
10 to 12 per cent in 1969
12 to 18 per cent per year from 1970–1972.

The rate of inflation may have fallen off in the second half of 1972 but data is not available.

Costs and the University. From the University's point of view, the most serious effect of cost escalation and its erratic pattern lies in its effect on what they can get for their money. As a public agency, the University must build within the budgets established when projects are undertaken—the only way additional funds can be made available for a project are to take them from other projects. When a building has a long construction period of three to five years in an inflation ridden environment, the University's experience has been that it is impossible to balance the construction budget.

Experience has led the University planning staff to conclude that two approaches to controlling costs in an inflationary environment exist. The first and least acceptable of these is to admit defeat and simply set higher budgets for construction—or build less. The second is to find techniques of construction and management which offer better cost performance and control.

THE 1971 CAPITAL IMPROVEMENTS PROGRAM

In the fall of 1969 the University prepared and submitted to the Governor a request for funding of the 1971 construction program. This program included thirteen construction projects on eight campuses, costing about $30 million.

Apprehension about the impact of the construction of the trans-Alaska oil pipeline and state construction programs on labor and costs created a desire on the University's part to undertake and complete this construction program as quickly as possible. During the summer and fall, studies were made by the University and its consultants, Lawrence Lackey and Associates (LLA) and Building Systems Development, Inc. (BSD), into various techniques by which construction could be speeded up.

These studies led to the University's decision to apply three sets of innovative design and construction methods to the program. These three were: 1) fast-tracking of design and construction process by the generic space design method; 2) application of building systems technology; and 3) use of management contracting. Although each of these techniques was considered and adopted as a largely independent approach, it will be seen that they complement one another.

In November 1970, the voters approved the sale of $29.7 million of bonds to finance the 1971 Capital Improvements Program of the University. The University immediately commissioned architects for the construction projects and began converting the bond funds into individual site budgets.

Design and Construction by the Generic Space Method.

The shortness of the period between bond approval in November and the end of the first construction season in October of the following year does not allow enough time for the architects to complete the programming, design, and bidding of large University projects using traditional linear approaches. As a result, construction of University projects has traditionally begun no earlier than the second outdoor construction season following approval of a bond issue

In order to speed the project delivery process, the University sought a design and construction method which would allow construction to begin the first season. To solve this problem, the University and LLA found that a building could be divided into two functional packages—the basic building shell and the internal functional division. These packages could form the basis of two separate but interrelated design and construction processes which could be overlapped.

By separating the time consuming process of programming and designing the functional layout of the building from the process of designing the basic building shell, it was felt that the design schedule for the shell could be sufficiently shortened to allow on-site construction to begin during the first outdoor construction season following issuing of bonds. In fact, this process of design and construction in two phases does not differ greatly from the processes used to provide shopping centers, office buildings, and other facilities where an early return on investment is vital.

In order to achieve this type of two stage design on projects as functionally complex as university buildings, two elements are essential—1) adequate criteria for performance and planning of the "generic spaces" of the building shell, and 2) a compatible and flexible means of conditioning and subdividing the interior into functional units.

The Generic Space Method. To satisfy the need for adequate generic criteria, the University defined nine categories of space use, or "generic space types," covering all of its facilities:

1. Classroom ("dry academic")
2. Laboratories ("wet academic")
3. Heavy shop
4. Special use
5. Residential.

For each of these defined generic space types, the University and LLA prepared performance and planning criteria which were included in the design manual for each project.

In this view, each building consists of three functional elements—the shell, one or more space modules, and a spine. The shell or "generic space structure" contains and provides services to blocks of generic space or "space modules." Each space module contains one type of generic space and its direct supporting functions, such as storage. The spine element provides general supporting services for all types of space modules—stairs, toilets, service chases, utility runs, etc. The spine may exist as a continuous backbone element or as isolated service elements on multibuilding campuses.

The functional programming and layout of each space module is a separate process although constrained by the design of the generic space structure and the building's overall program.

Application of Building Systems Technology.

In addition to better value for the dollar and quicker on-site assembly, building systems appeared to offer the University two types of flexibility needed in this program. The first of these was design flexibility which gives each architect design freedom within basic system constraints. The second was adaptive flexibility which would a) allow internal functional planning during the construction process and b) provide relative ease of change of layout in the future.

After further research, it was decided to group the six projects committed to building systems into a single bidding package. This was done in order to achieve cost savings from volume purchasing, to simplify the University's administrative problems, and to gain certain benefits for the smaller projects. By bidding as part of a large state-wide program, the smaller projects, as small as 7200 square feet and in remote locations, could obtain participation from bidders who would otherwise only be interested in the larger urban projects.

