
**MANAGEMENT OF CONSTRUCTION PROJECTS
IN LOS ANGELES COUNTY GOVERNMENT**

Volume II

Detail Analysis and Data

REPORT OF LOS ANGELES COUNTY CITIZENS
ECONOMY AND EFFICIENCY COMMITTEE
CONSTRUCTION PROJECTS TASK FORCE

September 1972

PREFACE

Early this year, the Los Angeles County Board of Supervisors, in a series of three Board orders, asked the Chief Administrative Office, the County Engineer, and the Economy and Efficiency Committee to study and recommend improvements in the County's administration and management of its facility construction program. A Task Force composed of members of the Economy and Efficiency Committee has conducted a thorough study of all County activities related to facility construction. Assistance to the Task Force was provided by the Chief Administrative Office, the County Engineer, and the Executive Secretary of the Economy and Efficiency Committee. Technical assistance to the Task Force was also provided by the Los Angeles Technical Services Corporation by means of a contract approved by the Board.

Although the Task Force has worked in close cooperation with several committees within County government, the conclusions and recommendations contained in this report are those of the Task Force. Members of the Construction Project Task Force are. J. Munzer, Chairman, Roc Cutri, Jerry Epstein, Milton Gordon Joseph Lederman, Robert A. Olin and William Torrence.

Volume I of the report present our findings and conclusions and descriptions of our specific implementing recommendations.

Volume II provides more detail of the analysis leading to their commendations and summaries of the data used to support the studies. It also includes chronological histories of the three projects specifically requested in the Board orders.

The Task Force submits this report to the Economy and Efficiency Committee and respectfully requests its review and approval for formal submission to the Board of Supervisors.

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I. ANALYSIS OF RECOMMENDATIONS

INTRODUCTION

This chapter contains detailed analysis of the 18 implementing recommendations that we have proposed as the means for the County to expedite the following seven major improvements of the County's system for acquiring capital facilities:

- Concentration of responsibilities for planning and construction in a single consolidated organization.
- Installation of a system for comprehensive and continuous management of individual projects.
- Strengthening of comprehensive advanced planning, in particular by tenant departments, during the project definition phase.
- Strengthening of countywide capital budget planning and controls.
- Definition and documentation of facility acquisition procedures and policies.
- Delegation of more authority to execute necessary project changes.
- Development of innovative management and contracting methods.

The first and most important recommendation we are making is the establishment of a consolidated facilities department, which will concentrate under one head all major functions involved in the planning, design, construction, and maintenance of County facilities. This includes project planning and management,

architectural and engineering services, real estate management and procurement, construction supervision, change management and building maintenance. The Chief Administrative Office would continue to control overall financial planning and budgeting of capital projects and would exercise general management supervision over the consolidated department.

This basic organizational change is vitally needed to concentrate responsibility for management of both the capital facilities program and control the costs and schedules of individual projects. Under the present system, the major responsibilities for facility planning and construction are scattered among five different departments. Thus, no single organization can be held accountable for providing economical buildings to house County activities and there is no uniform and continuous system of construction management. The result is schedule delays, design deficiencies, lack of effective control over client department requests for changes, and escalating costs.

In our next most important recommendation, we propose the establishment of a new function in the County organization - a centralized project management office. This office would be manned by building project directors and assigned as a key function to the new consolidated facilities department.

Currently, major project responsibility shifts among three divisions in the Chief Administrative Office, and the County Engineer as the project moves through its sequence. At each step, a different individual must coordinate with as many as thirty internal organizations. He must also direct contractors, provide required liaison with external agencies, and control project schedules and budgets. Regardless of where problems originate in this system, it is a virtual certainty that someone else will inherit them. No single individual is responsible for the project from its inception to its completion.

The difference in the system we propose is that full responsibility for project completion, covering all project business, comes to rest in one project management office, which calls on the other participants to perform their functions under prearranged budgets and schedules. Under our proposal, the project director would be responsible for the planning, programming, design, construction and evaluation of the projects to which he is assigned.

Above all, he would be held strictly accountable for completing the project within approved budgets and schedules, and would draw on the capabilities of County departments and architects, contractors or consultants to meet this responsibility. The substantial benefits which result from this unified control is the major reason why all the large private firms which we surveyed during the course of our study employ this project management approach in the design and construction of their buildings.

INTERIM ACTION

The other sixteen recommendations that we propose are all designed to provide effective systems support to these two major proposals for reorganization.

We recognize that a complex *reorganization of the type we recommend will require some time to put into operation. We are concerned, therefore, that critical improvements in the present system not become stalled while awaiting the intensive interactions necessary to accomplish organizational change. For this reason, we are proposing a two-stage approach to the organization problem. First, we propose that responsibility for acting on our recommendations be assigned to existing departments with the minimum *realignment of functions necessary for their immediate implementation. Of particular importance is the installation of a project management system for continuous management of multi-million dollar projects.

In the interim, until a consolidated department is established, we propose a project management office with the responsibility for comprehensive and continuous management of construction projects be assigned as a new unit to the County Engineer. We also recommend that the financial analysis and evaluation functions related to executive direction of the countywide facilities pro-gram be strengthened in the Capital Projects Division of the Chief Administrative Office. Under no conditions should the responsibilities for individual projects as presently divided between the Chief Administrative Office and County Engineer be allowed to continue.

Our recommendations address questions of organization, planning, management and control, policy and procedures, and contracting methods. The eighteen detailed recommendations, in the order of presentation in this chapter, are, briefly stated:

- Form a new organization to consolidate facilities management responsibilities.
- Establish a project management organization with appropriate responsibility and authority to manage projects.
- Require preparation of project program plans including service programs, architectural programs, firm project budgets, and realistic project schedules.
- Manage architectural contracts according to work plans and schedules.
- Install an evaluation system so that the County's experience can be used to improve the quality of project planning and management.

- Require annual preparation of a long-range facilities budget.
- Expand staff analysis of the need for facilities.
- Provide essential information and analysis for making critical investment decisions.
- Expedite documentation of firm and comprehensive procedures.
- Establish a formal information and reporting system.
- Adopt facilities standards for use throughout the County.
- Monitor the progress of implementing our recommendations.
- Streamline the processing of supplemental agreements.
- Make more effective use of change orders.
- Provide contract clauses allowing proceed orders to permit construction work to continue while paperwork is approved.
- Test new contracting approaches.
- Strengthen construction contract terms and conditions.
- Start a legislative program to improve the County's ability to manage projects and contracting.

Clearly, each recommendation can be implemented singly, without regard to the current status of any of the other recommendations. Furthermore, it is possible to proceed immediately with the implementation of each recommendation, once it is adopted.

Consequently, in the discussions in this chapter, we treat each of the recommendations independently in some detail, as if it is the only one that is to be attempted. In many of the discussions, we refer to the major tasks involved in implementation of the recommendation being discussed, and we give an estimate of the amount of time that is required for full-scale implementation. We also refer to the need for legislation, when appropriate. However, the discussions do not interrelate major tasks, schedules, and legislation and we have not prepared a detailed plan for implementation. The reason for this approach is that we believe our recommendations should each be pursued by the County when adopted, regardless of whether or not the others have been adopted.

Nevertheless, there are some important relationships and interdependencies among the recommendations that should be considered during implementation. In particular, we have estimated potential savings on the basis of implementation of all the recommendations, rather than of any of them singly. If they are pursued independently, it is unlikely that the full benefits will be realized.

The recommendations on Project Management (2) and Project Program Planning (3) are a case in point. The County could implement either of these without the other, and has, in fact, already made some progress on introducing elements of program planning for major projects. However, it is extremely unlikely that either of these will work properly without the other, and the discussions should be read with this point in mind.

The recommendation on project management calls for assigning a project director, with full responsibility, to each major project, for the purpose of providing a continuing business management control on the planning and completion of the project to which he is assigned. Clearly, the project director will not be able to function without certain important tools of

management, such as the project program plan. Without complete project program plan, the project director will have no basis on which to carry the project through to completion. Just as important, without the schedules, budgets, and requirements documentation provided by the plan, County executives will have no basis on which to evaluate the effectiveness of the idea of project directors or the performance of the people assigned.

Conversely, project program planning will not work properly without assignment of project directors. There is little point in having a plan, complete with schedule, budgets, and job requirements, unless it is to be carried to completion by those who are party to its formulation. With any other arrangement that does not ensure continuity of management with concentration of responsibility, the project program plan is almost sure to end up being enforced by someone who never agreed to it, ' has little stake in its proper accomplishment, and may not understand it. The end result will be that the project program plan has no impact on the effectiveness of managing the project. Instead of resulting in savings, it will represent an additional project cost that doesn't pay off.

Many of the other recommendations are similarly related. Those on the subjects of supplemental agreements, change orders, and proceed orders would best be treated as a group, since they have in common the question of reducing delays that are attributable to necessary project changes. Those on the subjects of architectural contracts and construction contracts, while very different in the details, deal with basically similar questions of contract management. Those on the subjects of the long-range budget, analysis of facility needs, and policy commitments will all be necessary to support a comprehensive planning capability, even though each of the three is different enough to accommodate independent implementation. The recommendations calling for delineation of policy, documentation of procedures, and establishment

of an information system support all of the improvements to be introduced. Without these, the County will find it difficult to operate with the new management system. Finally, the recommendations on organization, evaluation, and legislation transcend all the others in the depth of their impact on the total system and all participants and in their importance.

There is another point of some importance to implementation; that is, most of our recommendations are intended to produce both short range and long-range effects, and to enable the County to obtain both immediate and long-term benefits. This is reflected primarily in the proposed two-stage approach to organization, but is not discussed in detail in each of the other recommendations. For example, the proposed comprehensive evaluation system will provide immediate benefits by enabling the County Engineer to formulate and report performance information for the use of the Architectural Evaluation Board. But the full benefit of evaluation that includes product test information and long-range cost-benefit analysis will probably become evident only after the new consolidated facilities department has been operating for some time.

We have also predicted that some major annual savings can result from implementation of our recommendations. Detailed discussion of these savings and the methods we used to estimate them appears in Chapter IV of this Volume.

The following breakdown details the quantifiable savings:

Reduced Construction Delays	\$1,400,000
Shorter Construction Phase	1,100,000
Shorter Design Phase	1,400,000
Reduced Redesign and Rework	800,000
More Economical Construction	<u>700,000</u>
	\$5,400,000

Other non-quantifiable benefits also result from improved management of capital facilities and development. Briefly these benefits, and some of the recommendations related to them, are as follows:

- A management system which completes buildings more quickly permits the Board more flexibility in decision making (Recommendations 3, 13, 14, 15, 16, and 18).
- When appropriate, the Board would be able to defer commitment to a project until a later date and thereby take better advantage of new technology developments (Recommendations 6 and 8) 9.
- The Board would have better analysis of needs available (Recommendations 5 and 7L.
- Buildings could be available to provide services earlier when needed (Recommendations 3, 7, and 16).
- The facilities program could be more responsive to changing needs for services (Recommendations 1, 2, 3, and 5).

1. ORGANIZATION

Recommendation: That the Board direct preparation of a program to consolidate all functions essential to provision of facilities into a single, permanent organization; and, further that the Board assure immediate organizational improvements by assigning full interim responsibility for management of individual projects to the County Engineer.

Our study of the County's present system for acquiring buildings shows a very clear need to strengthen and consolidate management responsibilities at two levels: (a) the Countywide level that is concerned with integrated facilities planning, priorities, economics, uniform policies, control and reporting of total progress, and continuing evaluation and improvement of the organization and system for providing facilities; and (b) the detailed level, that is concerned with planning, programming, design, construction and evaluation of individual projects. The most important point of this recommendation is that full benefit of improvements to the capital projects acquisition system will be achieved only through major realignment of all facilities-related operations into a single consolidated facilities department reporting to the Board. The department would be a super-agency form of organization, and will be referred to in some places below as an agency. In addition, this recommendation also addresses the question of how the County can derive some immediate benefit from the recommended improvements by assigning responsibility for them to existing County organizations.

The County's general need for functional consolidation and for reduction of the Board's overwhelming span of control is known and has been addressed elsewhere by the Economy and Efficiency Committee. In the case of facilities acquisition and management, this need has become clear through our analysis of five alternative ways to organize to accomplish the major improvements we have proposed.

However, it is not sufficient to identify the best organizational arrangement and propose its implementation. In the first place, considerable time is involved in making organizational changes in the County, and there is no reason to delay, for reorganization, those improvements that can be accomplished now. Secondly, the "best" organizational arrangement must be identified within the context of total County organization planning and management, a problem that goes far beyond the scope of our investigation.

Therefore, we have considered two questions. First, how could the County best organize to achieve the full benefit of the recommended improvements? Second, what immediate steps can be taken to utilize the existing organization to achieve short-term results from the improvements? Our analysis is based on two principles:

- Executive planning and control should be separated organizationally from operations of doing the work (in this case, managing and acquiring facilities).
- All functions and activities that are necessary to accomplish an approved objective should be unified organizationally and managed as a consolidated unit.

In particular, the following of our additional recommendations require action that affects County functions and organizations: project management, project program plans, design management, evaluation, long-range budgeting, needs analysis, and policy.

The functions that are required to accomplish the major improvements, or are now performed, are:

Total Facilities Program Planning, which includes (a). collecting and analyzing needs for service facilities; (b*) comparing and selecting alternatives; (c) analyzing life-cycle benefits and investments; and (d) establishing integrated budgets, financing schedules, and priorities over time.

Policy Development, which includes establishing and enforcing countywide a) space standards; b) quality and aesthetic standards; c) equipment and service standards; and d) other limitations and constraints on tenants.

System Control, which includes establishing and enforcing the management system, and includes a) requiring formal reporting of status, progress, performance, changes, and exceptions; b) requiring standards governing the content of project documents; and c) requiring formal meetings, reviews, and communications.

System Evaluation, which includes a) analyzing and determining the effectiveness of management and the management control system; and b) determining the cost-effectiveness of completed projects within the approved facilities plan.

Project Management^{*}, which includes a) *governing* the progress of an approved project from planning to occupancy; b) reporting status and progress; c) administering contracts and agreements with all consultants and contractors; d) directing the participation of all County departments involved in the project; and e) coordinating with State, Federal and District Agencies.

Project Programming, which consists of the planning and documentation of project functional requirements, schedules, phasing, costs, construction management approach, and other instructions A to the architect.

Change Management, which includes a) evaluating and approving change orders and supplemental agreements; b) planning and budgeting for project changes; and c) negotiating and expediting change contracts, delays and damages.

*Not the same as the classified position of the County with the same title.

Design Management, which includes a) governing the progress of projects through design phases; b) coordinating the activity and input of all participating departments and contractors;) ensuring the suitability and quality of project plans and programs.

Project Evaluation, which includes determining a) the effectiveness of the project program; b) the performance of participating departments, contractors, and consultants; and c) the cost-effectiveness of materials, equipment, and design parameters used in the project.

Building Management, which includes a) maintaining facilities and equipment'. b) specialized custodial care; and c). acquiring and maintaining technological and communications support.

Technical Services, which includes all advisory service on building technology and design, such as maintainability, test and evaluation, and manpower utilization.

In the present County organization, performance of these functions, or parts of them, is divided among a number of separate units, including the Board, the Chief Administrative Office (two divisions), the County Engineer, the Department of Real Estate Management, Client Departments in need of facilities, the Mechanical Department, the Communications Department, the Building Services Department, the Forester and Fire Warden, County Counsel and other service and regulatory departments.

We maintain that, as soon as possible, the required organization should consolidate these functions in a single agency, and that, in the interim, the division of parts of these functions among existing organizations must be discontinued. Moreover, the continuing services provided to tenants, such as telephones, internal communications systems, janitorial, building maintenance,

and mechanical building services are important to the efficient use of space. However, these functions are presently unified in the County, and satisfactory administrative mechanisms already exist for their provision to other organizations, so that their inclusion with other functions in the system may be desirable but not essential.

We propose two stages of organization development, as illustrated in Figures 1 and 2. In Stage 1, management of the total program of the County is concentrated in the CAO, management and implementation of individual projects is concentrated in the County Engineer, and the service, advisory, and regulatory roles of other departments remain unchanged. . In Stage 2, all functions except financial planning, fiscal control and regulatory authority, are concentrated in a consolidated facilities department which include* at least facilities planning and production responsibilities and possibly also maintenance, custodial, communications, and other services. It is desirable to add these service functions in order to provide the agency with professional operations and administrative capabilities supporting cost-benefit aspects of program planning as well as to optimize the life-cycle management and cost control of facilities.

Our conclusion is based on analysis of the five alternatives illustrated in Figures 2 through 6:

- ❑ Consolidated Facilities Department (Figure 2)
- ❑ Current Organization (Figure 3)
- ❑ Expanded CAO functions (Figure 4)
- ❑ Expanded CE functions (Figure 5)
- ❑ Additional County department (Figure 6)

We have viewed each alternative in terms of the principles mentioned above, and have emphasized the effective performance of requisite functions rather than line authority, reporting

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responsibilities, personnel, or ability. In most instances, we have kept to the department level, although in some cases it is necessary to examine the internal department structure.

In addition to the two principles, we have applied certain judgmental criteria relating to economy and efficiency in comparing the alternatives. We have been concerned with:

- The Board's span of control
- Demands on personnel administration
- Existing departmental roles
- Existing ability and expertise
- Desired organizational trends in the County
- Feasibility of implementation under current laws and charter Accountability
- Disruption of current operation
- Cost of innovation
- Availability and preparation of staff

Major elements of the Task Force analysis are summarized in Table 1.

Figure 3 illustrates the present County organization of functions. Implementing the recommended improvements so as to derive the benefits would be virtually impossible with this structure, for two reasons, indicated by the problem functions in the figure. First, those functions, which are performed, are divided so that the parties with responsibility for performing part of the work have little voice or authority in determining its nature and scope. For example, the Capital Projects Division of the CAO negotiates architectural service agreements which are managed by the Architectural Services Division of the County Engineer. Second, some important unit functions are not performed at all, primarily because activities that are part of them would be assigned to separate organizations under current practice.

Table 1. Summary Analysis of Organizational Alternatives

Alternatives	Major Advantages	Major Disadvantages
CONSOLIDATED FACILITIES DEPARTMENT (FIGURE 2)	<p>Consolidates and unifies functions.</p> <p>Reduces Board Span of control (by 3 units)</p> <p>All required expertise available to support management objective.</p> <p>Reduces administrative costs and improves coordination.</p>	<p>May depend on legislation or charter change</p> <p>Involves learning costs</p> <p>Will take time and requires planning</p>
EXPANDED CAO (FIGURE 5)	<p>Can be implemented immediately with present levels and staff</p>	<p>Combines executive control with service and operations.</p> <p>Depends on work transfers.</p> <p>Does not affect coordination and communication.</p>
EXPANDED CE (FIGURE 5)	<p>Can be implemented immediately with present levels and staff.</p> <p>Improves accountability</p> <p>Maintains excellence of technical communication and coordination.</p>	<p>Depends on finding management staffing.</p> <p>Does not affect coordination and communications.</p> <p>Inhibits long range improvements.</p>
ADDITIONAL DEPARTMENT (FIGURE 6)	<p>Provides strong management accountability.</p> <p>improves technical and management communications</p>	<p>Increases Board span of control.</p> <p>Increases administrative expense.</p> <p>Does not affect interdepartmental communications.</p>

For example, project program plans are not prepared in our estimation; because architectural programming is isolated from scheduling and budgeting. The chart contains a brief list of other functions that are problems under current organizational practice. After some discussion and analysis by the Task Force, it was clear that creating an additional County department (Figure 6) is a weak alternative because it increases the already over extended span of control of the Board; adds the administrative costs of a new and independent unit without affecting those of existing units; and would do little to affect the existing difficulties of coordination between planning, management, and implementation.