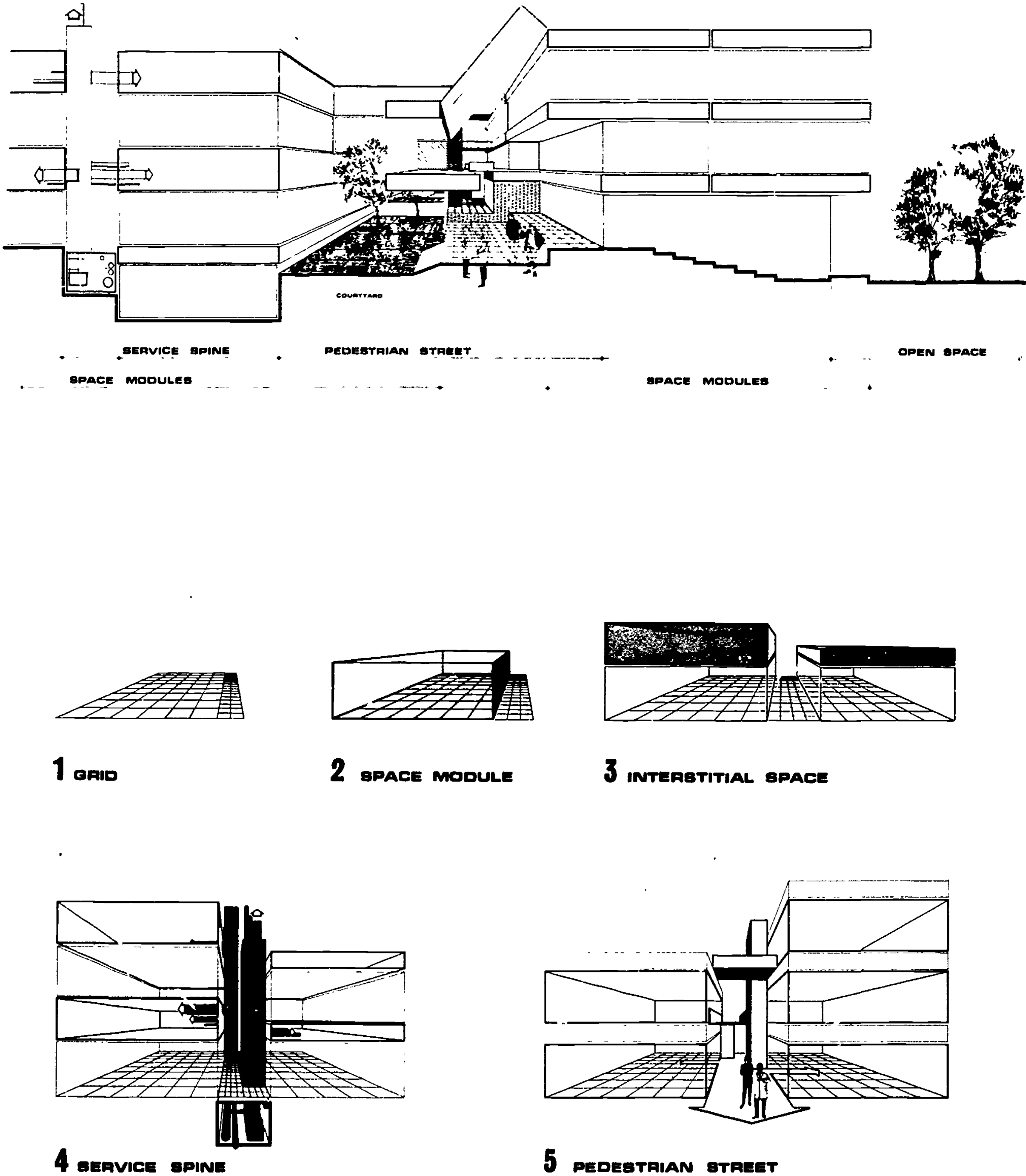


Figure 2
Generic Space Design

Shell Structure Subsystems. Accordingly and in line with the two stage design and construction process, work was begun on the design or the generic space structure for each site and on the three building subsystems—structure, HVC, and lighting/ceiling—which would be included in the first bid package. The University's consultants developed the necessary information which was bound, along with the generic space program and criteria, into the project program book for each site, released to the architects in early December 1970.

The schedule called for completion of schematics on each project early in 1971. Building systems were to be bid in March or April to allow maximum lead-in time for the successful bidders, especially structure, to submit shop drawings, fabricate and deliver their subsystems. The architects would have to complete their schematic designs, obtain approval, and prepare necessary systems bidding drawings by February.

The consultants undertook the development of the performance specifications and other contract documents for the program immediately after the bond election. These documents required, in addition to proof of performance, that each bidder submit two sets of prices for his subsystem—one a price covering the entire six project package, the other a breakdown for each of the projects.

Systems bidding documents—two printed books, one containing the performance specifications and contract documents, the other drawings for each project necessary for bidding of the subsystems—were released to potential bidders on February 21, 1971. Bids were taken on April 14, 1971. At that time, seventeen bidders—four in structure, five in HVC, and eight in lighting/ceiling—submitted 198 compatible building systems proposals.

The proposal submitted by the successful bidders was considerably below established budget costs:

Subsystem	*Successful Bidder*	*Budget/sf*	*Bid/sf*
STRUCTURE:	Romac Steel, Inc.	$ 5.92	$ 4.00
HVC:	MacDonald/Miller	$ 5.49	$ 4.30
LIGHTING/ CEILING:	Grasle Electric	$ 2.70	$ 2.17
	TOTAL	$14.11	$10.47

These subsystems were 27 per cent less than budget and 20 per cent less than target costs prepared by BSD.

Following the nomination of successful bidders, the architects began design development and preparation of working drawings for nonsystem elements of the generic space structures. The University signed contracts with Romac and MacDonald/Miller on May 21, 1971 and with Grasle in early June.

In spite of the logistics problems involved in shipping the structural subsystem from the Florida manufacturing plant to the various Alaskan sites, made more difficult by the lengthy West Coast dock strike, structural delivery schedules were met. Four of the six systems projects were enclosed by the end of the first outdoor construction season following the bond issue. This was achieved by the combination of the quick assembly characteristics of the structural subsystem and the management techniques described below.

Interior Subsystems. As the design of the projects developed and the interior space plan became defined, bids were requested for interior subsystems—moveable partitions, service columns, and carpeting. Based again on performance specifications and contract documents prepared by BSD and on subsystems bidding drawings prepared by the architects, these subsystems were bid on November 2, 1971.

The bidding package for the Moveable Partitions and Service Columns Subsystems consisted of the six projects in the April bidding package plus the Resources and General Classroom Buildings at Fairbanks. Only four of these projects used carpeting, however, and carpeting bidders were allowed to bid for either a four project package, the two Fairbanks projects, the two Anchorage projects, or a single project.

The results of the bidding are shown on page 14. The low partition bid was 30 per cent below the target figures established by BSD, while the service column and carpeting were 20 and 18 per cent below respectively. Separate bids for each project provided the lowest combined price for the Carpet Subsystem.

Furnishing Subsystems. On May 2, 1972, bids were taken on two furnishing subsystems—furniture and chairs—for the eight projects in the interior subsystems bid package. Performance specifications for these two subsystems were prepared by McClure/Nixon, AIA, of Seattle. Full results of this bidding are shown on page 14. Successful bids for the furnishings and chairs were 10 and 4 per cent below McClure/Nixon's targets respectively.

Management Contracting.

In addition to the possible cost and time savings inherent in the process, the University turned to a management contracting approach to cope with the problems of phased construction unique to public works construction. Because Alaska's laws do not permit negotiation of public works contracts, the application of the fasttracked design and construction processes of generic space design meant that traditional general contracting procedures could not be followed. The delay caused by withholding the start of construction until the completion of all project documentation, necessary in general contracting because bids are based on these complete documents, was one of the problems generic space design was intended to solve.

These problems affect primarily the larger construction projects of the University. On smaller jobs, the shorter construction time required makes possible the completion of documents, bidding of contracts, and construction on the shorter delivery schedules within the framework of traditional general contracting.

Accordingly in June 1970 the University asked its consultants to study and report on alternative methods of contracting. Three possible methods were studied—phased bidding with a management consultant, design/construct contracts, and management contracting on the University of California model.