By contrast, Task Force members reacted to the agency alternative (Figure 2) with enthusiasm. The concept supports organizational objectives of the County and clearly introduces major economies of consolidation. It also provides the most logical and appropriate organizational means to implement major improvements such as project management, long-range facilities planning, and test and evaluation.

However, the County Engineer has pointed out some weaknesses in the agency alternative, as presented in Figure 2. First, the presence of functions that involve providing continuing services to tenants, such as maintenance, custodial, and equipment services, may not be necessary and could introduce manpower, personnel, and industrial relations problems that do not seriously affect facilities acquisition in the current system. Second, the Department of the County Engineer already is an agency for all practical purposes, is required by County Charter to perform all engineering for the County, and may need only some strengthening to improve the effectiveness of management.

These objections deserve consideration, insofar as they point up one of the major problems of analyzing the agency alternative

within the scope of our study of capital facilities. That problem is that, while we have determined the functions that should be organized in a unit to improve the capital facilities process by itself, we cannot address the question of the relationships between the functions of this agency and the functions and responsibilities of other County departments. Nor have we resolved the question of what to do with functional pieces of departments that could be left over after consolidation, such as mail or messenger services. Finally, we have not made sure that the Facilities Agency would be a better idea than other organizational arrangements that would achieve consolidation benefits by including all internal services to County operations.

Therefore, we have recommended that the agency alternative (Figure 2) be an established objective to be approached cautiously within the context of the County's organizational planning and analysis, and that it be implemented upon resolution of the problems we have cited.

Recognizing that an effective reorganization will require sometime and may require legislative action, we recommend that, as an interim measure, the functions related to management of the Countywide facilities program be strengthened in the Capital Projects Division of the Chief Administrative Office, and the functions related to more concentrated management of individual projects be established as a new unit under the County Engineer. Under no conditions should the responsibilities for individual projects as presently divided between the CAO and County Engineer be allowed to continue (Figure 1).

We feel that the need to begin systems changes, make new assignments and develop new procedures is urgent and should not await completion of the organizational changes. The other recommendations included in this report take cognizance of the need to start now.

That is, we strongly affirm that the functions necessary for the accomplishment of improvement to the capital facilities process be implemented immediately. (These are defined earlier in the discussion of this recommendation.) Our Task Force examined the remaining two alternatives, Expanded CAO Functions (Figure 4) and Expanded CE Functions (Figure 5) with this in mind. What organizational alternatives are the best interim measures for immediate implementation?

The major problem in analyzing immediate alternatives, that is, for interim improvement, is the organizational assignment of the functions related to individual projects, such as the project management office, project program planning and design management. This is so because it is clear that those functions related to planning, budgeting and executive control of the total County facilities program must be established in the CAO's office.

There are many reasons to consider strengthening the CAO (Figure 4) to incorporate project management and programming. First, the CAO already has sufficiently broad powers and authority, established by law and policy, to implement the major recommended improvements with maximum speed and flexibility. Moreover, some staff of the CAO has considerable experience in the management and execution of major facilities programs.

Thus, it is logical at first glance to propose that, for immediate but interim action during planning and phasing of the agency, major functions of project planning and management be made a CAO responsibility.

Nevertheless, the Task Force rejects this alternative, because it violates the principle of separating executive control from project execution. It would have the effect, for example, of putting budget advocacy in the same organization with budget approval and management evaluation. This would never be comfortable, and would soon cripple the effective-ness of the new functions in achieving cost and time improvements.

On the other hand, making the County Engineer responsible for the interim implementation of improvements during planning of the agency is proposed as the alternative that offers the best chance of immediate improvement, since the main requirement would be to strengthen the management and control system of the department that now has most of the required technical and supervisory capability.

IMPLEMENTATION

Our organizational recommendation proposes two stages of development of a consolidated facilities department, or agency. The first stage requires interim strengthening of existing departments by implementing recommended improvements, and the second stage requires formation of a permanent department to be planned and structured by the CAO.

The following assignments of responsibilities are proposed for the interim. They preserve legislative and political responsibilities of the Board; administrative, fiscal and organizational responsibilities of the CAO; technical management responsibilities of the County Engineer; and service responsibilities of service tenants.

Proposed Responsibility for Recommendations (Interim)

<u>Board</u>	establishes overall policy and standards, and approves appointments, major variances, and priorities.
<u>CAO</u>	maintains executive management, performs planning, budgeting, and financing of countywide program, enforces standards, and prepares organization plan.
<u>CE</u>	is responsible for project implementation and for providing executive and Board with professional advice and service regarding plans and budgets.

Clients

are responsible for providing program requirements, approving program and getting budget and variance approvals.

Service Tenants

are responsible for providing program requirements, approving program elements, and providing professional advice and service regarding costs and feasibility to the Project Director.

2. PROJECT MANAGEMENT

Recommendation: That the Board establish a new organizational unit to provide total management of the programming design, and construction of capital projects by putting a Project Director in charge of each large or complex project.

DISCUSSION

The problem addressed by this recommendation is the lack of accountability for projects resulting from the present system of passing responsibility from office to office and person to person throughout the development of a project. In the existing system, the responsibility for taking action that affects the progress of project changes hands at least five times over the course of the project. First, the Board and the Architectural Evaluation Board collaborate to appoint an architect. The Real Estate Management Office is responsible for the purchase of land. The Capital Projects Division of the Chief- Administrative Office negotiates and executes architectural service agreements. The Architectural Services Division of the County Engineer directs the architect and other participants in the performance of design work. The Construction Division of the County Engineer directs the contractor in the performance of construction work. Figure 7 illustrates these shifts of responsibility.

What this means is that, at any given stage of facility development, problems of delay, cost overruns, and mistakes are explained away because they originated in earlier stages of the process. Problems encountered during construction can be referred to architectural specifications, over which the Construction Division has no control. To aggravate the problem, the responsible party must coordinate with more than ten internal County units and nine external agencies or other governmental jurisdictions. Table 2 lists these agencies.

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Table 2

(PARTIAL) LIST OF AGENCIES INVOLVED IN
COUNTY FACILITY DEVELOPMENT

Required by Law	Required by County Policy
County Engineer	County Engineer
Building and Safety Division	Architectural Division
Industrial Waste Division	Waterworks and Utilities Division
Regional Planning Commission	Design Division
Forester and fire warden	Sanitation Division
Health Department	Survey Division
County Counsel	Mechanical Department
State Bureau of Hospitals	Road Department
State Department of Corrections	Communications Department
State Fire Marshall	Water Company
State Water Pollution Control Board	Gas Company
	Power Company

In the existing project management system, responsibility passes from level to level, department to department. The difference in the proposed system is that full responsibility for project completion, covering all project business, comes to rest in one Project Management Office, which calls on the other participants to perform their functions under prearranged budgets and schedules.

Thus, our recommendation proposes a new structure for managing the facility development process. The structure has two key elements, similar to those of the "matrix" system of management as commonly practiced in industry. One element is the formation of a separate organizational unit, the Project Management Unit, to which the department head delegates full authority to draw on the technical expertise and manpower of the department and to call on other departments with his full executive authority. The second key element is to make the project management office fully responsible for the completion of projects within the approved budget and schedule. Essentially, this responsibility is to manage projects rather than an organization. Building Project Directors have no group of technical personnel permanently assigned to them; instead, they have the responsibility for allocating expenditures from the project budget to internal or external entities that can deliver those products and services necessary to complete the project.

Each major project would be assigned to an individual in the Project Management Office. The Project Director then would be responsible for the planning, programming, design, construction and evaluation of the projects to which he is assigned. He would be responsible for the timeliness, cost, and quality of the work directed by the Architectural Services Supervisor and the Construction Supervisor, but he would not replace them. He would be responsible for completing the project within approved budgets and schedules, and would draw on the capabilities of

County Departments and of contractors or consultants to meet this responsibility. He would complete the Project Program Plan, and would maintain and update it throughout the course of the project.

The Project Director would be designated as the legal County representative in all contracts and agreements supporting the project. He would negotiate all contracts and agreements and would make key management decisions affecting the project. Such decisions would include, but not be limited to, approval of requested program changes, the appropriate processing and budgeting of changes, the amount of time allowed for delay in each delay situation, the timing of bid advertising and approvals of working drawings, the mix of internal County external professional services, schedules of approvals and payments, required input to the project program and all other decisions affecting the County's success in producing the facility under budget and within schedule. For the professional and technical advice required to make decisions beyond his individual range of competence, he would call on the experts available in divisions of the Department of the county Engineer, the Department of the Chief Administrative Officer and other county departments. However, the final responsibility for the decisions and their effects would lie with the Project Director.

All the agencies contacted for comment and testimony now use general managers to conduct projects through all stages of development, regardless of the specific techniques used to design and construct the building. As many private developers point out, the policy of assigning a manager to individual projects can improve a developer reputation among contacts so that they begin to offer price advantages based on their clients management policy. Once contractors have confidence that changes will be minimized and long delays not tolerated they will be able to forecast workloads and plan future jobs more accurately and can lower bids on that basis.

Mission agencies of the Federal Government have been using contract officers to perform major management functions for 30 years. The contract officer is an engineer who has broad ranging authority over contracts, negotiation, design work and approvals, construction and inspection. He has the authority to delay, suspend, or stop work at any time.

When it comes to Los Angeles County, there is less unified support for the concept of Project Directors. Some officers, such as the Chief Administrative Officer and his Capital Projects Division Chief, favor the concept. Other participating agencies; such as Real Estate Management, Building Services, and Mechanical Departments, are neutral. They tend to see some advantage in the concept, but not necessarily major advantages. The majority of client departments strongly favor the appointment of building Project Directors, because they see it as a solution to their age-old problem of finding a responsible party to whom they can make known their needs and wishes.

Objections to the establishment of a building Project Management Office and appointment of Project Directors have been pointed out by some employees of the County Engineer. These objections to the idea of Project Directors are based on the belief that (a) the current system of management works well enough as it is, (b) project management as proposed in the recommendation would introduce jurisdictional and organizational problems, and (c) the proposed change would not result in dollar savings. They point out that project managers in charge of the Engineer's phases of a project perform all the duties proposed by this recommendation, and that the Department does not have the jurisdiction to require other departments and agencies to perform on a schedule. Finally, they maintain there is no evidence that savings would be realized because it is impossible to attribute any direct dollar loss to the absence of a business management capability.

What these objections reflect is an underlying difference between the concept of a Project Director as understood by the Engineer and the role of the Project Director as proposed. The role proposed is not identical to that of either the construction supervisor or the architectural services supervisor, who currently direct the detailed operations of contractors and staff during construction stages or design stages. Instead, the Project Director has the responsibility for managing the production of a facility throughout the process. The following paragraphs are brief descriptions of what he does. Complete detail would be developed by the Chief Administrative Officer or the Facility Acquisition and Management system committee, as stated in Recommendation 9.

1. Following initial, long-term budget approval by the CAO, the Project Management Officer is in charge of preparing the complete project program, which includes comprehensive delineation of client and tenant facility requirements, selection of contracting methods, preparation of complete and detailed project budgets for design and construction, including internal and external services and costs, and instructions to architects and contractors. He secures the agreement of participants to proceed with the program. (See Recommendation 3 for complete description.

2. Following approval of the project program, the Project Management Office is responsible for its implementation within budgets and schedules. During design stages, the Project Director negotiates a work statement and services agreement with the architect, secures any required guarantees of quality and cost, selects the methods and schedules to be used for plan checking and code enforcement, coordinates and synthesizes the work of all participants, informs other departments of required scheduled actions such as land purchase or land sales, monitors progress, and arbitrates disagreements. He controls the quality of the

the design work and its progress through the Architectural Supervisor, and reports on progress to the County Engineer. During construction stages, the Project Director directs and coordinates the work of the construction supervisor, the inspectors and observers, the architect, County departments and agents of other jurisdictions or political subdivisions of the County. Most important, he coordinates the activity of all client departments, in order to provide the earliest possible occupancy and use of the facility. He makes sure that business and management practices are consistent with the law and with County requirements. He ensures that occupancy proceeds according to the schedules established in the project program, and that all necessary legal approvals are acquired. He has complete authority to suspend or stop work at any time, and to issue orders to proceed.

3. Following completion and occupancy of the facility, the Project Management Office is required to file a complete and comprehensive project evaluation, which reviews both the product and the performance on its delivery. The product, or project, review covers how well the project meets program requirements; complete documentation of changes, their causes and how they may have been averted; how well client requirements are realized by the end product and how well they were communicated in the program; and the Project Director's evaluation of the budgetary and monetary processes used to support the effort. The performance review documents the performance of County departments and divisions according to program criteria, the performance of other jurisdictions or political subdivisions, and that of architects, consultants, design specialists, contractors, and subcontractors. The Project Director delivers his findings and recommendations to the appropriate County executives. Subsequent to occupancy, at least one year but not more than three years after occupancy, the project director re-evaluates the project in light of its actual use and reports his findings and recommendations for use in programming future projects.

IMPLEMENTATION

Establishment of a Project Management Office to function as we propose would be unique step for Los Angeles County. Since it requires the purchase of services and work by one department (or division) from others that are equal to or above it in the political-administrative structure, it requires an approach to management that differs fundamentally from the practice of local public bodies.

Moreover, the kinds of skills required to fill the project management position are not readily available in the County. Individual project directors must have both business management and engineering skills, the first in order to do the work, and the second in order to be able to direct the efforts of project supervisors, designers, engineers and inspectors during design and construction. Ideally, the people would be former engineers or architects whose experience had led them along the path of management and control of projects.

Finally, under County organization and policy, there is no single organization in the present structure in which it would be most appropriate to locate the functions of the Project Management Office. This question is discussed in detail in Recommendation 1. For most effective operation and full realization of benefits, the Project Management Office should be part of an organization which incorporates all the functions involved in facility planning 1 production, and use. Formation of such an agency will take some time. Therefore, for immediate implementation, we are suggesting that the new capabilities be established by placing the responsibility for a Project Management Office with an existing County department.

On the basis of our analysis, and considering all alternatives, we believe that the most appropriate interim location among

existing departments would be in the Department of the County Engineer. The major reason for this finding is that it will be necessary for Project Directors to have broad authority over professional and technical aspects of job completion, which should be conducted under the same departmental authority. To be sure, such authority may be easier to implement in the office of the CAO; however, the executive functions of the CAO are more important and need sufficient broadening themselves to fully utilize the CAO staff. It would be poor practice to place budget advocacy in the same office that is charged with approving budgets and evaluating project costs. Therefore, we firmly recommend that establishment of the Project Management Office be made the responsibility of the Engineer prior to formation of an agency with full responsibility for facilities.

The recommendation can be adopted within the framework of State and Federal law, and the Los Angeles County Charter, but may require changes in the County Administrative Code. Specifically, Section 79 and Sections 79. 1 and 79. 2 delineate the ways in which County Departments and the CAO request work transfers, and would have to be reviewed and modified. In addition, some of the language of Sections 122, 123, and 124 may affect the establishment and operation of a Projects Management Office. Section 84, describing the duties of the County Engineer, would be amended to reflect the change.

Finally, and most important, the appropriate placement, relationship and organization of the Project Management Office and its employees in the Civil Service structure will have to be determined. We firmly believe that it is necessary for project managers to be as free as possible of the limitations in responsibility inherent in some civil service rules, and that all required authority be delegated to them as necessary to implement projects within approved budgets and schedules.

The steps required to implement the recommendation following Board adoption involve the CAO, the County Counsel, the Civil Service Commission, and the County Engineer. The major steps include the following:

- Coordination of Civil Service requirements
- Coordination of contractors, professional societies for construction or construction management, and County boards and commissions
- Formation and adoption of local ordinances, amendments, codes, authorities and orders, especially those affecting organization and civil service codes
- Development of *guidelines, policy, procedures and reporting requirements governing the role of Project Directors and the placement of the Project Management Office
- Development of job descriptions, detailed specifications, compensations, qualifications and hiring procedures associated with the new civil service or exempt position
- Acquiring facilities to house the function, initiating the office and staffing it.

We foresee a schedule of six months to put the recommendation into effect, with no major difficulties, provided the Engineer and CAO expedite the legal, civil service, and organizational work.

We anticipate an annual expenditure of approximately \$300,000 to implement this recommendation. This expenditure is based on availability on a continuing basis of about 15 Project Directors.

3. PROJECT PROGRAM PLANS

Recommendation: that the Board require completion and approval of a project program plan for all large or complex facilities prior to the appointment of a project architect or any expenditures for design.

DISCUSSION

The CAO would (a) ' select the projects that require programming, (b) establish and maintain criteria governing programming, (c) ensure the completeness and quality of the program document and d) ensure that the project is cost effective and supports the overall capital facilities plan. When approved by the Board on recommendation of the CAO, the project program becomes binding on all County departments regarding subsequent work on the project, and defines and controls all technical, administrative, organizational, scheduling and budgetary aspects of the project.

Project programming translates the needs and requirements of prospective facility users into functional criteria, thus providing a framework to be used by professional architects to analyze problems, evaluate alternative concepts and designs, and provide a design solution. When documented in a project program, this ensures that all design concepts proposed by the architect meet the needs of the client as- expressed during programming, conform to County standards, and are consistent with project planning goals. The program document provides a basic reference tool to all participants in the project and other interested agencies, and exerts a unifying force on the project. It is produced by a team, led by the building project director, that consists of interested County agencies, including the tenants, capital projects planners, construction managers, architects, and programming experts. Thus, it governs

all subsequent activity on the project, and forms a basis for arbitrating differences, for analyzing proposed changes, and for evaluating subsequent projects. It is the principal act of the programming phase and its approval by the Board of Supervisors concludes that phase.

Clearly stated project budgets and schedules would save many days of work that always result from the present system of providing a variety of different estimates to the Board of Supervisors over a period of time at progressive stages of the project.

Currently, the phases of a capital project are governed more by organizational interactions and personalities than by unified and documented design requirements, schedules, and budgets. The absence of a program is one major contributing factor to the pattern of project costs and time overruns as well as to an unmeasured indirect or overhead cost to the County. Moreover, the present County system fragments organizational responsibility for a project. During planning and programming, the CAO is principal agency; the Architectural Division of the County Engineer is primarily responsible during design; and the Construction Division of County Engineer controls the project during construction. In other words, there is no single individual responsible for a project from cradle to grave. The result is lack of project continuity. Until the concept of project directors is possible, the architectural program document will help to mitigate present lack of project continuity, and to simplify the communications required.

Other private and governmental organizations were contacted to determine the extent of their use of the architectural programming concept. Generally, the majority had a specific document, which they produced for each project and they felt both time

and money could be saved on the project with such a document. The CAO and County Engineer have instituted the trial use of architectural programs on some ten selected projects. The value of this effort could be increased if the County would set explicit goals and objectives for this concept, development specific table of contents for the document and plan formal evaluation of the usefulness of the concept.

The most recent Architectural Division project report reflected the fact that 92 projects are currently being planned whose cost would exceed \$1 million each. The appearance of a large percentage of these projects in one year would either impose a very heavy burden on present staff or require additional staff to manage the project or prepare a project program. There are some facts which tend to ameliorate, but not eliminate this problem.