A lack of specialty contractors, especially in the site work and foundation categories, combined with reluctance to accept exposure as its own general contractor, led the University to reject phased bidding and management consultancy. Design/construct contracts were felt to be undesirable because of the difficulty of developing and enforcing an effective design/construct specification.

Management Contracting—California Style. The use of management contractors along lines similar to those used in the University of California's URBS program appeared to offer the most to the University. This process is characterized by:

1. use of experienced general contractors in a largely management capacity;
2. prequalification of candidates on the basis of experience and financial ability;
3. selection of a management contractor (MC) by competitive bids based on fees and expenses;
4. performance of most of the actual construction work by subcontractors who bid publicly to the MC or the owner—the MC performs a specified percentage of the work and may bid on the subcontracts;
5. establishment of an "upset" fixed price by the MC based on known costs;
6. consultancy by the MC during the design phase;
7. reimbursement of the MC's direct and some indirect costs.

In order to introduce the management contracting concept to the state and to answer questions about it, the University held a series of seminars with the AGC and active contractors in the state. Initial opposition to the concept and procedures was somewhat lessened by these meetings, although uncertainty and reluctance remained through the program. On the other hand, the prequalification feature of the process was abandoned in the face of contractor opposition.

Specifications and bidding documents for management contracts on the three largest 1971 program projects were prepared and released in March 1971. The three projects using MCs are: the Community College Expansion and the Higher Education Library at Anchorage, and the Resources Building at Fairbanks.

Modifications. During the discussions between the University and the contractors, Governor William Egan had become concerned about the procedure because of possible inefficiencies and high costs. As a result of his concern and at his direction, the State Bond Committee—state officials charged with the proper sale of bonds—looked further into the matter. This committee discussed the matter with the University and hired DeLeuw-Cather, Associates, of San Francisco, California—an engineering consulting firm familiar with management techniques—to assist them in their analysis.

After careful analysis of the process and the contract documents, DeLeuw-Cather recommended some modifications and alterations which were adopted. Although still not convinced of the value of the approach, the governor felt that sufficient improvement had been made to insure the protection of the public interest and that the process could be attempted. DeLeuw-Cather remained with the program, as a consultant providing a monitoring service.

Alaska's extreme climate has produced numerous specialized building elements. An example is the "upside-down" roof used on University buildings. In this roof, rigid insulation is laid on top of the weatherproof membrane and held in place by pavers. Pavers and insulation may be removed for maintenance access to the membrane.

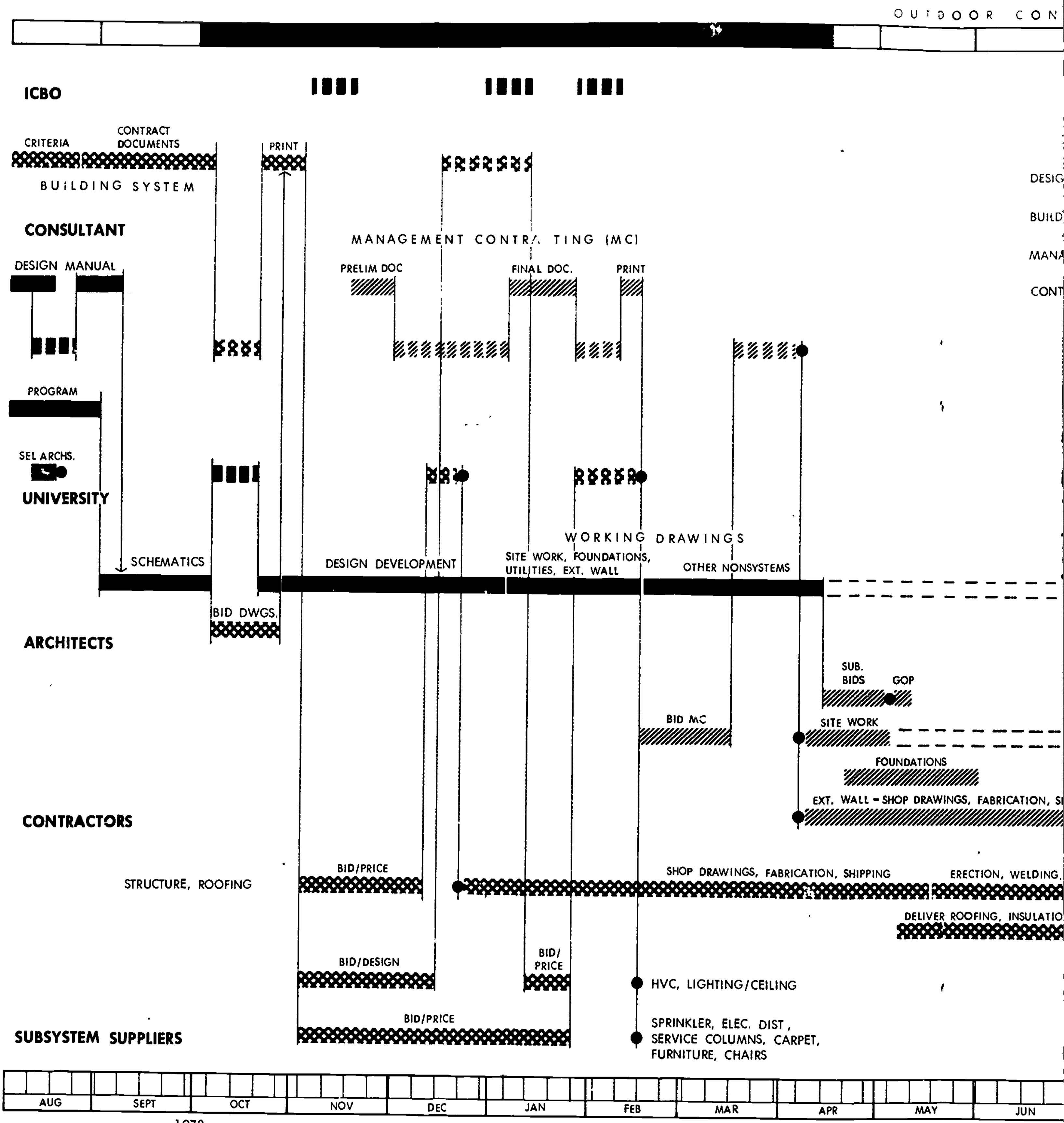
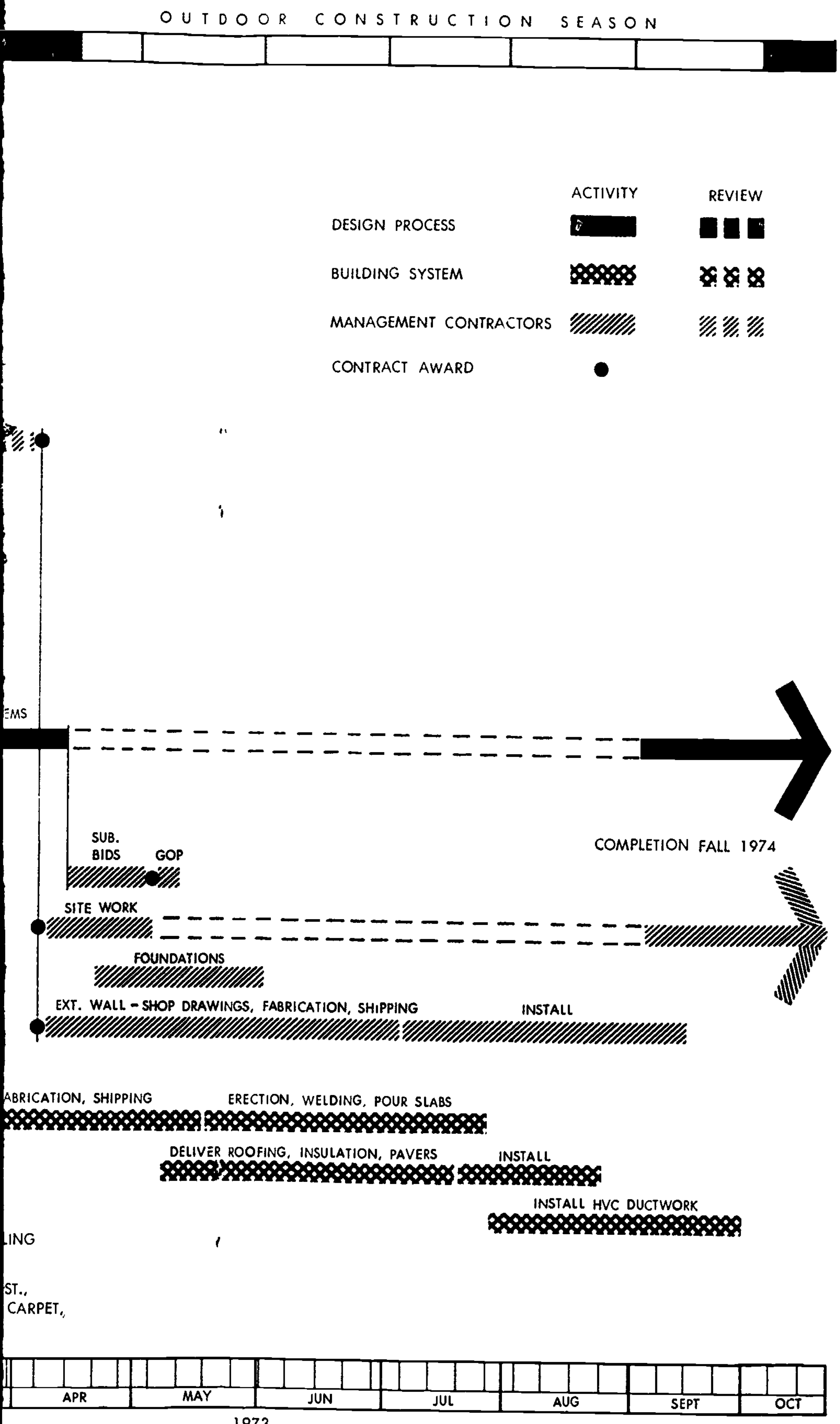