1. Some facilities can potentially be produced from "formula" programs. Formula programs would apply to facilities produced on the same fundamental design, on successive occasions. Warehouses, fire facilities, sheriff s' stations, and general office buildings fall into this category.

2. Some portions of a project program can be produced on a formula basis even if for moderately difficult structures. Some electrical, plumbing and mechanical criteria are repetitive, as are floor space requirements for personnel based on position space standards. Obviously this formularization assumes the existence of floor space and criteria standards.

3. In some cases, a project program will be determined as inappropriate as, perhaps, with recreational facilities, and some libraries

4. The long-range capital budget should pose questions as to what facilities the County needs how many it can afford, and for which project programs should be developed during a given year. Posing these questions should tend to reduce the number of projects which enter the programming phase or spread the programming of all facilities over a number of years.

5. Part of the intent of this recommendation is that much of the actual work on project programs should be completed by specialist consultants in that field. This would relieve the work-load of County Engineer personnel.

6. Much of the work on sections of each program should be completed by staff from service and client departments.

7. When most of a project program is produced by the County Engineer, he should employ techniques used by consultants in the field. If these techniques are used for example, programs for general office facilities in the \$15-20 million class can be completed in 8-12 weeks.

Considering all of these factors, the County should set a goal of approximately 30 projects per year and budget an average of 17 weeks per program. This would require 510 calendar weeks or 42 project weeks per month each year, based on a present Architectural Division staff of 294 people that work each month for the 92 major projects. Assuming that two full man-months per month are required for project management and management of project programming, then five man-months per month are needed for other projects and support.

Figure 8 is an example of the condensed contents of a program plan. This particular program is for the Los Angeles County * Sheriff's Administration Building, a \$22 million project.

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IMPLEMENTATION

Architectural programming of capital projects would be the responsibility of the County Engineer. Through the project director, he would assemble and manage the appropriate team of professionals and users to develop the program and prepare documentation for each project included in the capital facilities plan and designated for programming by the CAO. This responsibility would include subsequent updating and maintain-mg the program through the entire course of project development, and using it to manage the project, arbitrate differences, and judge proposed changes.

The CAO would provide general management to the architectural programming by (a) providing preliminary project approval and budget as part of the overall capital facilities plan, (b) developing and disseminating the policy and procedure which sets the criteria for contents and form of architectural programs, (c) determining which projects must have an architectural program, (d) approving the architectural program and verifying interdepartmental agreement before any subsequent project activity is authorized.

It is expected that participation of the Capital Projects Di-vision also would be necessary during programming stages to provide information about the project's place in the County's plan, its priority, budgets, and schedules, and to ensure that the program remains consistent with such requirements through-out its development.

The purpose of the following paragraphs is to provide the background detail required to effectively implement the concept of a project program. This concept involves production of a document called the "project program plan. It also involves a set

of procedures required to produce this document and to control the use of the contents. The intent of these paragraphs is to serve as a guide by providing detail from the experience of other agencies who have used project programming.

The amount of detail contained in the plan will vary with the size and complexity of the project, and the control requirement of the project manager. Generally, the major headings should include a description of project authorities and responsibilities, description of the site, definition of need, outline of the project building, project budget, design criteria, and project schedule.

Project Authorities and Responsibilities

This is certainly one of the most important sections. It will contain a copy of the architectural agreement for programming services, name the building project director and his immediate staff, summarize any agreements reached which are assumed to be part of the project, identify consultants who may be required on the project, provide space for document certification by participating organizations such as Board of Supervisors, and client department, and define authorities, such as ordinances, -resolutions, State laws, etc. , on the basis of which personnel associated with the project may act.

Definition of Need

The definition of need should cover the client department's perception of need for the subject facility as reflected in historical statistics concerning their operation. In addition, the client department must justify need based on statistics which reflect overall County requirements. This latter aspect of need has not been explicitly defined but would certainly include such things as a graph of population growth, change in

the tax base, growth of the County and department budget, and growth of staff overtime (probably the last 20 years). This tool can then be compared to, for example, a graph of the departments' workload. It is imperative that the department's requirements be stated always in terms of countywide needs.

Description of the Site

This section will contain maps, charts, and text, which clearly portray the site upon which the proposed facility will be placed. This description will include the map book, page, parcel number, and assessed value of the site, taxes paid on the site in the most recent year, soil analysis, circulation, drainage, topography, utilities, and present ownership of the site. In some cases, it may be desirable to have more than one site so that some choice is available as the project develops. It is, however, more desirable to reflect, in this document, the site chosen.

Outline of the Project

This section will contain criteria for material, mechanical, structural, electrical and plumbing facilities, analysis of space requirements, and the standards on which they are based, local code requirements, county image involved in the building, community opinions and requirements, potential for facility expansion, etc. This section should also include line drawings or diagrammatic of the proposed buildings as well as reflect the results of using a simple model to solicit design inputs from the client department and associated servicing agencies.

Project Budget

The dollars available to produce the facility described in this document are strictly limited by the project budget. This budget is derived from the approved long-range capital budget, and is

the goal to which the architect must adhere. Since this budget should not be expected to change and will form the basis for negotiating for the best architect at the most reasonable price, the budget should contain at least those items shown in Figure 9. Of particular significance are those items noted by an asterisk.

1. Funds Avail/Funds Needed--The appearance of this item on a budget form explicitly notes any differences between funds needed to complete a project against those available.

2. Supplemental Work--Although Changes must be minimized, it can be assumed that some small changes will be required. Since such is the case, this item makes provision for a certain per-cent of the project budget as reserve for changes of \$4,500 or smaller in size.

3. Contingency--For very large, complex projects, especially those which may involve technological changes, some provisions should be made when the budget is compiled. This contingency would apply for changes exceeding \$4,500 per incident, but in all other respects would fit present requirements of supplemental changes.

4. Time Factor--Additional costs may also be expected because of project delays, and some provision can, therefore, be made for these costs in the budget.

5. Total Project Cost--This must be a firm dollar goal. This figure should be used to control such things as design. The architect cannot exceed this figure. The client department also cannot exceed this figure.

Contingencies allowed for on lines 2, 14 and 16 may be used to set performance goals. For example, changes presently add between three and five percent to total project costs. It is

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reasonable to expect that these costs can be reduced to approximately two percent. Consequently, if two percent of the total project cost is entered in line 2, and the County rigidly adheres to the cost on line 19, then the adopted County goal for this project is two percent or less, preferably less. Whatever these lines are called, they are to be used to plan for even contingency costs based on past experience. Evaluation will, of course, use these figures as goals that should be achieved.

Other budget-related detail should also be included in the project program such as the probable cash flow requirements and any detail regarding any of the financing mechanisms used, such as joint powers authority, Board of Retirement, etc. These ingredients must be explained because the cost of money is a major consideration in capital projects. Thus, if the project is being funded by a bond issue there should be a report in the program explaining interest rates, period, payback plan, etc. , as well as an option on bonds.

Project Schedule

The objective of this section should be to provide time norms for performance, and not simply to list permissive dates. Figure 10 is one form which a project schedule might take. It clearly establishes temporal goals for each phase. However, these goals will be attained only if they are regarded as absolute maximum time allowance. Thus, for example, an allowance for plan review should specify number of days or months scheduled, and the beginning and ending dates. If a final date is set for plan review inputs, and formal, typed inputs should be the rule, then the absence of plan comments will be regarded as assent and the project will proceed on schedule. Figure 10 is, of course, a critical path schedule only for the conventional capital facilities production process.

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The exact amount budgeted for program plans should be based on a percentage of the total project cost determined as follows;

- One percent of project budgeted costs for complex projects such as hospitals.
- Three-fourths percent of project budgeted costs' of multi-jurisdictional or multi-occupant buildings.
- One-half percent of budgeted cost for all other capital projects.

The compilation of the long-range capital budget must make provision for funds to support programming for projects to which it will be applied. These funds will be used to employ a consultant if necessary or to pay for the cost of preparation of a program by County government staff. The funds should be available from savings in architectural and engineering contracts.

This recommendation addresses questions of project management and requirements, which are the internal business of the County. It is not expected to require legislative change.

The work on project programming has effectively begun in as much as the County has authorized production of programs for some selected facilities. The project program recommended here differs from these prototypes not so much as to form but distinctly as to degree. The emphasis of present programs is on architectural design. The recommended program gives equal emphasis to design, budget, and schedule. Present programming appears to have consumed inordinate amounts of time as, for example, the Sheriff's Administration Building. The recommended program is distinctly limited in the time allowed for its production. Because of these and other differences, the following general schedule seems indicated. These steps are time-ordered.

The procedures involved in the production of this document are simple but nonetheless important.

1. The project should have been approved by the Board of Supervisors in the long-range capital budget. This budget contains an estimated project cost which, in all probability; will be changed as the project program is produced. Nevertheless, this approval should exist.

2. The Project Director and the CAO analyst meet to review the list of candidate consultants produced by the Architectural Evaluation Board. Based on their negotiation, a contract assigned with a programming consultant. Essentially, the consultant and the CAO analyst serve as advisors to the Project Director. These three constitute the programming team.

3. The team meets with the client department to establish a schedule for producing the program. The schedule should be three months or less for most projects, or six months or less for particularly complex projects, such as hospitals. Generally, the project budget will be produced by the CAO, the description of the site and outline of the project will be produced by the consultant, definition of need by the client, and the schedule and project authorities and responsibilities by the Project Director.

4. A draft, loose leaf-bound copy of the program should be compiled for review by the County Engineer, the CAO, the manager of Real Estate Management Department, service departments, and the client department manager. Their concurrence with the document contents will be certified by all of them signing the project program, thereby agreeing to live within the boundaries and conditions of its terms.

5. A final copy of the program is transmitted to the Board of Supervisors for their approval.

Some of the steps involved in implementing the recommendation are:

1. Compile a list of all organizations who have the ability to produce project programs. Ask these organizations to submit detailed capability documents to the Architectural Evaluation Board.
2. Have representatives from these firms put on a comprehensive seminar for Project Directors, concerning project programming techniques. The seminar should require at least 40 hours.
3. Evaluate the usefulness of architectural programs produced to date. This evaluation is required because architectural programming is one important component of the project program.
4. Select those projects in the long-range capital project budget which are determined to require a project program. Pre-prepare project program costs for the capital budget.
5. Prepare a project program for the first project.

4. MANAGEMENT OF ARCHITECTURAL CONTRACTS

Recommendation: That the Board consolidate the responsibility of preparing and negotiating architectural services are events and for monitoring, directing, validating, reviewing and approving design work according to agreed-upon schedules and statements of work.

DISCUSSION

Design, in this recommendation, includes all architectural work subsequent to the project program and preceding construction. This includes the production of schematics, preliminary drawings & plans, working plans, and specifications according to the requirements, schedules, and budget established in the project program. Design management and control, then, is the County's entire system of utilizing internal and external resources to produce the drawings and documents which ultimately become instructions to the builder and subcontractors.

The important point of the recommendation is to ensure fairness to the contract architect and timely delivery of an adequate product to the County by changing the basis of the architectural services agreement. The new basis would be a work statement that details the work to be done by the architect, criteria for its acceptance, its costs, and schedules for its completion. The County would provide assurances of timely reviews by the County and other participating agencies, as well as the usual protections against abandonment, cancellation or suspension.

This recommendation is also designed to correct the few remaining problems that pertain to architectural services. Of these, one of the most serious is that, during the early stages of design, it is never quite clear who the architect is working for. He has been appointed by the Board, negotiates his contract with the CAO, has to satisfy the tenant department, and has his designs

reviewed and approved by the County Engineer. Moreover, the County sometimes appoints architects before there is sufficiently clear definition of the need for a facility, or before serious site or funding problems have been solved.

Our investigations indicate that the Architectural Evaluation Board is working well and exactly as planned. The AEB has succeeded in broadening the base of architects qualified to do County work and has protected the County from selecting unqualified firms. However, the lack of direct involvement of the County Engineer in the selection and negotiation of Architectural Services Agreements inhibits his ability to schedule and control the progress of design. We believe that the County Engineer should be requested to provide information and evaluation available on architects that are candidates for appointment, so that his prior experience can be used by the AEB. In critical cases, he could recommend opening negotiations with more than one firm.

One manifestation of difficulties in the way the County manages design is the time it takes to complete the design phase, which compares unfavorably with that of private developers. For example, in 40 completed projects, the average design time was 34 months and it was not unusual for project design to exceed this number. For complex County projects, such as hospitals or courts, design time averages about 40 months, while for more routine projects the average is 34 months. But it is common for private developers to design a hospital within 13 months, and less complex projects within seven months.

To be sure, one source of the problem has been inadequate architectural programming, a flaw which is now being corrected. More-over, some major causes of delay during design are out of direct County control, because of dependence on reviews and approval by State and Federal agencies. County departments which are responsible for producing project designs control neither the appointment of project architects nor the timing of budget allocations to projects.

Furthermore, the agreement with the architect is currently 1/2 negotiated by the CAO and inherited for implementation by the Engineer. Consequently, neither is in a good position to insist on standards, budgets, and schedules. Since the Engineer is responsible for the quality of the designs, we believe he should be allowed to define the work and negotiate the contracts, subject, of course, to CAO review and Board approval.

Time and cost are not the only reasons to strengthen the County's design management system. Not the least important is the vulnerability of the contract architect to the increased costs of uncompleted or modified work on a project. Although the agreement protects the architect against suspension or cancellation of the work, it does not compensate him for costs incurred when the County acts abruptly to decrease expenditures or to change the nature of the project. To be fair to the contract architect, the County must be able to meet its commitment to schedules set by the services agreement. As contract management improves, architects may be able to modify prices to County advantage.

The proposed system of design management and control would address the following elements: architect qualifications and performance review, architectural contract terms and conditions, architectural fee schedules, procedures for naming internal County representatives, concurrent design review when feasible, mandatory design review schedules, standardized industry-compatible design schedules and exceptions control, guide specifications, and continuously validated and monitored design costs and schedules.

Thus, our recommendation proposes changes in both the content of the agreement with the architect and in the methods of managing the work under the agreement. First, the contract agreement should contain a work statement describing the facility, expected

levels of quality, facts influencing design, design problems, and spatial or functional requirements. Second, a system of design reviews should be implemented to ensure that the County, external agencies, and the architect are strictly accountable for schedule and budget.

The work statement must contain complete instructions to the architect and be used in negotiation. The instructions go far beyond the breakdown of cost by "portion of the work" that is currently used (see Table 3) to name the kinds of products and services to be purchased from the architect. For major projects, the work statement would be based on the project program as defined in Recommendation 3. For all projects, the work statement would contain sufficient delineation of standardized and non-standard project requirements to provide a basis for fee negotiation.

TABLE 3

1. PRELIMINARY	7. TRAVEL TIME
2. CONFERENCE	8. TRAVEL EXPENSE
3. WORKING DRAWING	9. SPECIAL (MISC.) COST
4. SPECIFICATIONS	10. REPRODUCTION
5. SUPERVISION	11. ENGINEERS
6. PROJECT ADMINISTRATION	

The contract would also contain provision for scheduling the work, including expected delivery dates, length of review cycles, and payment schedules. Fees would be negotiated on the basis of work performed against the work statement rather than on the degree of completion of a drawing phase, as is currently practiced. This would lead to decreased dependence on early

construction cost estimates as the basis for fees and to increased precision in describing the architectural and engineering work involved and its costs.

Changes to the County's procedures for procuring and managing architectural work are also necessary, in our opinion. First, the County Engineer should be responsible for preparing, negotiating, supervising and administering all architectural services agreements. In particular, negotiation by the CAO should be discontinued. The CAO would approve contracts, budgets, and schedules for implementation by the County Engineer. Second, and most important, a strict schedule for design reviews, plan checking, building and safety and interdepartmental processing must be established and strictly enforced within the County. The Board could make departmental adherence to the schedule mandatory by policy, and include assumptions of approval in the case that schedules are not met.

The County appears now to be at the mercy of other jurisdictions, external agencies, and granting authorities when it comes to meeting design review schedules. As R. . Reich of the County Engineer's office points out, there is nothing to stop the State Fire Marshall from ordering a \$300,000 change to a facility while under construction if his approval is assumed.

Nevertheless, the County can and should take some steps to improve the situation and reduce the risk of schedule slippages and design modifications caused by outside authorities. Many agencies may be willing to negotiate conditions under which they will accept the County's review or allow the County to assume approval after a specified time has elapsed. Others may adapt to a County system of reviewing design work in progress or onsite, or during early stages of completion. For some agencies, their inclusion in programming stages may be adequate to ensure their attention to schedules when their design checks are required by law. We are confident that a system can be established.

The nature of design review should also be addressed in the new management system, and criteria established for its level and quality. Code conformance and drawing accuracy or completion must be included, but they form a relatively minor part of the work. Is the design up to the current state of the art? Does it conform to the project program? Does it have innovative features? Does it provide for code or technological changes expected in the near future?

Still another aspect of design management deserves emphasis, namely, the evaluation of architect and participant performance. The Architectural Evaluation Board (AEB) should receive pertinent information about the performance of architects as the work progresses and after completion. This information will supplement the Board's ability to use past performance as one criterion in reviewing the qualifications of architects for planned jobs. Performance evaluation should incorporate measures of delivered work quality, the necessity for changes to ensure conformance, the architect's success in interpreting codes and standards without direct County supervision, adherence to the program(including schedule and budget), the technological level of the concepts used, the effectiveness of the architect's job management, and other relevant factors.

IMPLEMENTATION

Acceptance of this recommendation by County departments is generally high, except for some question of the most appropriate methods to use to enforce design review schedules. Since much of the current design review practice is intertwined with interpretation of codes and code changes, there is a high potential cost of assuming external agency approvals in order to proceed with the work.

For example, on Martin Luther King, Jr. Hospital, the County proceeded under the assumption of approval by the State Fire Marshall,

who later mandated a \$300,000 supplemental agreement. It is not clear whether this could have been averted by careful, scheduled, internal reviews. The incident points out an interesting act, and suggests the need for additional analysis by the County. The fact is that while plan checking, building and safety, fire safety, and other code conformance reviews can easily be carried too far, take in too much detail, or take too much time, the trade-off between identifying and correcting problems in design phases and missing them during design and fixing them later are not well understood. The optimal cost and balance between internal design checks and waiting for external reviews should be determined and adhered to by the County. In the case of grant financing, the schedule is set by the granting agency, not the County.

Other agencies, such as the Federal General Services Administration, have introduced or are considering a design management system to fulfill the necessary coordination requirements while at the same time reducing the number of sequential, in-house agency reviews. For example, reviews at the architect's site are feasible and effective on a drop-in basis. Selection of architects can be based on clearly enunciated and published criteria, such as previous performance on similar projects, design creativity, conformance and compliance. Mandatory schedules for external agency reviews could be assigned with the stipulation that agency approval would be assumed if the schedule is not met.

The appropriate County organization to implement this recommendation for immediate improvements is the County Engineer. The business and contract management activity called for is an appropriate function of the Building Projects Management Office defined in Recommendation.

Legislation, as such, is not a problem for timely implementation of most elements of this recommendation. However, it will be necessary to negotiate the appropriate methods and terms of

design review schedules with external agencies and to coordinate 3/4
The requirements of internal agencies for meeting schedules.

Full scale implementation of all aspects of the recommendation could take up to one year from the time of Board adoption, because of the necessity for coordinating certain aspects with external agencies and other jurisdictions. However, most of the major elements of this recommendation are related to internal County management policy, and could be accomplished within three months of adoption.

Major steps of implementation include:

- Development of complete guideline content specifications governing work statements to be included in architectural services agreements.
- Transfer of responsibility for preparing and negotiating architectural services agreements to the County Engineer, including establishing requisite controlling authority and administrative procedures in the CAO.
- Coordination of new contracting and negotiations of new County scheduling requirements and methods with State and Federal authorities and dissemination of review scheduling and methods instructions to County departments.

Full-scale operation of this recommendation would involve no additional costs to the County. It can be accomplished by current staff, and primarily involves a shift of emphasis in the management process.

5. EVALUATION.

Recommendation: That the Board require continuous, unified, and formal evaluation of current and completed projects and annual evaluation reports on the performance of the management system and progress of the County's total capital facilities program.

DISCUSSION

The important point of the recommendation is the unification of evaluation activities at all levels of the total County facilities program and of individual projects. We also propose to make evaluation more formal than it is now. The primary purpose of evaluation is to provide an experience base for three activities of management: planning, corrective action, and system improvement. At the level of the total County program, evaluation includes a) assessing the practicality, utility and effectiveness of the management system, and b) determining the effectiveness of the total capital facilities program in light of County service objectives, requirements and plans. At the level of individual projects, it includes a) analyzing current and completed projects as to progress, performance, schedules, and budgets; b) determine the effectiveness and cost effectiveness of the building technologies of the project; and c) establishing the conformance of the projects to requirements of the project program, law, and current levels of service technology.

The methodology of evaluation is to determine modifications and corrective action by comparing existing factual results to plans and programs or by comparing plans and programs to needs. The requirement of making evaluations useful is necessary in order to ensure that the information generated by the comparisons is fed back to the appropriate points in needs analysis, planning, programming and management so that it can be integrated, unified and absorbed.

Thus, to be effective, evaluation must be continuous; it must flow through the entire system as current, empirical information. It is not a phase of project development, and it is not preparation of a periodic report, although it contains both.

Many current activities of County departments would form significant parts of the proposed evaluation system at the project level. Plan checking, building and safety, and design review by regulatory departments would be included, as would the testing and experimentation of the Mechanical Department, on site inspection or observation, and client reviews of design. There would also be some functions that are not now practiced, such as post-occupancy reviews of project programs and comprehensive reporting on contractor performance during design and construction. Finally, project level evaluation is rounded out by integrated review of completed projects. Did the project program effectively account for client requirements? Does the facility conform to the program? What were the causes of changes not anticipated by the program? What were the causes of design flows, schedule slippage and budget extensions? How does the level of building technology compare with that of similar projects built in the same timeframe?

At the level of the total County program, the evaluation system would integrate and unify results from all individual projects, and further, would isolate and correct aspects of the management system that are revealed as problems. Analysis of needs for the facility would be based in part on experience of the County with facilities to house the same or similar services, and the planning of budgets, finances, and commitments would thus be improved.

We do not intend to attribute projected savings or goals to initiating the recommended establishment of formal and unified evaluation. Without some evaluation, the system is not likely to work at all. Progress in making gains based on recommended

improvements will be impeded as long as the evaluation system remains as fragmented and* diffused as it is currently. Savings will become visible as the planning, programming, and management of projects improve, based on careful feedback of evaluation of experience

Construction trends toward industrialization, systems building, and construction management will intensify the need for evaluation as they gain momentum. This will result in the need for information about broader ranges of alternatives and, hence, for all available information about the cost and effectiveness of previous applications.

Some other jurisdictions use formal project evaluation in their capital improvements system. In particular, both the Federal government and the university system of the Church of Latter Day Saints of Utah prepare and continuously update general and performance specifications for all projects, based on evaluation. This has the effect of providing architects more freedom to choose reduced-cost alternatives without compromising function or quality.

IMPLEMENTATION

Prior to formation of a facilities department, the organizations affected by this recommendation are the CAO, County Engineer, and County Construction Commission.

We recommend that the CAO be held responsible for unifying evaluation to update and correct the overall capital facilities program and the facilities management system. This includes (a) project cost analysis during preliminary planning stages (before the architectural program); (b) utility assessment after project completion; and (c) review and analysis of architectural programs before approval. The CAO also would perform annual evaluation of the overall capital facilities plans and management systems

to determine necessary modifications and corrective actions. Finally, the CAO would develop and disseminate guidelines and procedures governing the evaluative function of County project administration and management.

We recommend that, for the interim, the County Engineer be held responsible for assessing all operations during project implementation, including the programming, architectural, and construction stages. He reports to the CAO all evaluative information generated by his office regarding the project and its status, but retains in his office the responsibility to conduct and complete the project. The Engineer would determine and report on the performance of contractors, architects, and consultants, and would monitor the status and progress of all projects

The County Construction Commission was asked to conduct review and evaluation activities by the Board of Supervisors on July 25, 1972. However, its role, as defined, is limited to review of pre-construction stages.

The steps to implement this recommendation could be taken immediately, anticipating full-scale operation of the evaluation system within one year.

6. LONG RANGE BUDGET

Recommendation: That the Board of Supervisors direct the CAO to prepare and submit annually a six-year capital projects program budget, to be maintained and updated annually.

DISCUSSION

The capital projects program would a) show the current and future financial impact of completing currently approved projects; b) list projects for which architectural programs will be initiated or completed during the current fiscal year; and c) provide a preliminary schedule to be initiated in future fiscal years. Then approved by the Board, the capital projects program becomes an official list of those projects which will be programmed or initiated during the current fiscal year.

The six-year capital projects program is a document which defines the County's current and future needs for new facilities and reflects the estimated fiscal requirement of these programs. The first year of the six-year plan should be the current fiscal year. All current and projected facility requirements should be included in the program so that the document contains all probable County demands for new facilities and indicates the funds needed to support development of these facilities. The document should list three kinds of projects which are included in* the program:

1. Approved-Programming Completed -- These projects usually will be in either the architectural design or construction phase. Development of the facility will have been approved by the Board of Supervisors, and the County will be committed to funding the projects.

2. Not Approved-Programming or Initial Architectural Work Planning This Fiscal Year -- These projects are not yet approved by the Board of Supervisors for development, but the CAO and client

department head have agreed that a priority need for the facility probably exists and, therefore, a detailed project program should be prepared. However, inclusion on this list would not mean that the County was committed to building the project.

3. Required But Not Approved-Not Scheduled for Programming --These projects are anticipated for future years on the basis of client department planning. They should be projects expected to become high priority at some future time and requiring County action during the six-year planning period. To be included in this category, projects should be submitted by the major client department on the basis of projected need.

The six-year capital projects program would serve to collect expected future needs in one document. It would also authorize the County Engineer to expend manpower and funds to prepare project programs for specific projects during the current fiscal year.

An annually-prepared, six-year capital project program would save administrative costs; would provide an excellent overall view of County capital project needs; and would serve as an annual plan for architectural programming activities.

A comprehensive program would reduce the "crisis management" aspects of programming and initiating new facility development projects. Most County needs can be anticipated well in advance and project development could be integrated with other projects in an orderly and timely manner. When a crisis project does come up, the plan would provide the information needed to decide which project(s) to defer in order to accommodate the new high priority project.

The County has prepared similar six-year capital projects programs in the past. However, the most recent update of the program was in 1968, and even prior to 1968, the County only revised the

program every two years. The absence of an annually updated program is a contributing factor to the confusion and crisis nature of the administration of capital projects. Without the perspective gathered from a multi-year plan for facilities development, it is almost impossible for decision-makers to assign priorities or allocate limited resources to specific projects. Most facility development projects are several years long and each project is part of an overall facility development program needed for each department and the County as a whole. The best way to visualize the County's overall development is with a multi-year program, which shows the time phasing, and multi-year financial requirements of projects.

The majority of private business organizations have multi-year (usually three, five or ten years) plans for all capital budget projects. Many government organizations have multi-year capital facility development documents. The value of those documents is in the improved decision-making which results in better establishment of priorities, fewer crisis programs, better phasing of various projects, and less administrative confusion.

IMPLEMENTATION

Preparation of the six-year capital projects program would be the responsibility of the CAO. He would assemble departmental requests for new facilities and assist in establishing the estimates of costs and schedules for each project needed for planning. The CAO would be responsible for approving the list of projects for architectural program development in the next year and would approve the cost estimates.

Implementing this recommendation would require an administrative analyst approximately half time and a clerk typist half time to maintain and update the six-year capital projects program. In addition, CAO personnel will be evaluating projects, preparing cost estimates establishing priority lists, and scheduling projects.

The six-year capital projects program document should not be thick and costly to publish. It should contain lists, costs, and schedules for projects in progress, projects planned for programming this year, and projects anticipated in future years. Extensive descriptions are not required. The program should be a working document guiding the County's facility development program. To be an effective working document, portions of it will require periodic updating (probably quarterly), but this can be handled by memo rather than complete reprinting of the document.

The contents of the long-range capital budget and the procedures and personnel responsible for producing the budget are well described in the annual for Preparation of long-range Capital Projects Program. " This manual was prepared in July, 1960:, by the CAO and will require some updating so that its contents con-form to policies and procedures that have changed in the past 12 years. It would be desirable if these procedures were bound together with general fund budget procedures to constitute a single, County-wide budgeting manual. In any event, this recommendation assumes that an updated set of the 1960 procedures will be used.

The product of adhering to these procedures will be a long-range capital budget containing all of tile elements appearing in the 1968 budget, plus a few additional elements. Without providing a detailed outline of the budget, its contents are intended for use by the Board of Supervisors to answer the following questions.

- What is the total value of capital building projects to which the County is committed over the next six years?
- What are the sources of revenue, which may be expected to offset project costs?

- What is the trend in capital expenditures over the past 30 years in relationship to other indicators of growth in the requirement for County services?
- What priority programs are scheduled (programming, design, and construction) for the next fiscal year? Are there sufficient revenues to support these programs?
- What are the very long-term capital financing commitments of the County?

These questions must treat all capital projects, including those through revenues of non-profit corporations, joint power authorities and bonds, as well as general fund monies, and grants. Adoption of this budget will mean that only a summary of capital programs will be required in the annual general fund budget. As a matter of policy, the Board of Supervisors should state that their approval of a capital budget is tantamount to all affected County departments' requisite authority to proceed with an appropriate phase of a given project. Insofar as practical, the Board of Supervisors should abide by this delegation of authority.

This recommendation addresses questions of planning and management, which are internal to the County. It is not expected to require any legislative changes. It could be fully implemented within three months of adoption by the Board. The preliminary document should be available within 90 days of adoption and include all projects in the first two categories (1. Approved-Programming Completed, and 2. Not Approved-Programming or Initial Architectural Work Planned This Fiscal Year). Future projects (Category 3. Not Approved-Not Scheduled for Programming) could be included in the first annual document which should be available shortly after approval of the next fiscal year budget (FY 73-74).

7. ANALYSIS OF FACULTY NEEDS

Recommendation: That the Board require expanded analysis of the kinds and amounts of space needed to properly house necessary County services and of the costs and benefits of alternative ways to provide it through acquisition, rental, or use of existing facilities,

DISCUSSION

The analysis will include, but not be limited to, a) determination of whether service agencies actually need requested space to perform their duties; b) inventory and analysis of existing space to determine whether decreased use and demand in one function can release space for the use of other functions and departments; d) determination of the most cost-effective alternative means of providing for future needs through acquisition, rental, lease, construction, or release of existing space.

The primary tool used by the County for facility program planning is the annual departmental budget request, which incorporates, from each department, a description of the proposed capital project, its priority in department operations, and itemization of the land and equipment (including land and construction estimates). The independent department requests are assigned priorities and approvals by the CAO and forwarded in the budget (and in the six year plan, when produced). The CAO analyzes the budget and negotiates with departments to clarify their needs and priorities. However, because of the independent structure of County functions and departments, there is insufficient integration and synthesis of requirements for space and there is very little analysis of alternative means to acquire it.

Comprehensive evaluation of needs and alternatives would unify departmental requests for space and compare the results to inventories and use of existing space. Gaps between the current or future needs and the inventory form the basis of requirements for new space. A broad range of alternatives can then be considered, their costs estimated, and their suitability to the need evaluated. One alternative, for example, may be to convert existing space from one use or occupancy where demand is decreasing to the use or occupancy experiencing increased demand for services.

Such analysis, which should be summarized annually in a report to the Board, would introduce an element of careful consideration of needs and priorities into the facilities planning process. Research of demand indicators and the temporal and spatial changes in population requirements for service will become necessary. Thus, for example, future needs for expanded services and facilities in outlying or undeveloped regions of the County would be anticipated and incorporated in the countywide plan.

Needs analysis also would supplement the cost-benefit analysis which sets levels of capital investment for current and future years.

Los Angeles County would be applying methods commonly used in industry by introducing such a system. In terms of governmental practice, however, it would be innovative, since very few units of government currently practice it.

What the system would require is a detailed basis for measuring the needs of the population for services; comparison of service levels and existing programs to those needs, for all County departments; and in-depth analysis over time of the relationships between facilities and their location and required service patterns.

IMPLEMENTATION

The most appropriate organization of the County to perform the research and analysis of needs is the CAO. He would draw on the resources of the Regional Planning Commission for population projections, environmental analysis, and consistency with the County's general plan. It will also be necessary to draw heavily on County service departments, who should be required to produce comprehensive service programs and plans. This requirement is presently being detailed by the FAMS Committee, as part of the Program Definition Phase. Other cities and counties may also have useful inputs to needs analysis, such as for contract services in the case of cities and for methods of analysis and regional back-ground data in the case of other counties.

Implementation would not require legislative or policy changes.

The County can begin to produce annual reports on facilities needs with its current resource, at no additional cost. The County thus should start the activity now and produce analyses of the needs for service and facilities as the CAO currently does.

8. POLICY COMMITMENTS

Recommendation: That the Board require the establishment and enforcement of a systematic method for making timely and favorable County policy commitments for land financing, and project program plans, and the budgets and schedules contained therein.

DISCUSSION

The important point of this recommendation is to improve the way the County makes decisions that determine assets, services, obligations, budgets, and expenditures of the future. It pro-poses that County should conduct much more financial analysis before making policy commitments to services, land or facilities and that the Board should be informed of the implications of all alternatives prior to commitment.

We have determined that the current level of obligations and policy commitments to land and facilities for 1976 is about \$411 million, and rising. To be sure, the Board requires and receives information regarding the alternative means of financing certain major projects. Nevertheless, we believe that this is another case in which the County's ability to make informed decision is impeded by the fragmentary nature of the information system, by the use of the budget as a temporary control tools, and by the step-by-step nature of decision-making processes.

We estimate that introduction of the recommended improvements to project management and project procedures will reduce the time it takes to acquire a facility by one year, on the average. One effect of this will be to provide decision-makers with the flexibility to manage an additional year's worth of borrowing power. That is, it will be possible to either accelerate or decelerate investments in facilities based on need for services, desired levels of service, financial advantage, trends in cost or availability of land, and other investment factors.

Management of this benefit will take place on the levels of the total County facilities program and on a project-by-project basis. On the level of the total program, the question will be how to arrange priorities, schedules and budgets among the various services in need of facilities so as to optimize the trade-offs among methods of financing, total obligations, and provision of services over time. On the level of individual projects, the question will be how to relate the timing of land purchases, financing, and project program planning to optimize trade-offs between scheduled occupancy and the long-range costs of financing the project. Alternative methods of financing and the range of options for land acquisition would also enter into the analysis.

IMPLEMENTATION

We have recommended that a system be established to accomplish the objectives mentioned here, but we have not determined its content. The first job would be to unify those elements of financial, land use, land and services analysis that now take place. The second step would be to define the analysis capability in terms of the decisions it supports. This step is under way in the form of the Facilities Acquisition and Management System Committee determination of a Program Development Planning System which contains a service program and a facilities needs analysis.

The appropriate organization to implement the recommendation is the CAO, who would conduct the investment analysis and other analyses of alternative policy commitments in the future. There is no legislation or cost associated with implementation of this recommendation.

9. DOCUMENTATION OF PROCEDURES

Recommendation: That the Board direct the precise definition and unified documentation of the current steps, organizational assignments, forms, policies, rules, and procedures that govern the provision of space for County activities.

DISCUSSION

The suggested document would contain a flow chart of the overall process phases, flow charts of the major steps in each phase, reference to state or local law as it applies to each step, a numbered copy of each major form used to record or report on activities in each phase, and a description of organizational responsibilities associated with each phase. The purpose of the manual is to specify policies, procedures and rules which apply to all County agencies, which have been formally adopted by the Board of Supervisors and that, taken together, define the boundaries within which all County employees must work in order to produce capital facilities rapidly and economically. Generally, this manual will result in some internal, indirect savings such as may be associated with reduction in training time for new personnel. These and other savings are not easily evaluated.

A major element of these procedures should be an explanation of the way in which citizen input is solicited and used. Input from a community or a Board appointed citizens committee may include their suggestions, recommendations, criticisms and review of a project in terms of need and location, services to be provided, and social, economic and environmental impact.

The purpose of including citizen input procedures in this document is to tighten informal policies now carried out by various County personnel. The formalizing of citizen input and review would: 1) provide individual Board members and their Deputies with a uniform way to respond positively and favorably to

inquiries regarding citizen input on specific projects; 2) reduce any communication problems that may exist among the Board, CAO, tenant departments, County Engineer, and other departments; and 3) direct citizen input and review to specific County personnel who are actually responsible for planning and consideration of their input.

The County has over 200 projects of all types in the planning stages. These projects involve the Board, CAO, County Engineer, tenant and service departments. With no formal policy established, citizens may direct their input to any of these departments. Some projects, like Model Neighborhood Community or Child Care Centers, require citizen input and review as a condition to receive construction funds. Federal or State agencies set detailed requirements to assure citizen involvement. Other projects, like the Chief Medical Examiner's building or the expansion of the Central Plant, would require no citizen involvement. However, certain projects like probation or welfare district offices usually will receive unsolicited citizen input and concern. This recommendation would permit the County to establish a standard procedure not only to solicit citizen involvement, but to receive and implement it.

Other government agencies were contacted to determine how they solicit citizen input. Some of the methods used are: 1) naming a coordinator or liaison for the project; 2) involving supervisors and/or their Deputies to provide names of community leaders and groups; and 3) notifying the citizens through meetings or other means that their input and review is wanted. School districts and community action agencies usually require citizen input and review on all facilities affecting the community. Few public works agencies have a written, formal procedure to solicit citizen input and review. They operate as L. A. County does in this area, and benefit from an informal procedure because their capital project budget is much smaller.

The County of Los Angeles has the largest capital facilities acquisition and maintenance requirements of any County in California or in the entire United States. Fulfilling these requirements involves State, County and local agencies, and hundreds of personnel. Furthermore, many of the requirements are in flux because of changing staff, modifications to law, or changes in interpretation of prevailing laws, ordinances, procedures and rules. In order to keep track of these requirements and to clarify the locus of appropriate authorities and responsibilities, a formal system description and manual of procedures are suggested. Inasmuch as County requirements will change, intentionally and unintentionally, this manual should be subject to an annual update.

The County of Ventura has produced a simple manual which serves well the purpose of maintaining internal control. Ventura County management also contends that the amount of time required to train new personnel, using their flow charts and manual, has been greatly reduced. In view of the number of personnel involved in the Los Angeles County process, the use of such a manual for training new staff is an especially attractive aspect. Other counties in California, such as Santa Clara, have developed very comprehensive manuals of procedure which also frequently contain design and construction standards. The Table of Contents for the "Procedures for Architectural Services" from Santa Clara County is shown in the following pages. Figure 11 is a diagram of a portion of the County of Ventura capital program logic flow chart.