Figure 3
Activities of the First Year of the 1973 Capital Improvements Program



Management Contracting—Alaska Style. The documents were re-released to bidders embodying the changes and modifications. The basic features of management contracting as bid by the University in April 1971 are:

1. use of experienced contractors in a management role;
2. selection of MCs on the basis of
   - A. a fee covering all work
   - B. cost of obtaining bonding
   - C. cost of workmen's compensation insurance
   - D. cost of indirect job labor as defined in contract documents;
3. performance by the MC of fifteen per cent of the work with his own forces on a guaranteed price basis;
4. taking of bids from subcontractors for the remainder of the nonsystems portion of the work—the MC may also bid on this work;
5. administration of the subcontracts and, on systems projects, of the subsystem contracts by the MC;
6. provision of value engineering services during the design phase by the MC, reimbursed on a per diem basis;
7. establishment by the MC of a Guaranteed Outside Price (GOP) for each project, based on known costs, to be changed only by authorized change orders.

Seven firms submitted bids on the three projects on April 30, 1971. In order to provide a comparison price for each bidder, the fees bid were applied to the budgeted costs of each project. The following table summarizes the results of the bidding:

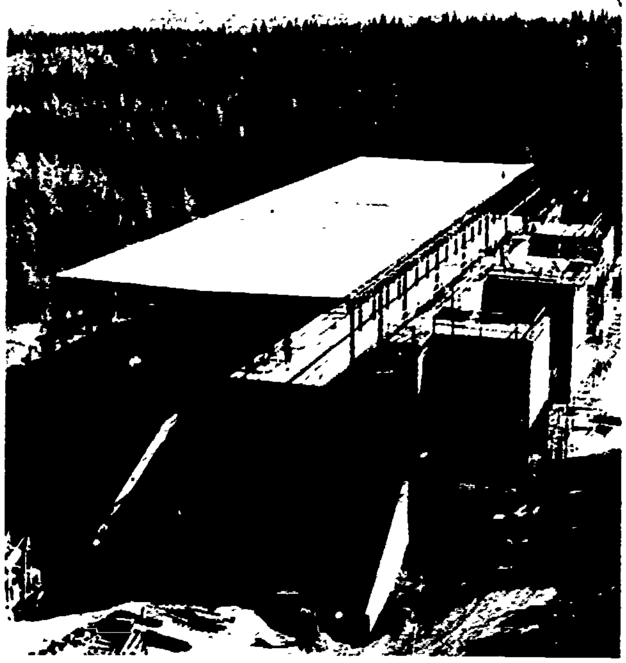
Project	*Range of Fee "Bids"*	*Successful Bidder*
Anchorage Comm. College	$357,493–$673,552 $4,730,000*	Modern
Anchorage Higher Ed. Library	$362,335–$784,784 $5,160,000*	Modern
Resources Building	$309,880–$506,625 $3,860,000*	Peter Kiewit

* Construction Budget

Management contracts for the three projects were awarded to the successful bidders in May and June 1971. On-site construction work began soon thereafter on each site. As will be seen in the next section, the management contractor on the Resources Building had his work cut out for him.