In the County of Los Angeles, there are a number of documents that constitute portions of the manual that is the subject of this recommendation. All that is required is to collect the documents, make modifications to reflect current conditions, insure procedural continuity, and seek approval by the Board of Supervisors. The existing documents are the following:

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1. The Facilities Acquisition and Management Study (FAMS), as a result of working with subcommittees containing most County departments, has acquired a fund of detailed knowledge regarding present approved and, ad hoc procedures, forms, rules and modes of operations. They have also discussed the shortcomings of present and proposed methods.
2. The E&E Task Force has produced a flow chart and system description of the present capital facilities process. This work is contained in Chapter II of this report.
3. The CAO, in 1960, produced a "Manual for Preparation of Long Range Capital Projects Program. " This manual is somewhat out of date but contains the essential activities required in one phase to produce a capital budget. This manual should contain some of the additional material reflected in the recommendation concerning capital budgets.
4. The County Engineer has prepared an "Architects and Engineers Manual," a construction "Project Inspectors Manual," and a construction "Project Managers Manual. " If some of the recommendations contained in this report are adopted, the contents of these three CE manuals will change. In any event, these manuals areas much as two years old and do not reflect some of the information, such as forms, which are used in the capital facilities process.
5. The CAO has produced procedures for the general fund budget, which should be adopted as part of the proposed manual.
6. Some of the County departments have produced manuals of procedures as they bear on internal operations. These documents should also be considered in preparing the overall' County procedures manual.

While there is other documentation that should be considered, these are, nonetheless, the most important documents.

The effective use of this manual will depend upon the explicit support provided to it from the Board of Supervisors and County line management. From the Board's point of view, this support could take the form of explicit policy statements. For example, the County of San Diego has compiled a "Board of Supervisors Policy Manual." This is an extremely convenient public document formulated to clarify as much of the County policy as is practical. Los Angeles County and its citizens could benefit from the existence of a Board Policy Manual.

IMPLEMENTATION

The County organizations most directly affected by this recommendation are the CAO and the County Engineer because they are producers and principal users of the manual. The Clients and service departments must also participate in producing the manual because they will be expected to adhere to its requirements.

The costs of producing the overall County capital facilitates manual should require six-months of professional staff time and two man-months of clerical staff the first year. Each year thereafter, a total of two man-months should be adequate to update the manual. These estimates do not cover participation by service and client department.

They comparatively simple procedures to produce capital facilities manual include.

- Assemble all existing documentation currently in use to facilitate production of County facilities.

(NOTE: Page 82 is on the reverse side of page 80.)

- Produce a draft copy of the manual.
- Provide one month for concurrent review by County agencies.
- Review the draft with outside organizations since they will be required to adhere to the terms of this manual.
- Produce and review a final copy of the manual.
- Submit to the Board of Supervisors for their approval.

The product of these procedures will, hopefully, not be as voluminous as the present component manuals taken together. In general, the contents of the proposed manual should include the following material.

1. Flow charts of work logic at three levels. The level of these charts should be gauged to the Board of Supervisors, department managers and capital facilities working staff, in that order of increasing detail. The charts should be of the decision logic type, e. g., Chapter II charts, and of the task- responsibility type, an example of which is shown in Figure 12, for the County of Los Angeles.

2. A phase-by-phase description of the entire capital facilities process. This would be modeled after the "Architects and Engineers Manual" in describing the process from beginning to end for all County departments.

3. A summary of all major forms and reports used during production of a facility; This section will perhaps be most difficult inasmuch as the current system uses controlled forms, uncontrolled forms, and could benefit from the introduction of some new forms

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while eliminating others. Reports described in this section will include, among others, the long-range capital budget, the project program, and evaluation report.

No legal requirements are anticipated.

10. INFORMATION SYSTEM

Recommendation: That the Board direct establishment of formal information systems to support executive planning and control, project management budgeting scheduling, contract administration and performance evaluation.

DISCUSSION

The reporting system will include (a) concise periodic progress reports; (b) scheduled special purpose reports; and (c) project reports. The CAO will require the County Engineer and others involved in facility planning and production to make reports, have project meetings, and keep files according to the reporting regulations the CAO establishes. The system will centralize forms management and control functions. It is intended that this system be used as* a capital projects information system designed primarily for Board decision-making purposes. It also should serve all agencies involved in capital projects.

The development of this information system must be regarded as a means of improving the effectiveness of Board decisions and the efficiency of internal County administration. Immediate savings that result will be realized in overhead costs, but they will not be clearly measurable without formal project cost analysis. Long range savings are also probable, since decision making will improve as the information supporting it improves.

An organization with a long-term commitment of six hundred million dollars in capital facilities, and an annual pay out of 70-100 million dollars inevitably must contemplate a system of collecting data on its expenditures. The data would be used to analyze financing requirements, expenditure trends, and cash flow forecasts; record technical details; follow project schedules; report on organizational responsibilities; and define administrative and accounting requirements.

Responsibility for collecting data for these purposes presently shifts among the agencies, as the project moves from phase to phase. The result is that in order to trace a project or to retrieve relevant descriptive information about it, it is necessary to investigate up to 30 different sets of records each kept in a different place. Moreover, the records are inconsistent in form and content, making it difficult, for example, to discover what caused changes on a given project or how many facilities the County currently has in its inventory. It is impossible to formulate meaningful and precise aggregate statistics without considerable effort.

Perhaps the fundamental problem is that there are many agencies directly and indirectly involved in a specific capital project and, therefore, many data generating sources, but no single data collection agency. Individual agencies must maintain adequate records for their internal requirements, but these records also contain data which, when assembled from all collecting agencies, can be effectively used to review the total County capital facilities program. These sources can be regarded as direct and indirect. The direct sources are those whose principal mission is to work on capital projects, such as the County Engineer and the CAO. The indirect sources are those agencies whose primary mission does not have to do with capital projects, such as the County Assessor. In some cases, these agencies have attained a high degree of data organization to the extent that it may be automated or simply well developed. It is possible that these agencies could be used as the basis of the recommended information system in order to circumvent development of a redundant, special-purpose system.

The Land and Facilities Data Bank task force has begun work on this problem with the immediate goal of assisting the Real Estate Management Department in responding to a state law that requires the County to produce an inventory of all property which it

controls. This is due in December. The longer-term goal involves developing a more comprehensive file of land and facilities under the control of Los Angeles County.

This task force has based its work on the aforementioned existing files of data, which include the following.

The Assessors land parcel file. Since all facilities of any kind are on one of the approximately 1,800,000 parcels of land in the County, this file is a fundamental indirect source. It presently records such items as map book, page, and parcel number, legal description, address, summary soils and drainage data, ownership, applicable tax codes, parcel dimensions. The file records are designed to accommodate this and other data for publicly-owned parcels (coded 200-299 and 900-999). This file is automated, it is possible that the records for public parcels could be expanded to add, for example, data describing public buildings located on a parcel.

County Engineer supervisor district project report. This file contains data on project schedule, dollar value, personnel assigned, etc. Procedures should be developed to add information to the file, at minimum expense with minimum effort, from the Construction Division's 3x5 card summary of each project, and the basic project files in the CAO and Construction Division offices.

Board of Retirement payment records. This direct file, covers only one source of finance data on County buildings. Nonetheless, it is an accurate file of data consistently maintained over the past years to reflect payments made on Board of Retirement financed projects.

The recommended system would formalize the required information transfer and record keeping systems, so that the County Engineer could prepare periodic summary reports for his own management and for the use of the CAO and Board.

IMPLEMENTATION

The principal responsibility for this recommendation lies with the County Administrative Officer. His role should be to develop a plan of action, to define the Board requirements on the system, to solicit the County Engineers system requirements, and to plan the use of resources to meet these requirements on a fixed schedule. The requirements and procedures of system use should also be developed by the CAO.

In the long run the impact of success or failure will lie most heavily with the Board of Supervisors, the Building Project Directors, and the CAO Capital Projects Division, in that order.

The cost for this system could be very high if planned development consumes much time because of bureaucratic inertia or the system is more grandly conceived than as represented by this recommendation. The existing staff of the direct and indirect data source agencies should be used, and some small portion of their time will be a cost, and approximately six months of information system analysts in the CAO will be required.

The system will produce reports of three general types. The first two reports, overall progress and scheduled special purpose reports, are produced primarily to inform the Board of long-term, policy-oriented action, or to respond to Board and CAO requests for information on program status. The third, project reports, are produced to enable the projects director to direct and coordinate projects within his range of responsibility and for the County Engineer to monitor the status of all current projects.

These reports will be of maximum usefulness if the content of each report is specified first in terms of its use, and then available direct and indirect sources are considered to determine how they can contribute to the reports.

In very general terms these reports should contain at least the following types of information.

- Number of projects, aggregated by dollar value, currently in the pipeline by phase.
- Graphic presentation of location of present facilities, planned facilities, and publicly owned parcels throughout the County.
- Total current and scheduled payments to architects and contractors and three-year plan of new obligations to these sources.
- Tabulation of long term financial obligation, by type Board of Retirement, bonds, joint powers authority, nonprofit corporation by total annual dollar amount and as a percentage of the total County budget.
- Report on the total square feet of floor space available for use, amount currently in use, additions planned over next three years and book value of facilities owned.

The level of detail required for these, and other categories of data, will vary depending on whether the report concerns a specific project or the entire capital facilities program.

This recommendation can be implemented within six months of adoption by the Board.

11. QUALITY AND SPACE POLICIES

Recommendation: That the Board develop and adopt guidelines establishing the Board's standards governing facility quality, durability, life expectancy and control of space allocations.

DISCUSSION

The recommended policy would make explicit the Board guidelines affecting a facility's durability and the efficiency with which it can be used and cared for. It encompasses design features that affect the operations of the tenants, safety of use, maintainability, and space allowances; and it includes material features that affect the efficiency of the tenants, building wear and hardware replacement, and life cycle costs. It excludes the physical specifications of a given material once selected. The purpose of such explicit policy is to ensure that each project results in provisions of an appropriate level of public services, the needs of the tenant departments, the requirements and expectations of the specific constituency to be served, and long range cost. Thus, it would consider the range of construction types and exteriors, the range of materials that can be selected, the level of building technology, and spatial and amenity standards.

Operationally, this definition implies, for example, the reduction in uniform use of building materials and hardware by encouraging the architect to submit several concepts for each project. It also would require a periodic evaluation of costs or benefits associated with building types and life expectancy. A periodic inventory of facility space is required to maximize the use of facilities, thereby maximizing benefits gained for costs incurred.

According to national averages, adjusted for regional and local peculiarities, a library (for example) can be built cheaply at \$15.65 per square foot, or expensively at \$80 per square foot. As further examples, courts range from \$19.75 to \$51.60 per square foot, jails range from \$17.80 per square foot to \$50 per square foot, parking structures range from \$6.35 to \$36.90 per square foot, police stations from \$18.10 per square foot to \$64 per square foot, hospitals from \$20 per square foot to \$*7 per square foot, and warehouses from \$3.70 per square foot to \$38 per square foot.*

It is clear that the range depends mostly on decisions about what is required of a facility, taking aesthetics, function, and expected life cycle into account. Sample costs of some County facilities are shown in Table 5. These costs appear to fall at the midrange of experience, which may be the place that they should fall. However, the recommended policy would establish the expected level of quality in terms of appearance, durability, etc. Many of these decisions are currently out of the control of the County. The major aesthetic decisions are up to the architect, who in Los Angeles County is selected without regard to the kinds of aesthetic alternatives there may be to his design, since he is selected before any alternative designs are considered. The County does have some influence on the type of construction, depending on occupancy, through its Building Code. The County can also state preferences for certain materials and design features during plan review stages and, prior to plan preparation, through documented professional standards of architects and builders. Nevertheless, the County does not have the option of selecting from a range of different building concepts and costs that are connective and based on benefit cost requirements.

* These cost "ranges" are the lowest and highest found in a sample of 7,500 projects located throughout the U. S. They exclude architectural fees and land costs, and are based on early 1972.

TABLE 5
Sample Unit Area Costs for
Los Angeles County
Facilities

Project	Bid ¹	Gross Area ² (sq. ft.)	Actual Cost ³ Per Sq. Ft.
Olive View	\$19,866,000	609,626	\$34.08
Health Dept. Adm. Building	10,130,000	267,883	38.46
Mall-Phase I	6,975,000	450,000	15.96
SE Dist. Court	6,680,000	195,594	34.90
Mall--Phase II	6,196,000	432,753	14.49
San. Fern. Juv. Hall	5,000,000	205,522	25.11
Van Nuys Courts	4,960,000	185,220	27.36
DPSS Bldg. Plant Bldg. Garage	4,200,000	118,882	21.93
		417,847	4.13
So. Bay Courts	3,978,000	148,350	30.06
Bev. Hills Courts	3,749,000	177,007	23.85
City Health Dept. Bldg	1,099,000	46,236	24.40

¹ Original Construction Bid Price

² Includes Buildings, Garages, Plants

³ Cost Computation: All Contractor Payments/Gross Area
(not adjusted for inflation)

The questions related to basic aesthetic and quality decisions are matters of intangible values, public preferences, and professional competition, and are related to more tangible matters such as future costs of maintenance and custodial care, efficiency of operation, and safety. Even the more tangible background, although often based on well-designed and documented evidence such as comparative studies of carpeted versus composition flooring, can be questioned.

Thus, the examples offered above are not put forth as matters of fact, but are presented as illustrations of the kind of decisions that this recommendation proposes for each project. That is, each project should have associated with it some guidelines addressing the tradeoffs between aesthetic image of the resulting facilities and their functional efficiency characteristics. And, given such guidelines, the County could consider alternative concepts of several architects.

The civic center complex is a model of highly efficient, functional design that makes no compromises for aesthetics. Some architects interviewed in the course of study contend that the resultant image is unsightly and cold, hardly welcoming the public as customers, but rather presenting the image that the public are items to be processed through highly-efficient and busy County services. Some charge that it is ugly. Others charge that the materials and design used are overly costly, referring to stainless steel guards on escalators and to marble wall paneling. On the other hand, these charges are countered by the contention of those responsible for building care and maintenance that costs of wear and tear are substantially reduced by the use of such materials.

The Engineering building is old, and difficult to use efficiently for the business that must be conducted there. Moreover, the technology of the mechanical equipment is archaic and costly to maintain, while the flooring and wall paneling are nearly beyond restoration to sparkling and cheerful condition. Nonetheless, at least to some observers, the facility presents a warm and appealing image that welcomes those who have business there.

There are some other cases in point in private developments. For example, the developers of Century City clearly decided at the outset that the development would be a first-class center, designed with deeply considered tradeoffs between aesthetic features and cost or efficiency characteristics. The Del Mar Shopping Center shows the influence of major tenants on aesthetic and quality design decisions. And shoppers can sense the difference between the atmosphere of Westwood shops and that of efficiency-minded, warehouse-type, discount centers.

Decisions affecting the aesthetics and quality of facilities or complexes are not currently made by the County. Should a given facility be built for permanence? Should it welcome the public or present a neutral appearance? Should it be built to withstand the wrath of disgruntled clientele or welcome people who may need service? Should it emphasize the efficiency of county government? Some such questions can be translated in to numerical or design parameters such as gross to net floor area ratios, but most of them are questions of judgement related to the image that County government wishes to project with a facility from the highest policy level. This implies the necessity of considering the questions during facility planning and considering a range of alternative concepts before entering an architectural agreement.

IMPLEMENTATION

The major responsibility for performing the analysis and recommending the tone to be set by a building lies with the primary tenant. However, professional opinion of county Mechanical and Building Service Departments will also be required regarding long-range costs, and general guidance from the Board may be appropriate, especially in cases of major developments.

Implementing this recommendation is not expected to create additional costs of operation, provided the recommendations regarding planning, architectural programming, and design review are adopted. Minor costs of reviewing alternative concepts and communicating guidelines will be incurred in case those related recommendations are not implemented.

This recommendation could be implemented within three months of Board adoption.

12. PROGRESS ON RECOMMENDED IMPROVEMENTS

Recommendation: That the Board require a three-year program of monitoring and periodic reporting on the County' periodic implementing improvement to the facilities management system recommended by the Economy and Efficiency Committee.

DISCUSSION

The effectiveness of the improvements recommended by our Committee will be realized only if there is continued and consistent review of progress toward their implementation. Since the recommendations are expected to be implemented within a short period of time, the reviewing staff need be assigned to this task for no longer than three years from adoption of these recommendations

The staff will be required to (a) provide reports to the Board on a periodic basis, regarding the status of these recommendations; (b) provide continuity for lower-term recommendations; (c) establish the importance of viewing performance of the capital facilities systems as County functions that cross departmental lines rather than of departments individually; and (d) inter- relate information and systems based on a common set of County operations data but presently segregated because of organizational collection responsibility.

This recommendation provides, at low cost and for a limited period of time, a mechanism to be used principally to monitor the progress toward implementation of all recommendations. The concern should be whether the recommended improvement has been implemented on schedule, whether it has realized projected direct and indirect savings, has exceeded estimated costs, has changed conceptually during implementation, and is having a beneficial impact on County operations.

Most of the E&E recommendations are conceptually similar to potential improvements with which various persons and organizations in the County have been concerned. This concern has resulted in the formation of study committees and task forces, which in some cases have established firm schedules and attained the improvement objective. More often, however, the press of daily business and the interrelatedness of all County work have tended to inhibit results. The staff, which is the subject of this recommendation would simply seek to determine whether E&E recommendations, and, therefore, committee and task force work, have resulted in any positive action. In this sense, these recommendations overlap work of such groups as the County Construction Commission, Facilities Utilization Task Force, Construction Management Study Team, the Liaison Committee of the Association of General Contractors Los Angeles County Administration, the Land and Facilities Data Bank Task Force, the Architectural Program Work Group, and the Facilities Acquisition and Management Study Group (FAMS) and its various subcommittees.

These committees and groups have been working on various problem areas for some time. Their collective experience and knowledge, especially regarding the inter relatedness of the subject matter, should be channeled and monitored for progress. Where necessary, progress should be supported with appropriate resources. However, the E&E Committee strongly believes that corrective action to improve facilities acquisition is urgent and can be accomplished readily by the County without further study. Our recommendations are specific, and in each case call for observable results within a specified time frame.

One group which has been fulfilling the role of monitor coordinators is the Facilities Acquisition and Management System (FAMS) Steering Committee. With some small changes in their present orientation, they could serve the staff role defined by this recommendation. Their emphasis has been coordination, planning

details of a "preferred System" and suggesting interim improvements. These activities should be continued. However, since the E&E Committee recommendations have been finalized, the FAMS Steering Committee would be asked, essentially, to report only on work completed toward progress of implementing the improvements. A list of the various committees/groups of FAMS follows:

The FAMS Steering Committee provides policy guidance for FAMS and reviews FAMS efforts.

The FAMS Team plans the FAMS program, coordinates all committees and task forces, performs special studies, and prepares study reports.

The Land and Facilities Data Bank Task Force coordinates current departmental data gathering and reporting efforts and prepares and implements plans for developing a data bank.

The Construction Management Study Team investigates application of new contracting methods to Los Angeles County construction programs.

The Facilities Utilization Task Force, the County Construction Commission, the Associated General Contractors/Los Angeles County Administrative Liaison Committee, and the Economy and Efficiency Committee Construction Projects Task Force are all separate from FAMS but maintain liaison with FAMS.

IMPLEMENTATION

Measures and observable criteria which can be used as a guide in evaluating implementation of these recommendations are:

- The existence of specific, simple, number-controlled forms. (Recommendations 9 and 10)

- Computed overhead costs for processing supplemental agreements and change orders. (Recommendations 13 and 14)
- The existence of a project program containing an approval statement signed by the Board and concerned departments. (Recommendation 3)
- A document describing the overall County capital process for all phases. (Recommendation 9)
- Decreases in the number of parties required for coordination and approval of decisions accompanied by reduction of the time taken to process contracts, changes, and design reviews.

There are, of course, many other measures. These are noted simply to illustrate that the evaluation group may expect to see specific things happen; if they do not, something is wrong. The evaluation group should make a complete list of such measures. The CAO will have principal responsibility for implementing this recommendation. Only minor clerical and technical personnel costs are required for the recommended work.

13. SUPPLEMENTAL AGREEMENTS

Recommendation: That the Board require expedited processing of supplemental agreements for changes which are necessary for compliance with the approved scope, functional requirements, and budget allowances contained in the project pro-gram plan.

DISCUSSION

The Supplemental Agreement (SA) is a contracting procedure, which the County Engineer may use to authorize and implement the additional work tied to changes of capital projects. Changes for which this procedure is used generally are major changes of project scope, which must first be approved by a 4/5 vote of the Board -of Supervisors. Sections 25461, 25450.4 and 25457.4 of the Government Code limit these changes to ten percent of the total project cost. This recommendation would retain Supplemental Agreements as a means of making changes to projects but would attempt to improve on the amount of processing time which an SA presently requires. The improvements would be accomplished by budgeting, as contingencies, money for anticipated changes in project scope; delegating authority to expedite Supplementals which the County Engineer deems to be within approved project scope; developing standardized, member-controlled supplemental forms and making every effort to reduce the number of personnel involved in pro-cessing Supplementals. These improvements are possible within the present law as well as within the capability of current administrative structure.

A certain amount of change to buildings under construction is inevitable in areas of rapid technological and mission changes. We have seen numerous examples of breakthroughs in medicine that render equipment obsolete during the time that it takes to put up a building to house the equipment. A significant number of other client or tenant initiated changes, however, do not result

in operating cost savings nor are they necessary to meet the original functional requirements. Those types of changes should be justified by the client department to the satisfaction of the Board.

Our investigations reveal that the County's performance on controlling delays is extremely poor. We have estimated conservatively that at the present rate of construction, unnecessary delays are costing the County approximately \$1.4 million per year in money invested in land, buildings and equipment for work, which is only partially completed.

The largest underlying causes are within the County itself and not attributable to either its architectural or construction contractors. Indecision, administrative processing requirements, and State legislation which prohibits sensible delegation of authority are the principal contributors. While efforts to correct the legal obstacles are under way, the Board can establish some ground rules to streamline the processing of changes. Supplemental Agreement paperwork now changes hands from 17 to 22 times within the County and involves signatures at several levels of management.

The point of our recommendation is to reduce the slack in the system by requiring that all changes be referred to the approved project program plan. Whenever a change is indicated that is within the scope of the approved program plan, it could be processed almost entirely by the project management office, provided its costs are anticipated in the plan. Whenever change is indicated or requested that would modify the scope of the approved project plan or the costs of which exceed contingencies allowed in the project budget, the client department or other department requesting the change would be required to justify it.

Forty County projects completed during the past four years were studied from the point of view of delays caused by strikes,

weather, changes of scope, and other factors. In these 40 projects, 50 percent of all delay time was caused by Supplemental Agreements, which delayed the projects by a total of 2,965 days. The distribution of construction and delay times is shown in Figure 13. For all Supplementals, client requests for changes accounted for about half of the increases in costs and time, as shown in Figure 14. The other half of the scope changes are due to mechanical, code, architect, structural, and electrical reasons. The total number of client induced changes could probably be reduced from the present level, thus reducing the total number and costs of Supplemental Agreements processed. The same holds true for non-client changes but to a much lesser degree.

The Supplemental Agreement procedure involves a number of steps. These steps are shown in the construction phase logic charts contained in Chapter II. In general, the first step requires that the project architect must produce specifications, which describe the change. From these specifications, a Request for Quotation (RFQ) is prepared and mailed to the project contractor to obtain his bid cost for the change. Bids are received and either they are acceptable or they must be negotiated. Generally, they are acceptable because of prior discussions with the contractor. Based on the acceptable bid, a letter is prepared which transmits the bid to the Board of Supervisors for their approval. If some form of authority, such as Joint Power Authority or Board of Investment, is involved in the project, then their approval of the bid is also required.

For the 40 completed projects, which were reviewed, the average supplemental change required, on the average, 90 calendar days to process. These days were distributed so that, on the average, 29 days were required to obtain a contractor's bid, 25 days to prepare the bid Board Letter, 13 days to obtain Board approval, and 17 days for authority approval. It would seem reasonable that significant savings of time are possible in obtaining

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approvals and preparing a Board letter. No precise suggestions concerning savings are made because the data on which the days of processing time is based is affected by the procedures which produce it. For example, the date-stamping procedures vary between County organizations, which probably introduce errors of only a few percentage points.

IMPLEMENTATION

Implementation of this recommendation can be accomplished within present organizational boundaries. It would have greatest impact upon the County Engineer, who would be responsible for improving on internal paper processing procedures, but would also require the Board of Supervisors to modify some policy statements and the CAO to develop procedures to plan for project change contingency money of all kinds.

There are a limited number of specific steps that can be completed concurrently, beginning immediately. They are:

1. The CAO can determine the feasibility of including contingency funds in a project program to anticipate the need for Supplemental Agreements. This feasibility will be based on the experience with Supplementation past projects and will cover budgeting contingencies of money and time.
2. The Chief Administrative Office and County Engineer should review the internal paper processing procedures and publish a plan of action to minimize the number of administrative steps and the number of personnel involved. A signature authorization chart showing the minimum approvals required for various forms and for various levels of expenditures should help to clarify this situation.

3. The County Counsel working with the County Engineer and CAO, can assist in clarifying the differences between change in scope of a program plan as opposed to changes in scope of a construction contract. Ground rules for operating within present state laws, but providing rapid approvals for changes within the budget allocations in the program plan will have to be established.
4. CAO and County Engineer should develop standard member- controlled Supplemental Agreement forms whose purpose will be to expedite as well as control paper processing.

This recommendation is designed to improve on internal procedures already in existence. Therefore, the cost should be very small. Some changes to local ordinances may be required.

14. CHANGE ORDERS

Recommendation: That the Board revise its cumulative limitation on Change Orders to permit project program plan budgets to establish the cumulative limits and further, that the Board encourage processing of small changes under the Change Order system.

DISCUSSION

The change order procedure is a standard method, provided for by State law, of making moderately small changes to a project while it is in construction. County implementation of State law has resulted in a cumulative limit of \$9,000 for any one project. On multi-million dollar projects, the \$9,000 project limit is almost invariably exceeded, in which case the County Engineer must seek approval of the Board of Supervisors for additional funds, frequently in \$9,000 increments.

This recommendation would modify present County policy within the framework of existing State law. It is proposed that the approved project program budget contain a contingency for change orders (CO's) which would be based on County experience. In addition, the County Engineer would have authority to approve changes under \$4,500 so long as the cumulative total is within the project budget provided for change orders. Periodically, as required by the Board, the County Engineer may be required to account for the dollar value of change orders processed in relation to the budget provided. In the event that change orders exceed the budget, the County Engineer would be required to seek Board approval of additional funds.

This recommendation would increase the total funds for CO's indirect proportion to the cost of the project. The basis for establishing a percentage is to permit reasonable flexibility

and not restrict all projects, regardless of size ,to a fixed \$9,000 limit for change orders.

The principal savings which could be expected from this recommendation are those which would result from improvements in administrative processing procedures. The savings are difficult to estimate; however, dollars and time can be saved by reducing the number of times that Board approvals are required for additional funds and reducing the total time required to process any one change order. In some cases, time and dollars are lost due to project work stoppages associated with Board letters for more change order money.

The change order procedure used in California counties is based on Section 25466 of the Government Code which provides that "The Board of Supervisors, may, by board order, authorize the County Engineer, or other County officer, to order changes or additions in the work being performed under construction contracts. When so authorized, any change or addition in the work shall be ordered in writing by the County Engineer or other designated officer . . ." This section further provides that the delegated authority, for any one change, cannot exceed \$500 for contracts less than \$50,000 or one percent of contracts in excess of \$50,000 subject to a ceiling of \$4,500. In a Board of Supervisors memo of June 7, 1956, the cumulative amount is set at \$9,000 or two percent of the contract, whichever is less.

The change order procedure begins with a County Engineer letter to the contractor specifying desired changes and requesting the contractor to estimate costs associated with the change. The contractor then transmits his bids to the County. If the prices are not regarded as fair then negotiation is required. When affair price is identified, the County Engineer draws up a change order in letter form directed to the contractors. The contractor is then authorized to proceed with change order work.

On 40 completed projects costing more than \$500,000 the average project had 26 change orders amounting to \$24,881 and involving delays of 17 days. The change orders amounted to less than one percent of the original contracts. The total days of delay averaged 3.9 percent of total project time. In view of these statistics, an average change order involves less than \$1,000 and less than a day of delay. There is no question that administrative costs associated with this average change order should be held to a level commensurate with the small time and dollar impact of this form of project change. Details concerning change orders on 40 projects are shown in Table 6.

Of the 40 projects, 30 required Board action to increase the \$9,000 limitation on change orders. . We estimate that over 50 Board letters were necessary to authorize funds over the \$9,000 limit for technical changes involving interpretations of plans, specifications, and job conditions. Had the total amount authorized for change orders for the projects studied been based on one percent of the contract amount, the number of Board letters required to increase the change order amount could have been reduced to 21.

Our study of the 40 projects also revealed that 40 percent of the Supplemental Agreements processed were for less than \$4,500. These Supplemental Agreements required an average of 55 days for administrative handling, and resulted in an average of 10 days extension to the construction contracts. Only a few of these minor changes actually involved an increase in the space or amenities of the building.

In view of the administrative expenses, the actual waste involved in delayed completions and the expense of processing Board agenda items, we recommend taking maximum advantage of the present State laws regarding delegation of responsibility for contract changes.

Table 6. Change Order Data on 40 County Projects

Project Title	Proj (Spec) No.	Original Project		Change Orders				
		Amount	Days	No.	Amount	%	Days	%
Olive View hospital	2515	19,866,000	1000	129	136,399	0.7	19	1.9
Health Department Admin.Bldg.	2581	10,130,000	750	30	34,613	0.3	0	0
El Paseo de Los Pobladores, PH I	2287	6,975,000	620	28	35,667	0.5	34	5.5
SE Superior Courts Bldg.	2413	6,680,000	670	43	42,679	0.6	0	0
El Pasco de Los Pobladores, PH II	2612	6,196,000	790	36	21,530	0.3	0	0
San Fernando Valley Juvenile hall	2225	5,000,000	500	39	22,999	0.5	20	4.0
Van Nuys Courts Bldg.	2381	4,960,000	670	74	44,089	0.9	33	4.9
Welfare Bldg., Adams & Grand	2507	4,200,000	840	36	127,679	3.0	0	0
Torrance-So. Bay County Bldg.	2285	3,978,000	690	51	38,278	1.0	71	10.3
Beverly Hills Municipal Courts	2537	3,749,000	540	48	44,056	1.2	44	9.1
Rancho Chronic Disease Bldg.	2529	2,751,603	550	37	49,305	1.9	26	4.7
Malibu Administrative Center	2378	2,472,000	360	43	35,551	1.4	36	10.0
No. End Parking Structure	2702	2,330,000	260	10	13,919	0.6	2	0.8
Olive View hospital heating/AC	2516	2,120,000	450	40	20,239	1.0	5	1.
Compton DPSS Bldg.	2658	1,993,200	180	4	40,966	2.1	0	0
NE Superior Courts Parking	2599	1,552,921	270	13	13,624	0.9	22	8.1
Eastern Ave. Service Complex	2937	1,370,000	300	12	16,834	1.2	9	3.0
Road Dept. Central Yard Warehouse	2597	1,341,000	270	14	7,114	0.5	21	7.8
Juvenile hall Boys School Bldg.	2570	1,300,000	480	24	24,444	1.9	72	5.0
Central Htg. & Refrig. Plant Lx' pa	2511	1,229,839	350	17	14,756	1.2	31	8.9
San Pedro Municipal Court Bldg.	2530	1,162,000	400	16	8,944	0.9	7	1.7
Citrus Courts & Health Bldg.	2518	1,099,000	400	22	15,571	1.4	24	6.0
General hospital Laboratory Bldg.	2449	1,033,500	365	11	5,739	0.6	0	0
Los Cerritos Regional Library 2603	2603	1,033,500	250	12	3,446	0.3	24	9.6
Victoria Golf Course	2376	994,634	270	12	8,993	0.9	0	0
Rancho Powerhouse Expansion, PH I	2380	962,000	520	36	7,893	1.9	31	6.0
San Antonio Regional Library	2640	909,695	365	15	9,935	1.1	36	10.
Marshall Canyon Golf Course	2431	906,000	315	20	17,624	2.2	21	6.7
Wilshire District Health Center	2583	799,000	365	24	9,721	1.1	13	3.6
Rancho Los Amigos Golf Course	2415	795,943	300	11	13,012	1.6	6	2.0
Van Nuys Court Bldg. Park Struc.	2541	792,000	480	14	7,226	0.9	12	2.5
Storage Hangars, Fox Brackett AF	2691	796,748	195	10	11,311	1.4	11	5.9
Health Department Bldg., Alt. * Ad	2536	752,000	365	24	15,297	2.0	13	3.6
Rio Hondo Regional Library	2455	691,000	300	14	6,064	0.9	20	6.7
Whittier Municipal Pkg. Struc.	2912	633,985	219	9	9,364	1.3	0	0
Long beach Hospital Surgical Clinic	2732	625,300	270	16	7,600	1.2	5	1.9
E.L.A. Sheriff's Station Warehouse	2267	576,386	360	22	19,946	3.3	0	0
General hospital Repair sealing	2590	589,777	547	4	4,720	0.9	0	0
Compton Airport Runway & Taxi	2770	535,722	270	21	16,324	3.0	17	6.3
La Canada Library	2896	512,000	270	11	5,999	1.2	0	0
TOTALS		106,184,153	17,347	1,051	995,259	0.9	685	3.9
		2,654,604	434	26	24,881	0.9	17	3.9

We propose, therefore, that the Board direct the County Engineer to process all changes by means of the change order system which are under \$4,500 and are necessary to meet the functional requirements of the facility as stated in the approved program plan. If a small change appears questionable to the County Engineer, the change order could be referred to the Board for approval without necessarily requiring the full Supplemental Agreement procedure and four-fifths vote.

Other counties contacted have been using systems similar to that proposed in this recommendation. The Orange County Director of Building Services is delegated to approve any change up to \$4,500, providing it does not exceed the initial budgeted amount. Their Director of Buildings is a counterpart to Los Angeles County's Engineer. In these same counties, a report regarding change orders is submitted to the Board of Supervisors at the completion of each project. This report lists the amount spent for all change orders as compared to the initial allocation in the project program. This report is used to evaluate the performance of personnel who are responsible for constructing capital facilities.

Most private construction firms contacted delegate the authority to approve change orders. In this regard, private firms have two distinct advantages over government agencies :1) most small changes can be approved on the site and 2) contingencies are included in the construction budget to cover small changes.

IMPLEMENTATION

The Board of Supervisors can immediately adopt a policy to establish a change order contingency fund at the time new construction contracts are approved, and at the time project program plans are approved for projects which have not yet entered the design phase. The Board can lift the \$9,000 limitation for all projects, which have an approved contingency fund.

The County Engineer would be primarily responsible for approving all changes under \$4,500 and reporting on each project the amount of all change orders, compared to the amount' allocated for change orders in the project program.

The Chief Administrative Officer should assist in estimating reasonable change order contingency funds for each project and should approve the amounts of such allocations.

Certain classes of facilities may require higher than average funds, and a special allowance will be needed for changes formerly processed as supplemental agreements. If a repetitive project is built, a smaller contingency fund could be allowed.

There should be essentially no cost to implement this recommendation. It is merely an increase in the flexibility of the use of change order procedures.

15. PROCEED ORDERS

Recommendation: That the Board request State legislation which will permit construction agreements to contain provisions enabling the County Engineer to authorize contractors to perform extra work under special cost controls when a pending change is in danger of causing delay.

DISCUSSION

A proceed order invokes a special clause in construction contracts which states *at the buyer may direct the contractor unilaterally to perform extra work and the contractor will be reimbursed on a cost-plus basis.

On projects costing more than \$500,000 the County grants time extensions to construction contractors for changes in scope and technical requirements which are at least three times as great as is normal for other government and private sector projects.

At least 75 percent of the change-related delays involve a work stoppage that, because project phases are highly inter related, can have very large impacts on many other aspects of project work. The delays are costly to the contractor, involving in efficiency in construction methods, waste labor, extra insurance and extended overhead. Ultimately the County pays for the waste.

The County is at a disadvantage. The contractor has already been selected, is well into the work and competitive bidding procedures are not applicable. Blame for most of the delay can be attributed to the County's requirement for price agreement and associated administrative and approval times. As a result, the County has no choice but to extend the contract completion date.

The proposed change could potentially save a large percentage of the days granted by supplemental agreements. At current spending rates this could amount to a savings of many dollars per year. If the County is able to implement some of the other recommendations involving tighter control of tenant changes, the savings will be even greater.

In addition, the provision for payment on an actual costs-incurred basis eliminates the justification for contingency provisions in the contractor's price, and greatly reduces the in-efficiencies brought about by a stop-work condition.

The proposed procedure has been used and tested by City, State and Federal agencies. It is designed to compensate contractors for their actual costs plus a percentage to cover overhead and profit at a rate which is less profitable than the contractor's normal profits on a contract. Contractors are willing to accept the procedure because it enables them to finish the job sooner, reduce risks, and avoid inefficiencies that produce hidden costs.

Proceed order features of the State Code can be applied by Counties to Public Works projects, but not to Capital Projects. This apparently is an oversight or flaw in the State Law. County Counsel states, however, that the present wording is quite clear and not subject to a more liberal interpretation.

Most other County Governments in California are not deeply concerned with this problem. Their total programs and individual projects are generally much smaller, fewer client agencies are involved in changes, and their administrative processing times are shorter. In other cases, their Public Works Manager or Engineer has more authority and can negotiate changes with contractors without requirements for additional approvals.

IMPLEMENTATION

Some of the significant steps necessary to implement the recommendation are:

- The County Counsel should be requested to complete the draft of recommended state legislation, draft any necessary ordinances, and furnish opinion.
- The State Legislative representative should be requested to identify sponsors, obtain opinions and support from other County Governments, and expedite actions at the State level.
- All relevant factual data pertaining to the change should be furnished by the CAO to the Association of General Contractors for their review and action.
- Plans, detailed procedures, and forms to implement the change should be developed by the County Engineer in conjunction with the CAO and Counsel.

Operating costs for the proceed order system will not be a factor, since the present monitoring of contractor status includes audits and reporting of contractor and subcontractor labor and materials.

The first three items above should be accomplished by January 1, 1973. At that time the CAO's Facility Acquisition and Management System (FAMS) group should report implementation status to the Board and should provide status on State level actions at the end of each quarter thereafter until the procedure has been in operation for one year.