The Resources Building.

The construction of the Resources Building at Fairbanks employed the generic space design and management contracting methods of the 1970 program, but was not included in the volume bidding of building system



The Resources Building at Fairbanks combines modules of "wet academic" space with deep interstitial spaces for service runs. The value and flexibility of management contracting was demonstrated on this project.

components. This building is a three-story, 60,000 square foot facility, housing several modules of laboratory or "wet academic" space.

Because the building's program called for an eight-foot deep interstitial service space between floors, the architects, Jennings H. Graham, AIA, of Ketchikan, Alaska, and Knorr and Elliott, AIA, of San Francisco, felt that a custom designed structural system would serve better than available building systems structures. Working to certain constraints of the building system, notably the five-foot planning discipline, the project engineers designed a structure of deep precast concrete trusses. A precast concrete ceiling grid supported ceiling elements and catwalks providing access to interstitial services.

This precast structure was budgeted, based on the engineer's estimates, at about $400,000. In July 1971, Peter Kiewit's Sons, the project MC, took bids on the construction subcontracts for the building. The low structural bid came in at $720,000 plus an additional $80,000 for the precast concrete ceiling grid.

The University could not afford to exceed their budget so badly on this project so the architects were instructed to redesign. The MC, having seen the results of building systems application on the other projects, suggested that the approach be used here. Accordingly, the architect and MC turned to a building system structure which could be planned on the foundations already in place under the accelerated schedule.

Documents were prepared and released for bidding of three subsystems—structure, HVC, and lighting/ceiling—in November 1971. Bids were taken and contracts awarded in December 1971. Successful bidders were Romac Steel for the structure, Owens-Corning Fiberglas for the lighting/ceiling, and Trans-Alaska Mechanical for HVC. While Romac was structural contractor and Owens-Corning the partition contractor for the other systems projects, Trans-Alaska was bidding systems for the first time.

The successful structural bid of $295,000 contributed to a combined savings with the three subsystems of $500,000 over the rejected bids. The only major alteration in performance was the elimination of the catwalk support grid. The catwalks are now suspended by hooks from the structure and moved along as the worker moves through the interstitial space.

In addition, the rapid on-site assembly of the subsystems and the flexibility and control afforded by management contracting has made possible the redesign, rebid, and delivery of the building on a schedule which has slipped only two months from the target dates set in 1970.

Results of the 1971 Capital Improvements Program.

Advantages of the Innovative Methods to the University. In a discussion with BSIC staff, Richard Holden, Architectural Planner on the University staff, was asked what advantages had accrued to the University from the use of innovative techniques in the 1971 program. Holden listed three major advantages:

1. The flexibility inherent in the building systems is of definite value both for design and for future adaptability.
2. Although data is not available for cost comparisons, the University obtained greater areas of building than anticipated and without exceeding a single budget.
3. The reduction in project delivery time due to the combination of generic space design, use of building systems, and management contracting has given the University its buildings almost a year sooner than with traditional methods.

Perhaps the clearest indication of the University's satisfaction with these methods is their decision to apply them, modified in the light of experience, when they undertake their 1973 capital improvements program. On the other hand, these advantages have not accrued without considerable effort and participation by the University as a strong, directive client. In the following sections, this increased role of the University in building programs will be further discussed.

1973 CAPITAL IMPROVEMENTS PROGRAM

At the time of this writing, the University is awaiting action by the voters on November 7, 1972 on a bond issue authorization for $18.0 million worth of capital improvements. As itemized in Table I, about $11.6 million of these funds will go for projects upon which generic space design, building systems, and management contracting will be used. Most of the buildings in the program are scheduled to go into service in the fall of 1974.

Experience gained in the 1971 program has led the University to make some significant changes in the application of building systems and management contracting to the 1973 program. Generic space design has proven successful and, with necessary modifications to criteria and standards, will be used largely unchanged. In applying all of these processes, the University has realized and accepted the role of a strong, participatory client, a necessary condition for success.

The following discussions will be more easily understood if the reader will first study Figure 3, the chart of activities for the first year of the 1973 program, found on pages 8–9. Data for this chart was provided by Carl Bryant of McClure/Nixon, systems consultants.

Application of Building Systems.

Satisfaction with building systems, especially in the areas of cost control and speed of assembly, has led the University to increase the proportion of the building in the system in the 1973 program to 55–60 per cent of building cost. As in the 1971 program, the ten systems projects will be bid as one package. At the same time, however, some problems encountered in the 1971 program have caused changes to be made in the process of selection of certain subsystems.

Enlarging the System. Little modification has been made in the technical performance requirements of the 1971 subsystems which were:

1. Structure
2. HVC
3. Lighting/ceiling
4. Moveable Partitions
5. Service Columns
6. Carpet
7. Furn
8. Chairs

To these, the University has added for 1973:

9. Secondary Electrical Distribution
10. Roofing
11. Fire Protection Sprinklers.

Changes in the Bidding Process. For most of the subsystems used in the 1971 program, the bidding process calling for the submittal of a priced system proposal was successful. With the HVC and lighting/ceiling and the partitions and demountable furnishings subsystems, however, problems of interface following selection were encountered which delayed acceptance of the components by code officials and hence delivery and installation schedules. In order to counteract these problems, the University has decided to further fast-track the bidding of subsystems in the 1973 program.

In the modified process, systems bidding documents will be released for all subsystems immediately after

TABLE I
1973 CAPITAL IMPROVEMENTS PROGRAM PROJECTS USING BUILDING SYSTEMS AND MANAGEMENT CONTRACTING

Facility	*Location*	*Budget*	*Architect*
Laboratory Building*	UA Fairbanks	$2.5 million	Jennings H. Graham
Classroom/office Building*	UA Anchorage	$4.25 million	Lane/Knorr/Elliott
Music Wing	Anchorage CC	$1.0 million	Blomfield/McClure/Nixon
Vocational Ed. Building	Juneau CC	$1.35 million	George Filler
Vocational Ed. Additions	Kenai CC Kodiak CC Mat-Su CC (Palmer)	$1.5 million	Maynard and Wirum
Extension Centers	Nome CC Sitka CC Kuskokwim CC (Bethel)	$1.0 million	W. Wellenstein

* Indicates project using building systems and management contracting procedures; all others use building systems and general contracting procedures.

approval of the bond issue. The preparation of schematic designs and systems bidding drawings by the architects and performance specifications and contract documents by McClure/Nixon, AIA, the University's consultant, will be completed by the bond election.