A rough draft of the type of State legislation necessary has been prepared by the County Counsel and is shown in Figure 15. The

Add Section 25461. 1 to the Government Code to read:

25461.1 This section provides an alternative method of changing a contract. The contract or specifications may provide that the specifications may be changed or extra work ordered by the issuance by the county engineer of a "notice to proceed. "

A notice to proceed may be issued by the county engineer if he determines that:

1. Changing the work pursuant to Section 25459 or 25461 would unduly delay the work, or

2. The county engineer and the contractor are unable to agree upon the cost of the work, or credit for work deleted, or upon any extension of time demanded by the contractor.

In the event that the county engineer issues a "notice to proceed," the contractor shall forthwith comply with the order.

This section shall not be effective unless the specifications provide for the payment for extra work under a "notice to proceed, "which payment shall be limited to the actual cost of labor, materials, equipment rental, and other expenditures and in addition the sum of not more than 15 per cent of said actual costs in lieu of overhead and profit.

No notice to proceed shall be issued if the estimated cost of the extra work exceed the lesser of \$50,000 or 10 per cent of the original contract price.

Figure 15. Orders to proceed -- Proposed Legislation

draft is for review and comment by members of the FAMS team, the County Engineer, and representatives of the Association of General Contractors. Counsel's opinion as to the advisability of the measure has not been obtained.

We recommend that the State law not restrict the powers of the County any more than the 10 percent limitation on changes to Capital Projects imposed by other sections of the law. Instead, the County should enact an implementing ordinance in parallel with the Government Code change that calls for prior approval of scope changes by the Supervisors, and provides appropriate dollar level authority for technical approval by the County Engineer, and budgetary approval by the CAO. The dollar level should be stated in such a manner as to avoid the need for frequent revisions caused by inflation and should be set at a level that would require only exceptional problems to be addressed in advance by the Board.

16. NEW CONTRACTING APPROACHES

Recommendation: That the Board direct the testing of new techniques for managing facility design and construction, as appropriate and legal.

DISCUSSION

The point of this recommendation is that the County should have a broad range of alternative methods of acquiring facilities from which to choose the most appropriate for each individual project.

Currently, the County uses only one method, the sequential process, even though current building and management technologies have developed and tested a broad variety of alternatives. We recommend that the County develop the ability to use these new techniques when they suit a project by testing them now on appropriate projects. The impact of using the new techniques can be to reduce the total project design and construction time by as much as 50 per cent, with substantial savings. Once the ability is developed, the County can select the technique that offers the best cost and scheduling advantage for a given project, depending on unique characteristics of the project.

The approach currently used by the County, which may be referred to as the sequential process, is that which has the most recent tradition of use with government agencies. Using this process, an entire facility is first planned, then all aspects of the-facility and the site are designed in one package and, finally, the construction proceeds according to specified design. Using this process, the planning generally is completed by the owner, and for large projects, a contract architect is retained for design and a contractor for construction. For most local general purpose governments, the architect is selected based on his experience and paid a fee based on a professionally determined schedule tied to estimated project value, and the contractor is selected as the "lowest responsive" bidder of those competing on the project.

The sequential process (described in detail in Chapter III) is at one extreme in the range of alternatives, while the design-build is at the

other. The design-build approach involves procuring the services of a firm which, based on a guaranteed outside price and a firm schedule, will both design and build the facility based on an outline provided by the client. The design-build firm may employ any project-phasing technique, which will ensure his profit and delivery of a facility meeting the client's requirements. Presumably, for counties in California, which are required to select the lowest responsive bidder but which have considerable leeway in selecting architects, the design-build approach would mean selecting the lowest responsive bidder of a guaranteed out-side price, thereby obtaining the architect and contractor in one step.

Between these two extremes, there are a number of other alternatives, which share some characteristics, more or less, of these two approaches. One approach is referred to as construction management. This approach seeks to involve the contractor during design, often the preliminary drawings phase, in order to take advantage of his practical knowledge to obtain a more advantageous construction bid and to smooth the transition from design to construction. Another approach is a variation on design-build with the exception that the guaranteed outside price results from negotiation, not bidding. Unless California State law and State Supreme Court decisions are changed, this is probably not a feasible alternative for Los Angeles County. Yet another alternative is the phased construction or fast track method. Using this approach, a facility is divided into reasonable packages such as site preparation, structure, plumbing, electrical, mechanical, and finish. These packages then are scheduled to provide for maximum overlap between design and construction in order to minimize total project time. As each package design is completed, it can be bid as a separate construction contract. Construction can thus begin on Package 1 while Package 2 is in design, and so on. Actually, fast track is not a separate approach but a technique that can be used with any approach.

For a more complete definition of each approach and examples of their use, refer to Chapter III.

The potential savings that could be realized by adopting new contracting methods are potentially very large. In order to develop some estimates of time and dollar savings, three documents were studied in depth from a number that were available. One study reported on 112 projects across the nation that were built using various contracting approaches (see Table 7), The second document summarizes the costs and times to produce 20 hospitals in various states. The last document reports on the Federal General Services Administration (GSA) experience in producing government office buildings and other types of structures. The results reported in these documents were then compared to Los Angeles County experience on 40 completed projects comparable in cost or complexity.

The experience of the County on 40 completed projects indicates that it requires an average of 34 months to design and 27 months to construct an average building. Thus, project completion takes an average of 61 months, or 5. 1 years. The numbers are summarized in Table 7. By comparison, the GSA compared various methods in producing their buildings and found that the design-build approach would require 24 months for an average government facility. The study of 112 industrial warehouses and general office buildings found that an "average" facility could be produced in 10 months using this method. For 20 hospitals, planning and construction using the design-build method required 21.7 months. All of these studies reported that, of all methods tested, the design-build approach resulted in the largest timesavings. On this basis, the County projects could potentially be completed in 60 percent less time than at present. Table 9 summarizes time and dollar savings on 20 hospitals. Table 9 summarizes GSA'S experience with their buildings.

Table 7. Summary of Experience of Various Agencies
Using Alternative Contracting Methods

	Project Design	Project Construction	Total*
Conventional Approach LA County Average Time	34	27	61
Average Cost			\$2,756,897
Design Build Approach** Burt Study Average Time	-	-	10
Average Cost	-	-	\$989,605
Conventional Approach** Burt Study Average Time	-	-	25
Average Cost			\$2,597,458
Design Build Approach 20 Hospital Projects Average Time	7.5	14.2	21.8
Average Cost	-	-	\$3,027,264
Other Public Agencies In California Average Time	17	28	45
Average Cost	-	-	\$1,000,000 or more
Private Developers Average Time	16	23	39
Average Cost	-	-	\$1,000,000 or more

* Includes all project changes that increased costs or extended time.

** "An analysis of the Attributes of Alternative Methods of Purchasing Building Construction", David Burt, Stanford University. An analysis of 112 construction projects throughout the United States.

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The design-build approach is not a new phenomenon. Ancient public monuments such as the Lighthouse at Pharos and the Pyramid of Cheops were produced by architect-builders with the royal owners. In the contemporary United States, its arrival also is not an occurrence of very recent history. For example, the Austin Co. has been producing facilities for industry for the past 50 years. Between 1967 and 1968, the number of industrial facilities produced using this approach increased from 28 percent to 33 percent. Currently, it is estimated that ten percent of all capital facilities are produced by design-build. Partly, this trend has been encouraged by dramatically rising construction labor costs. The large potential savings accruing from design-build have been used to offset these cost increases. Figure 16 summarizes the salary changes as discussed in the October 1970 FORTUNE magazine.

Chart may be viewed at LA Co. EEC Office

Figure 16.

Construction wages have gone through the roof. The chart compares the median wage increases for construction and manufacturing, in cents per hour, over the past decade. Increases in construction wages began to accelerate in 1963, and really took off in 1967. They are still roaring upward. The figures are based on Industry surveys by the Bureau of the National Affairs, a private research agency.

(Graph by Tom Cardamone for FORTUNE Magazine.) Reprinted with permission from FORTUNE, October 1970.

The possible savings in cost, assuming equal quality, could also range as high as 60 percent. Based on 112 projects produced throughout the United States, using the design-build approach, a typical 100,000 square foot structure can be built for \$9.83 per square foot. The same "average \$2,500,000" building would cost \$24.87 per square foot using the conventional approach.

Consequently, savings of both time and cost could range as high as 60 percent. Whether this potential savings could ever be approached by the County depends largely upon goals which the Board of Supervisors must set and enforce. If a savings goal in the range of zero to 60 percent is chosen by selecting a new contracting approach, it will not be realized for two to three years. That amount of time would be required to clear legal hurdles, establish new procedures, and select projects upon which the new approach will be tried. Therefore, the savings resulting from new contracting approaches are distinctly long-range. The percent savings would also be a function of the exact type of approach chosen. Design-build would be most beneficial, construction manager next, and so on, with the conventional sequential method being, apparently, of least benefit. In any event, percentage savings on a construction program the size of Los Angeles County are, indeed, very large.

IMPLEMENTATION

The County has established a Construction Management Study Team whose objective is to review the various construction management approaches. They have interviewed construction management firms and clients who have had facilities produced for them using one or another of the CM methods. Their tentative findings, reported in a draft memo, indicate that there are definitely time and dollar advantages possible using construction management approaches. They have not yet recommended the use of one construction management approach for the County but, presumably, that is the intention of this study team.

Although all do not use the same approach, there are a number of companies in the construction management business. In Los Angeles, examples are: the Bechtel Company; the Ralph M. Parsons Company; Caudill, Rowlett, and Scott; and the Austin Company. Thus far, the local governments in California have not often called on these companies to provide construction management services for three major reasons.

- California State law requires that construction contractors be selected as the lowest responsive competitive bidders. Some of the construction management approaches are based on negotiated fees and costs. This tends to make use of these approaches in County government very difficult.
- Counties traditionally have dealt with a set of architects and a set of contractors. One of the advantages of the new contracting methods is that these two groups are dealt with as one. Consequently, this traditional way of doing business has become a major hurdle to change.
- Effectively implemented, the new methods would tend to reduce the number of County employees required to produce public facilities.

These problems must not, of course, be taken lightly. A well-conceived attempt by the City of Inglewood to use innovative management contracting methods recently failed, despite a careful attempt to construct job requirements in a way suited to their innovation.

What has happened, of course, is that legislation originally intended to protect the public from corrupt practices and which guaranteed an element of free enterprise, has resulted in unanticipated increased costs to the public. The limitation to strict price competition has constrained local governments from the

consideration of any criteria or qualification except price and thus, in the last analysis, it is a severe restriction on free competition.

We strongly believe that it is imperative to combat this restriction on all fronts. Other governmental jurisdictions have brought well tested forms of procurement that are free from corruption but nevertheless allow competition on the basis of quality, demonstrated competence, past performance, and qualifications. Los Angeles County can and should join together with other local governments and begin to do the same.

This recommendation requires three months of study, selection of a new alternative, trial of the alternative on a prototype project, and measurement of results using the new approach versus the present approach.

17. CONTRACT TERMS

Recommendation: That the Board require the development and use of contract terms and conditions which require the contractor to prove the necessity for delays and which incorporate cost and schedule incentives for contractors.

DISCUSSION

This recommendation proposes methods of improving the County's management of construction contracts and its position in negotiating changes during the term of the contract. Under current practice, the contractor has major advantage in that the burden of proof lies with the County in cases of disagreement about delays changes, or other contract modifications. We recommend the removal of these advantages, as well as the inclusion of certain major incentives that are not presently offered to contractors.

Specifically, we believe that the contractor should be required to justify and document any departure from the project program plan, regardless of the origin or source. Such departures would include, for example, delays or schedule slippages caused by strikes, weather, County action, and other normally authorized extensions of contract time. They would also include departures from the contractor's work program, such as changes to design detail required by practicality and any improvements suggested by the contractor. Moreover, notification would include, as a minimum, documentation of the causes of the delay, estimates of its extent, and proposed assignment of responsibility.

In current County practice, prompt notification is not required and the County is placed somewhat in the position of having to justify why a delay for weather or strikes is not granted. On 40 projects, valued at \$133 million, completed in the last five

years, 4,758 days were lost due to strikes and severe weather. The average extension of the contract time was 9.3 per-cent. We estimate that the time extensions could be reduced to 8. 5 percent by more accurate assessment of the actual effects of weather, and by closer monitoring of contractors' capability to "work around" problems. Putting the burden of proof on the contractors automatically produces a reduction in the requests for delays by forcing contractors to go to the trouble of keeping records and preparing justifications.

As a result of our discussions with other public and private agencies, we believe that further improvements in cost and time overruns could be achieved by careful use of terms and conditions to provide incentives to the contractor. These could include, for example, provisions for sharing the benefits when the contractor suggests a change which results in dollar savings.

Value Engineering clauses have been used successfully by the U.S. Army Corps of Engineers for several years on both military and non-military construction programs. The clauses generally split the net cost savings on a 50-50 basis between the contractor and the government. In Southern California, the government's share has averaged 0. 4 percent of the original contract price. Although this level of savings may appear trivial, it amounts to \$400,000 on a \$100 million program.

The benefits of Value Engineering are automatically incorporated in the Project Manager or Design/Build systems discussed in the recommendation No. 16. With either of these Systems, the contractors are highly motivated to use both economical designs and economical construction methods. Their ingenuity is rewarded either by having submitted the winning bid, or by some form of sharing on cost savings. For contracts placed on an open-bid basis, however, the Value Engineering approach can be used to provide at least some opportunity for savings. We recommend that the County seriously investigate the use of such clauses.

Another successful method for applying cost incentives uses a "target" price and a sharing ratio between fixed limits. . The ratios in this form of contract normally run between 70-30 and 90-10 with the government receiving the higher proportion of share on savings. However, the government also runs a risk of paying for overruns on a higher share basis. This form of procurement has been used on Design/Build or "Turnkey" military construction procurements where, since the facility has not yet been designed, the exact price is difficult to establish. Be-cause the upper and lower limits of the cost sharing curve are set by the government, its liability for overruns can be fixed absolutely. As long as the same formulas are applied on all bidders, the selection of a winner on an open-bid competition can be based on the target or midpoint of the cost sharing curve. This method can give government a bigger share of cost savings, but it must also reserve more contingency funds for a possible overrun. It has generally been found to provide the buyer with the most economical product but has not been extensively used or tested for construction contracting.

Schedule incentives have been used successfully by private developers and are applied when the buyer can profit from early use of a facility. The clauses on a schedule incentive contract, however, must provide rewards for early delivery as well as penalties for late delivery. In most cases, clients are unable to make good use of an early delivery. For example, they are unable to accelerate delivery of vital equipment, hiring of new personnel, or moving of existing personnel and equipment adequately to avoid rental costs or put the new facility into effective operation. We feel that the County would probably have similar limitations in its ability to reschedule its plans. We do feel that the County should have the capability to use this form of contract, however, in cases of urgent need and on architectural services agreements, or site preparation contracts where favorable financing or lower construction costs can be obtained by starting construction earlier.

While early occupancy of a building is not necessarily beneficial, a late delivery is almost always costly. The only contractual remedy for such losses which can be assessed without compensating rewards, is the liquidate damages clauses presently used by the County.

Unfortunately, the penalties imposed for lateness must be provable in court and are generally estimated on a conservative basis. For example, we could not suggest that excess costs due to non-use or non-taxability of land or unavailability of capital for alternate uses would be allowable as a damage to the County. Our study showed that the County's figures for liquidated damages (0.06 percent of contract cost (per day) are roughly of the same magnitude as other public agencies (from 0.01 percent to 0.1 percent). If anything, Los Angeles County pursues its assessment of liquidated damages more vigorously than others.

The system of progress payments has also been examined from the standpoint of its effects on schedule performance. The County's system is not significantly different from either the private sector or government practices in that they all hold back from five percent to ten percent during the last half of the project and retain that amount until the building is accepted. Private clients who use contract provisions allowing them to retain a higher percentage generally make exceptions to allow for prompt payment of subcontractors on completion of satisfactory work. This allows their general contractors to focus attention on completing the job, rather than on financing.

With regard to the County's use of liquidated damages and progress payments, we were unable to estimate the effectiveness of increasing penalties or retention on the schedule performance of contractors. We found that contractors already operate under a very strong incentive to complete jobs as quickly as possible. Their insurance, supervision, and overhead costs eat directly into profits on a daily basis. On the other hand, the fundamental causes

of most delays are almost universally the fault of the County and consist of indecision, changes, and administrative red tape. These factors so obscure the picture that it is difficult to assess the effects of improved scheduling methods and greater efficiency on the part of construction contractors. At this point, it would seem unfair to penalize contractors by withholding a larger percentage of their fees for stretch-outs that are primarily caused by the County. Once basic deficiencies in County management are cured, however, then it would be advisable to re-examine these clauses.

IMPLEMENTATION

We have encountered no opposition to the proposed improvement in the terms and conditions related to notification and documentation of changes or delays. However, some sources have questioned the feasibility and legality of contractor incentives, because of potential conflicts with laws governing competition and because of possible interpretations of incentives as gifts of public funds.

However, according to at least one of our sources, such incentives are the current practice of some California counties. One key may be to provide for the incentives as allowances in the project program plan, in the same way as extensions would be provided as allowances. The point needs clarification before final action to modify contracts.

The recommended improvements involve a system change, and need not affect organization. Contractor supervision and management by the County Engineer would be improved, because of the enhanced position of the County. Consistent with our other recommendations, the Project Management Office would be responsible for contract management and would conduct all negotiations proposed in this recommendation. Implementation of all of the methods would

require a considerable amount of advice and support from the 1/2 County Counsel. We believe that delay documentation and notification requirements can be introduced into construction contracts within 90 days, and that the capability to employ incentives can be achieved within six months, except for provisions which require legislative action.

18. LEGISLATIVE REFORMS

Recommendation: That the Board request State legislation which viiii permit construction agreements to contain provisions enabling the County Engineer to authorize contractors to perform extra work under special cost controls when a pending change is in danger of causing delay.

DISCUSSION

The importance of this recommendation is that some major reforms of the County's capital facilities management can be accomplished only by removing obstacles in the State law. The Board's freedom to delegate authority is severely limited by law, and this is one of the fundamental causes of lengthy administrative delay.

We propose, therefore, to request modifications of the State law that will enable California counties to do a better job of managing acquisition of facilities and the capital invested in them.

Some of the problems caused by the current law are procedural and mechanical, making it difficult to ensure efficient administration and processing. Others are deep-seated, fundamental interference with the ability of local government to interact effectively with the marketplace.

In the area of efficient administration, the legislation limits the Board's power to delegate its authority. In particular, according to interpretation of Los Angeles County Counsel, the "Extra Work" clause of the Government Code is an obstacle to contract provisions for proceed orders, because it cannot be applied to capital projects. (see Recommendation 15).

Also in the area of efficient administration, the Government Code sections controlling supplemental agreements require a fixed vote of the Board, sometimes by two-thirds and sometimes a four-fifths vote, instead of a simple majority. This puts extreme

demands on Board attendance for processing of construction contract changes, and thus increases the chances of procedural delay. This restriction on the voting level applies not only to the Board of Supervisors, but also to other boards and commissions that are more difficult to assemble with full attendance.

We, therefore, propose, in concurrence with the County Engineer and other County departments, to request modification, illustrated in Figure 17, to the following sections of the California Government Code: Article 25460, Article 25461, and Article 25466.