These activities have been going on since August 1972, financed by funds from a revolving advanced planning fund. This fund consists primarily of interest payments made on the University's land grant, recently supplemented by large appropriations from the state legi[illegible] revolving fund is reimbursed for its adv[illegible] bond funds on passage of the bond issue.

The subsystems most affected by the changes in the bidding process are HVC and lighting/ceiling. Because of their crucial effect on project schedules, a priced bid proposal will be taken on the structural and roofing subsystems in early December 1972. A week later, design proposals only for the HVC and lighting/ceiling subsystems will be taken by the University.

The design proposals for these subsystems will be carefully evaluated for technical suitability, compatibility, and code acceptance before returning them for final design and pricing by the bidders. To insure rapid code approval, the University has signed a special contract with the International Congress of Building Officials (ICBO), who write and administer the Uniform Building Code, which is in force in Alaska.

Priced bid proposals will be taken on HVC and lighting/ceiling, and on the remaining subsystems late in January 1973. Contracts will be awarded in these subsystems in mid-February simultaneously with the release of documents for bidding the management contracts. Erection of structural steel on some of the projects is scheduled to begin in May 1973.

Management Contracting Procedures—the General Goes Back In.

Although generally satisfied with the management contracting procedures used in the 1971 program, the University has made some important changes to the procedure in its application to the 1973 program projects. As a result of these changes it is probably more descriptive to use the term "management general contractor" to identify this participant.

The management general contractor role remains virtually the same with one significant difference. In the 1971 program, the University found that the management contractor's role as value engineering consultant did not result in any significant benefit. They did find that the contractors were, in fact, quite competent to consult in the areas in which they possessed expertise and that such advice was useful. However, the role of the general contractor has become so heavily management oriented that most GC firms do not possess overall building expertise in-house, rather they subcontract out most of the work to other parties. The University has therefore decided to drop the per diem consultancy requirements of the 1971 contracts.

The major procedure changes have to do with bidding for the management contracts. Instead of the bidding by fee and selected expenses followed in 1971, the University will this time solicit lump-sum bids from the potential contractors. In the bidding documents the University will include the prices of the subsystems contracts plus its estimates of the costs of other work broken down into the sixteen division standard format.

Each bidder will then submit in mid-March 1973 a lump-sum bid based on factors similar to those in the 1971 program—costs of work with own forces, costs of administering subsystems contracts and other subcontracts, and other expenses. Reimbursement will be on a lump-sum basis, however, similar to that employed in general contracting procedures.

The management general contractor for each project will still be responsible for establishing the Guaranteed Outside Price—the upset fixed price—for the project after subcontract bids are taken. As before this GOP can only be modified by legitimate change order from the University. Establishment of the GOPs should take place in May 1973.

Increased University Involvement.

In addition to the procedural and substantive changes in the building systems and management contracting processes, the University plans to increase its participation in the 1973 program. One key area of such participation is in the type and quality of information to be provided to architects and contractors. As will be discussed further in the section on program costs to the University, the staff has found that it can prepare better and at less cost, or provide more efficiently through consultants, some of the services it formerly obtained from architects and contractors.

A second area of increased participation is in supervision of the smaller projects. In the 1971 program, some of the smaller projects fell behind their original schedules in the absence of continuous University supervision. Also, the smaller project architects and contractors felt that the systems contractors had favored the larger projects at their expense. While some of this complaint is due to point of view, the University feels that the relationship between smaller projects and subsystem contractors could definitely be improved and will seek to do something about it.

FROM THE CLIENT'S SIDE

Even if the results justify them, an innovative program requiring increased client participation costs him something in time, manpower, and other resources. In this section, the view of part of the University's staff as to program costs will be presented.

Program Costs to the University.

In interview with BSIC personnel, members of the staff of the Office of Planning and Institutional Studies suggested that use of the various innovative approaches in the 1971 program had increased their work load by as much as twenty per cent. They felt that this increase was due entirely to procedural changes, that, for example, the use of building systems had not directly influenced them as most of the documentation, etc., had been prepared by consultants.

In addition to these manpower commitments to procedural innovation, much time had been spent on solving political problems. The problems attendant upon the introduction of management contracting in 1970–1971 have already been mentioned. Other problems this program encountered could be mentioned.

Consultants and their Costs. On these programs the University is employing expert consultants to prepare documents and define procedures. The goal of the University is to develop staff and industry expertise to the point that consultants will no longer be required to repeat activities. Counterbalancing these costs, it has been estimated by BSD that their involvement as consultants in the program resulted in large savings to the University, on the order of a $10 saving for each $1 paid to the consultants.

Economies of Scale. The University has found that by its participation at the overall program level, it can accomplish more efficiently and at less cost some of the activities formerly entrusted to its architects and contractors. This has been especially true in information collection, establishment of criteria, and hiring of consultants.

The Architect and His Fee. At this point one could logically ask, if the architect is not doing parts of his traditional role why not alter his fee to correspond with what he is doing? Richard Holden of the University staff ventured to answer this question. Holden feels that although certain aspects of the architect's role—information gathering, drafting, cost analysis, etc.—have been reduced or disappeared, the actual cost of doing a project in the architect's office has stayed the same, if not increased. More time is now required in decision making and in information flow, both activities requiring larger input of more expensive principal time.

As a result of the feeling that the architect does not have access to the type of information required for best decision making—and because of this he is unfairly condemned for failure to control costs—the staff has developed various tools for use on the projects. One of these is a means of trading off quality and quantity levels and costs. This tool was used in the decision to abandon the precast ceiling grid in the Fairbanks Resources Building and to use a less costly method of suspending the access catwalks.

The University as an Educational Institution.

Holden further commented on what he saw as the University's role in education in the broadest sense. The question of using local architects, contractors, and consultants or to go "outside" for this assistance came up continuously in the program development. The staff arrived at the following conclusion: as a state agency, and an educational one, the University should use its resources to sponsor programs which not only fulfill its needs within the limits of serving the public good, but it should also use these programs to develop and advance the local professions.

In an environment such as Alaska with limited expert resources, it may be necessary to go outside and hire expertise. But these experts should bring the local professions and industry along and work themselves out of a job. In the 1971 program, such has been the case. Holden feels that the University can now rely on the state's architects to deliver buildings on short schedules using procedures which insure good cost control and performance.

1971 CAPITAL IMPROVEMENTS PROGRAM

University of Alaska, Fairbanks, Alaska

Building Teams:

Facility	*Location*	*Architect*	*Contractor*
Community College Addition	Anchorage CC	W. J. Wellenstein, AIA, Anchorage McClure/Nixon, Seattle	Modern Construction Co.,* Fairbanks
Higher Education Library	UA-Anchorage	Crittenden, Cassetta and Cannon, Anchorage Helmuth, Obata and Kassabaum, San Francisco	Modern Construction Co.,* Fairbanks
Community College Addition	Juneau CC	George Filler, AIA, Juneau	Triplette Construction Co., Juneau
Community College	Kenai	Jenkins and Bridges, Anchorage	Sandland Construction Co., Anchorage
Community College	Kodiak	Maynard and Wirum, AIA, Anchorage	F&W Construction Co., Anchorage
Mat-Su Community College	Palmer	Ralph M. Alley, Jr., Anchorage	Firor-Janssen Construction Co., Anchorage
Resources Building**	UA-College	Jennings H. Graham, AIA, Ketchikan Knorr/Elliott, San Francisco	Peter Kiewit's Sons,* Fairbanks

* Denotes management contractor.
** Indicates buildings systems not initially used on project.

Volume Purchased Subsystems and Costs:

SUBSYSTEM	SUCCESSFUL BIDDER	PRODUCT LINE	CONTRACT VALUE
GENERIC SPACE SUBSYSTEMS: 6 projects with total area of 206,350 square feet			
STRUCTURE	Romac Steel Company, Inc.	Romac MODULOC	$ 840,527
HVC	MacDonald Miller/Hohn Corp.	Trane VAV	$ 913,836
LIGHTING/CEILING	W. R. Grasle Electric Co.	Conwed 5 + 5	$ 346,119
INTERIOR SPACE SUBSYSTEMS: 8 projects with total area of 366,350 square feet			
MOVEABLE PARTITIONS	Owens-Corning Fiberglas	Donn VANGUARD	$ 368,838
SERVICE COLUMNS	Electrolink, Ltd.		$ 23,651
CARPETING	Commercial Carpet Corp. Florcraft Tipton G&J Flooring	CCC Mohawk Lees Alexander Smith	$ 74,610 $ 36,649 $ 62,463 $ 64,218
FURNISHING SUBSYSTEMS: 8 projects with total area of 366,350 square feet			
FURNITURE	Westinghouse	ASD	$ 291,518
CHAIRS	Alaska Curtain Wall/J.K.Gill	Herman Miller/Knoll	$ 171,446
TOTAL VALUE OF VOLUME PURCHASE CONTRACTS			$3,193,875

Projects, Sizes, Costs and Schedules:

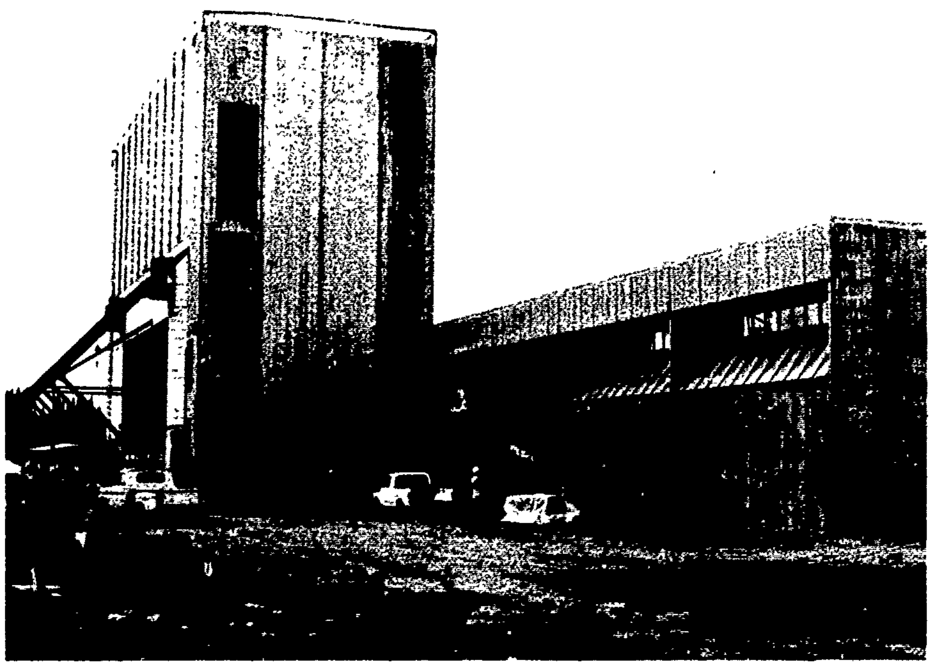
FACILITY	LOCATION	AREA (sf)	BUILDING SYSTEMS		CONSTRUCTION COSTS		CONSTRUCTION	
			CONTRACTS	$/sf	CONTRACTS	$/sf	BEGUN	COMP.
Higher Education Library	Anchorage	86,000	$1,007,335	$11.71	$5,037,578	$58.58	6/71	11/72
Community College Expansion	Anchorage	81,650	$ 830,047	$10.17	$4,406,839	$53.97	5/71	11/72
Resources Building (see below)	Fairbanks	60,000	$ 774,228	$12.90	$3,987,133	$66.45	6/71	2/73
Community College	Kenai	12,400	$ 180,873	$14.59	$ 625,651	$50.46	8/71	10/72
Community College Expansion	Juneau	10,800	$ 196,388	$18.18	$ 628,894	$58.23	8/71	10/72
Community College	Kodiak	7,700	$ 110,083	$14.30	$ 403,286	$52.37	4/72	9/72
Mat-Su Community College	Palmer	7,200	$ 113,961	$15.83	$ 422,964	$58.74	4/72	8/72

Building Systems Costs are total amounts of contracts plus change orders as of September 1, 1972 for these subsystems: structure, HVC, lighting/ceiling, moveable partitions, service columns and carpeting.

Construction Cost is as defined by the AIA and includes Building Systems Costs. Amounts shown are total amounts of contracts plus change orders as of September 1, 1972.

Generic Space Subsystems for the Resources Building were selected separately, see text page 9 for details.

The Anchorage Community College Expansion provides over 80,000 square feet of general classroom space. The fly-loft is for a theater to be built in the next construction program. The exterior walls of the loft are precast concrete panels reaching its full height—among the tallest ever erected.



BSIC ACTIVITIES

BSIC RELEASES TWO SCSD EVALUATION STUDIES

In a new publication, *BSIC Research Report Number Two: Evaluation, Two Studies of SCSD Schools*, BSIC reports on two studies which attempt to relate the SCSD program schools to their users in t^. ^s of satisfaction and utility.

The first of these studies is a survey of teacher and student response to the schools and to elements of the SCSD building system with which they have contact. The survey was performed by BSIC in 1969–1970 as a questionnaire survey of more than 2500 students and 500 faculty members. Results are presented both as comparative findings for the eleven SCSD schools involved and as response profiles for each of the schools.

Key findings of the study are that, while the system produces a generally satisfactory environment, problem areas do exist. Use of the flexibility built into the system is hampered by a lack of teacher knowledge of this capability and of procedures for putting it into use. Problems of technical performance occur in the areas of acoustic, and, in some schools, thermal environmental control. Student responses indicate sensitivity to environmental elements—use of color and proper landscaping among others.

The second study concerns an attempt to develop a model for an ongoing study of the intricate relationships between the physical environment and educational and behavioral objectives. The purpose of the program studied was to develop a method whereby the science teachers of Oak Grove High School, a SCSD school, might study and improve conditions within their department.

Elements of this process include: developing concise statements of educational and environmental objectives, measuring existing conditions, analyzing and synthesizing results, and making use of this information together with flexibility of the facility to improve the overall educational program.

This publication is available from BSIC at $2.00 per copy which includes fourth class postage. Add 50 cents per copy for first class mailing.

MCS UPDATE

Between full revisions of *BSIC Special Report Number One: Manufacturers' Compatibility Study*, this column will announce changes of address, contact, or product name for subsystems manufacturers and the introduction or discontinuance of subsystem product lines. Manufacturers are reminded to report relevant product information to BSIC/EFL, 3000 Sand Hill Road, Menlo Park, California 94025.

Current revisions to the September 1971 edition of the MCS are:

A. *Addition*

1. Add to Manufacturers of Structural Subsystems, page 6:

PRODUCT: KirbyTrus-Lok Structural System

MANUFACTURER: Kirby Building Systems, Inc.
P.O Box 36459
Houston, Texas 77036

CONTACT: Donald H. Sea
Project Manager
(713) 666-1941

B. *New Products*

1. New Product from Structural Manufacturer, page 6:

PRODUCT: Macotrus Modular Component System (MMC)

MANUFACTURER: Macomber, Inc.
Box 8830
Canton, Ohio 44711

CONTACT: Bernard E. Cromi
Vice President—Sales
(216) 456-2841

NOTE: replaces V-LOK System

2. New Products from Lighting/Ceiling Manufacturer, page 13:

PRODUCTS: Varitec 830
Varitec 8^0
Varitec 1400

MANUFACTURER: The Celotex Corporation
P.O. Box 22602
Tampa, Florida 33622

CONTACT: Karl W. Holm
Product Manager, Ceiling/Lighting Systems

C. *New Contact*

1. New contact for Manufacturer of Structural Subsystem, page 7:

PRODUCT: FAB-LOK

MANUFACTURER: Steel Fabricators, Inc.
P. O. Box 23219
Fort Lauderdale, Florida 33307

CONTACT: C. E. Tisdale
Sales Manager
(305) 772-0440

BSIC PUBLICATIONS

BSIC has available a number of reports and studies covering systems building of educational facilities. Single and multiple copies are available at the price listed. Subscription to the *BSIC Newsletter* is available free upon request.

- *BSIC Newsletter No. 1, Spring 1969* ($1.00)
- *BSIC Newsletter Vol. 3, No. 4, December 1971* (No Charge)
- *BSIC Newsletter Vol. 4, No. 1, June 1972* (No Charge)
- *BSIC Special Report No. 1: Manufacturers' Compatibility Study, September 1971* ($1.00)
- *BSIC Special Report No. 2: Listing of Schools Constructed with a Building System, Current Edition* ($1.00)
- *BSIC Special Report No. 3: Building Systems Planning Manual, August 1971* ($1.00)
- *BSIC Research Report No. 2: Evaluation, Two Studies of SCSD Schools, September 1972* ($2.00)
- *BSIC Research Report No. 3: A History and Evaluation of the SCSD Project, 1961–1967, 1971* ($5.00)
- *List of Sources of Information about EFL Supported Systems Building Projects* (No Charge)

Checks should be made payable in U.S. funds to BSIC/EFL. California residents should add 5 per cent sales tax. Price includes handling and postage at special fourth class book rate. For first class mail, or overseas shipment, please include 50 cents per publication ordered. For *BSIC Research Report No. 3: A History and Evaluation of the SCSD Project, 1961–1967*, add $2.00 for first class or overseas mailing.

EFL RELEASES PUBLICATION ON STUDENT HOUSING

Of special interest to persons involved in college and university planning is a new publication from Educational Facilities Laboratories (EFL), entitled *Student Housing*. Quoting from the publication's foreword: "Providing housing for students is more than just throwing up a barrack block and calling it something or other Hall. Traditional dormitories are out of step with the concept of higher education that makes the four years of college a cultural and social experience as well as a period of gathering information on academic topics."

In *Student Housing*, the authors attempt to view the problem in the broadest sense. Attention is paid not only to design and construction and the management of these aspects, but to the integration of housing into the total higher education experience through innovative use of housing facilities and management procedures.

Copies of the publication may be obtained for $2.00 each from: Educational Facilities Laboratories, Inc., 477 Madison Avenue, New York, New York 10022.

ITEMS OF INTEREST

In the May 1972 issue of *Construction Specifier* magazine, the Construction Specifications Institute (CSI) issued sections for its *CSI Manual of Practice* covering the preparation and use of performance specifications. Issued at that time were MP-2D: Organization and Format for Performance Specifying, and MP-3F: Performance Specifications.

In preparing these articles CSI made use of the existing building system and other project performance specifications documents and procedures.

For further information contact:

The Construction Specifications Institute, Inc.
1150 Seventeenth Street, N.W.
Washington, D.C. 20036

The latest in the Analysis and Bibliography series of publications of the ERIC Clearinghouse on Educational Management is No. 15: *Systems Building Techniques* by Alan M. Baas. The publication surveys the growth of systems building programs in education and reports on the experiences and conclusions of numerous architects and educators. Single copies are available free by ordering Accession Number EA 004 261 from:

ERIC Clearinghouse on Educational Management
University of Oregon
Eugene, Oregon 97403