With the proposed changes to the code, contract changes would not require a two-thirds vote of the Board as at present and the code would no longer require a four-fifths vote to approve, without bidding, a change costing more than \$4,500. The proposed legislation would also change the absolute maximum dollar limit on contract changes from \$4,500 to \$10,000.

The more fundamental changes affecting the relationships between the County and the marketplace are not as easy. There is no question that it is possible to create a more desirable atmosphere for corruption-free competition than one that is limited to strict price competition. The Federal government has been using source selection procedures for years that have comprehensive safeguards and are based on such factors as a) proposed design, b) quality, c) past performance, d) management capability and plan, and e) price. The current State law affecting capital projects of counties is highly restrictive, placing the burden of proof on the County to demonstrate that the lowest bidder is irresponsible. In the Federal systems referred to, the government can select a contractor from among a group of low bidders on the basis of how responsive the bidder is to project requirements. Thus, the burden of proof is on the contractor to demonstrate that he can perform the best job at the best price.

25460. Alteration or change in contract: Manner. Whenever the board enters into a contract for the erection, construction, alteration, or repair of any public building or other structure, the contract shall not be altered or changed in any manner, except:

- (a) As provided in Section 25466, or
- (b) As provided for in the contract itself, or specifications, or
- (c) By order adopted by ~~a vote of two thirds of the board~~, and the consent of the contractor.

25461. Same; Specification in writing: Agreement upon cost: Authorization without obtaining bids: ~~Four-fifths vote of the board.~~

If any change or alteration of the contract is ordered, it shall be specified in writing and the cost agreed upon between the board and the contractor. If the cost so agreed upon:

(a) Does not exceed the amounts specified in Sections 25450 and 25457, or

(b) Does not exceed 10 percent of the original contract price, the board may authorize the contractor to proceed with the* change or alteration without the formality of obtaining bids therefor.

~~No change or alternation shall be authorized the amount of which is within the limitations specified in subdivisions (b) and in excess of the limitations specified in subdivision (a) except by four-fifths vote of the board.~~

25466. Changes or additions in work being performed under construction contracts; Authority for; Requisites. The board of supervisors may, by board order, authorize the county engineer, or other county officer, to order changes or additions in the work being performed under construction contracts. When so authorized, any change or addition in the work shall be ordered in writing by the county engineer, or other designated officer, and the extra cost to the county for any change or addition to the work so ordered shall not exceed five hundred dollars (\$500) when the total amount of the original contract does not exceed fifty thousand dollars (\$50,000), nor 1 percent of the amount of any original contract which exceeds fifty thousand dollars (\$50,000). In no event shall any such change or alteration exceed ~~four thousand five hundred dollars (\$4,500).~~
ten (ten thousand dollars) (\$10,000).

Figure 17. Proposed Changes to California State Government Code

We strongly believe that such a system is badly needed by Los Angeles County. As we point out in the discussion of Recommendation 16, it would be possible to cut the time of project design and construction in half by using new contract management methods, such as "design-build" and "construction manager". Design build methods are precluded because of the requirement for advertisements of complete job specifications for price bids and because most contractors using the "design-build" method prefer negotiated price agreements. "Construction-manager" - a contract for managing the construction part of the job rather than building it with pre-selected subcontractors - is precluded whenever it is under-bid by a conventional general contracting package.

We believe that the ability of the marketplace to provide innovative, high quality facilities is severely inhibited by the restrictive laws limiting competition. To be sure, the original intent of these laws was to ensure competition and eliminate graft. With today's level of building and management technology, there are preferable systems available, and the current ones are unquestionably obsolete.

Still another fundamental problem with the restrictive State laws is their inhibition of incentive systems. According to some interpretations, incentive systems that allow construction to share the cash benefits of cost-saving methods that they develop during job construction are illegal because they entail a gift of public funds. We believe that such interpretations are too conservative. Incentives are basic to a capitalist society, other counties, recognizing this, have developed and use incentive systems.

We believe that a full and comprehensive legislative program aimed at correcting these problems with the State law should be pre-pared as soon as possible and vigorously pursued.

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II. SYSTEM DESCRIPTION

INTRODUCTION

The purpose of this chapter is to describe the operation of the present Los Angeles County capital facilities process. Capital facilities are produced as the result of the time sequential interaction of many activities and many people. The term "system" emphasizes the fact that capital facilities are the product of a highly interactive decision-making environment, and that changes to one part of the system generally will have significant effects on other parts. The interactions can be described easily in a logic flow chart.

We provide a series of such flow charts in this chapter, together with definitions of important terms and some description of the system as it presently operates. We also note those points in the present system at which our recommendations are expected to have the largest impact.

The first flow chart, Figure 18, provides an overview of the entire process of completing a project. Subsequent flow charts illustrate the detailed steps and decisions that take place during the progress of each phase.

THE OVERALL SYSTEM

In the flow charts in this chapter, each box denotes a distinct phase of activity. A letter notation at the bottom left of a box denotes the division or other organization which is responsible for the activity represented by that box. These notations are abbreviated by:

CAO: Chief Administrative Office

CE: County Engineer

CL/AD): Architectural Division of County Engineer CE/CD:

Construction Division of County Engineer

REM: Department of Real Estate Management

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Figure 18 illustrates the overall system for completing individual projects. This system referred to as the sequential or "phase sequence" approach, has always been used by the County and by most local governments in the United States. Its most important distinguishing feature is the completion of all design work prior to the advertising for award of the construction contract.

There are a number of noteworthy aspects of the overall system, as diagrammed. First, although an evaluation phase is provided for, as is shown as feedback to planning, the activity of evaluation is not as formal, complete, or continuous as the one we have proposed (Recommendation 5). Second, the early phase denoted as planning in the diagram, is not well defined and is often not performed as the system presently operates. This phase is not well defined in that, when it is performed, it has no clear beginning and ending and there are no concrete products associated with its completion. Our recommendations regarding long-term budget, needs analysis, and policy commitments would sharpen the definition of this phase.

In many cases, this phase also includes facility site acquisition and financing development (two phases not studied during this project). However, in most cases, site acquisition and financing are deferred to the point that they often occur closer to the construction phase than to planning, with the frequent result of construction delay while site and financing problems are resolved.

The programming phase has also not been clearly defined as to products of tile activities or beginning and concluding tasks. Nonetheless the programming phase consists of a set of tasks that begin the conversion of an estimated budget and project outline into a specific project with a much firmer budget, and a specific completion time. Programming is not always performed, even for major projects. Where it is, the responsibility resides with various organizations at various times. The CAO, the Board of Supervisors, the County Engineer, client and service departments,

and citizens groups can and have played significant roles in this phase. The degree of involvement often depends upon the type of project. For example, when the project is a community hospital or fire station, the County may view performance as a matter of reacting to citizen group pressures, thus consuming much time with little evidence of control. When it is performed in the current system, programming is not the same as program planning discussed in Recommendation 3. It provides technical detail to guide design, but may not include budgets and schedules.

The architectural design phases are the responsibility of the Architectural Division in the County Engineer department. Currently, the authority leading to this responsibility is delegated from the department to the division based on an interpretation of State law. Before 1965, interpretation of applicable statutes resulted in control of design by the CAO, but this control now rests primarily with the County Engineer. We have discussed improvements to the management of this phase in Recommendation 4. Design includes three phases distinguished by preparation of increasingly detailed architectural plans and drawings, schematic plans, preliminary plans, and working plans or construction documents. The construction documents are the project specifications used to solicit construction bids.

The construction award and construction phases could be regarded as a single phase. They are separated because construction award is a distinct step that divides phases, and responsibility shifts from the Architectural Division to the Construction Division after award. Our recommendations will have little direct impact on construction award unless, of course, some new construction management approach is adopted as discussed in Recommendation 16. However, all our recommendations, directly or indirectly, are designed to improve performance during the construction phase from some point of view. This is the phase upon which the entire system is focused. Inadequacies and lack of performance in earlier phases have their final impact during construction, and are manifest in

increased costs, poor design, unnecessary quality, long delays, etc. It is this deferred impact, when problems surface late in the life cycle of a project, which has been the source of concern to all. The construction phase ends with beneficial occupancy of the facility and final approval of the work by the Board.

There are a few overall characteristics of the system which are the focus of most of the E&E recommendations.

- The Board of Supervisors' involvement dominates every phase and many of the individual activities of the system. This dominance can take the form of unnecessary involvement- in detail leading to diffusion of authority and increased costs.
- The system is strictly sequential. Stopping work during any phase halts progress or delays all work that follows.
- Responsibility shifts among divisions between and within phases, coming to rest during the construction phase.
- Interpretation of State law and other existing statutes has a strong impact on allocation of responsibilities through the system. Other counties, interpreting the laws differently, delegate authority in a different way.
- The system tends to seek involvement of a maximum number of organizations and personalities instead of some optimum or best number.

With this set of characteristics, which are the consequence of all departmental involvement, that the system works at all is a compliment to the abilities and performance of County organizations and staff.

PLANNING PHASE

Figure 19 is a summary of the detailed steps conducted during the planning phase. Currently, this phase begins with CAO soliciting County departments for their input to the annual general fund budget. This solicitation involves preparation of various budget forms, some of which cover capital facilities that the department believes are required to fulfill its responsibilities to provide services. These departments are "clients" of the capital facilities program, and may request CAO or County Engineer assistance in the preparation of a statement of need for the specific facility. Consequently, this phase essentially begins with the step labeled 4 on the diagram, that is, the CAO requests department annual budget submission, using some form of input in terms of components and measures of need developed during step 1. The issue of defining need is a very large and pressing one, as discussed in Recommendation 7. We maintain that specification and measurement of need (steps 1 and 2) are not currently performed to desirable levels, since the prevailing method of justifying needs for facilities is based on projections of data describing departmental operations.

In similar fashion, step 0, to "specify/review long-range goals and objectives," which is related to need statements and the long-range capital budget, is currently not explicitly completed at a specific time. Our recommendations have given priority concern to the long-range capital budget which, it is felt, should serve to crystallize long-range goals and objectives as specific bud-get estimates for specifically needed projects. If a long-range budget were prepared annually, this phase would explicitly begin with preparation of budgets that reflect goals and needs of the County. The Board could then act decisively, thereby concluding budget policy decisions until the following year.

The steps 4 to 12 are currently a distinct and normal part of CAO work, which result in an annual budget, including capital

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projects, which is presented for Board review and action. However, this budget does not reflect capital projects financed by non general fund sources, which are an appreciable portion of the total County commitment. Other methods of financing include non-profit corporations, Board of Investment, and joint powers authorities. On some projects, a portion of these types of financing may be reflected in the annual general fund budget. Off setting revenue income in the case of Federal grants is an example.

The boxes in Figure 19 which are marked by asterisks are the points at which B&E Committee recommendations are designed to have the largest impact. If current procedures are improved for some steps and our recommendations are adopted, then this phase would begin with review of goals, need, and budget requirements (beginning, in order, with step 0) and conclude with goals and projects adopted as specific budgets by the Board of Supervisors. The CAO would be principally responsible for these steps and the following major products of the planning phase:

- Documentation of overall County need for new facilities as justification for need of individual facilities.
- Preparation and adoption of a long-range capital budget.
- Preparation and adoption of an annual general fund budget.
- Evaluation of projects rejected and need for inclusion in subsequent years.

PROGRAMMING PHASE

The detailed steps of the programming phase, the importance of which is discussed in Recommendation 3, are shown in Figure 20. This phase currently is moderately well defined as to beginning and ending. Improvements are in order, however, both in them management of architectural agreements, in the contents of

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programs or program plans, and in solicitation of citizen input. A major impact of our recommendations concerning this phase would be the clear definition of organizational responsibility and authority for products. Currently, the responsibility for producing programs and program plans is shared between the Architectural Division of the County Engineer and the CAO.

The phase identifies projects to be designed internally by the Architectural Division and those to be contracted, and marks projects requiring special attention because of size or complexity. Although, in the recent past, complex projects included only hospitals, and "programs" were sometimes produced, the current emphasis is on production of architectural programs for many large, non-hospital projects. Thus far, programs have emphasized space requirements and design needs. Our recommendations would convert the output from a space program to a project program plan by giving equal emphasis to design, budget, and schedule.

It is equally important that this phase provide high intensity focus on client requirements and strict control of project budgets. Two contributing factors to time delays and cost overruns have been uncontrolled client design inputs and budget freezes or suspensions. The Board control of the budget factor shows up in this phase because of poor prior planning: often the Board first becomes aware of the financial impact of previous commitments at this point. Our recommendations call for a long range budget in which programming commitments always precede major financial commitment, thus allowing the Board to defer commitment to build when the cumulative impact of projects is too high. The logic of the present system does not permit executive level, timed control of budgets, and use of client inputs at the appropriate time.

The major products of the programming phase of the current system include:

- A project program equally emphasizing design, and sometimes including budgets and schedules.
- Selection of a qualified architect.
- Documentation of citizen inputs.
- Unequivocal Board approval to pursue the project.

These products are the subjects of E&E. recommendations, and can best be produced and most effectively used if one organization or, for each project, one individual possesses explicit authority to guide work during this phase, as discussed in Recommendation 2.

SCHEMATIC PLANS PHASE

An effectively completed project program should result in enough detail so that the amount of work required during schematics is minimized. Since this is probably a long-term hope, the schematic phase, diagrammed in Figure 21, produces the first cu* at project plans. This phase, as well as other design phases, are currently the principal responsibility of the Architectural Division of the County Engineer. Our recommendations would not substantially change this arrangement. There would, however, be an overall manager provided, the project director, not to dilute present responsibility but to instill continuity through all project phases.

The schematic phase begins with a project kickoff meeting, and concludes with Board approval of schematics and approval to proceed. A well conceived project program plan, such as we recommend, would emphasize the kickoff meeting. Board approval of schematics could be eliminated, following approval of a project program plan, since the schematics provide little more detail than that plan and are preliminary in nature. Currently, the system operates without a project program plan. During

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preparation of schematics, the project architect of the County Engineer' S Department is responsible for working with the contract architect to produce schematic plans for the project. Since these plans must meet client department, service department, and other technical and legal requirements, this phase involves a number of design review cycles, for example, iterations through steps 30, 31, 32. Proper use of project program plans to secure prior departmental approvals can, of course, reduce the time consumed by these reviews.

Under the current system, the schematics phase takes an average of 6.5 months for projects valued between \$20 million and \$500,000.* This time includes all the steps shown in Figure 21 as well as delays resulting from policy, administrative, legal, and procedural influences. In the present system, the products of this phase include schematic plans and precise estimates of project cost. A new architectural services agreement (ASA) to produce preliminary plans may also be necessary.

One of the symptoms of important problems in the current system usually emerges during the schematics phase; that is, the estimated project cost is often higher than previous estimates. The reason is that, in the absence of strong project program planning, the first opportunity for client departments and other tenants to voice their requirements occurs during this phase, when descriptive and pictorial information about the planned facility is first available. Project program planning, as discussed in Recommendation 3, would require clients and tenants to complete their input and provide clear instructions to the architect before the start of the schematics phase. Moreover, the project budget approval by the Board, as included in the project program plan, would be extremely difficult to change. The project program plan will

* Computed for 40 projects completed by Los Angeles County during the years 1962-1966. The shortest time for schematics was one month, and the longest was 1.2 years. There is no apparent relationship to project value.

also incorporate contingency factors to cover potential cost increases, such as those that can result from emergence of problems or facts revealed during preparation of schematics.

DESIGN DEVELOPMENT PHASE

The design development phase (Figure 22), which produces preliminary plans, also usually ends with an increase of the project cost estimate. The increase, once again in the absence of project program planning, is the result of new design inputs from all agencies associated with the project. In the absence of strict project budget limits, the architect is not constrained from readily accommodating design changes that increase project cost, since architectural fees are computed as a percentage of cost. It should be emphasized that the complete elimination of all increases is neither possible nor desirable since some reflect honest, heretofore unarticulated design requirements, and some are required by code changes.

This phase is similar to other design phases, involving many of the same steps but leading to refinement of design, or design development through successive plan reviews, as illustrated by the iteration of steps 44 to 46. Preliminary plans are more detailed than schematic plans which implies a more extensive, time-consuming review, and concomitant increased workload by the contract architect. The average time required to complete this phase is 7.3 months. In the 40 completed projects we analyzed, the shortest time for preliminaries was three months, and the longest was 1.2 years. There is no question that the average time could be reduced by a considerable factor, just by introducing project program plan and strict controls on design changes.

Design development is the responsibility of the County Engineer's Architectural Division. The phase begins after a contract architect has signed an architectural services agreement to produce

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preliminary plans and is concluded with approval of those plans by the Board of Supervisors. The major product of this phase is set of preliminary project plans. An architectural services agreement to produce working plans, the next phase, may also be required.

CONSTRUCTION DOCUMENTS AND BID AND AWARD PHASES

This final phase, construction documents, in the production of a project design is also referred to as the working plans phase. The major products of this phase are bound prints of project design, copies of project specifications, final project estimate, and structural calculations. In this final design phase, the project cost estimate is typically higher than the prior phase estimate. This phase is the responsibility of the Architectural Division.

Preparation of the construction documents is the longest part of the design phase, on the average, and it incorporates final design and engineering decisions before construction. The phase logic, shown in Figure 23, averages 1.4 years from start to finish. For 40 completed projects, the shortest time in this phase was four months, and the longest was 2.8 years. The phase begins with authority to proceed with working plans and concludes with Board approval of the plans. In steps 49 to 56, plans are produced and reviewed. Board approval follows when there are no requirements for further changes for code compliance or County policy. Board approval also authorizes the County to advertise for equivalent materials, a means of informing all interested companies of the specifications so that they may submit any of their materials not in the specifications which they believe are equivalent to the materials in the project specifications. These products are reviewed by the contract architect, who may recommend their acceptance for use in the project.

The working plans and project specifications produced by this phase are used to complete the work of the project bid and award

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phase. For all practical purposes, these two phases are one, as shown in Figure 24. The product of this phase is a construction contract signed by the County and the lowest responsive bidder. The process of bidding and award averages two months. In the 40 projects analyzed, the shortest was 15. days and the longest was seven months. Although this may appear to be quite efficient, there is nonetheless probably some room for improvement.

CONSTRUCTION PHASE

The construction phase logic is shown in Figure 25. On the average, it takes 2. 3 years from authority to begin to complete a large project. The shortest construction time among our 40 projects was seven months and the longest was three years. The time increases roughly in proportion to the total dollar value of the project. The average increases to two years when delays from all sources are included. During this time, the County Engineer's Construction Division is responsible for all activity and job progress. Generally, an architectural services agreement is written so that the contract architect can be available, on site, to respond to questions regarding design.

Project progress meetings are held at the building site during construction. These meetings provide coordination and work supervision by bringing together the County Engineer project manager and project inspector, the contract architect, the contractor construction supervisor, the client department, and, periodically, subcontractor personnel. The purposes of the meeting are to monitor building progress, discuss problems, and make decisions affecting changes.

Project plans or specifications can be changed during construction in three ways. The smallest change, costing an additional 1,000 or less, called a field change order, guarantees that small project modifications are not permitted to delay entire projects. Authority for these changes is delegated to project

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Managers as a matter of County Engineer Department policy. If the change is somewhat larger a regular change order is used, as provided for by State law. According to the interpretation of State law by County Counsel, change orders may be for \$4,500 or less on any one change. Current Board policy limits the total of these changes to \$9,000 for any one project. When an initial authorization of \$9,000 for a project is exhausted, the County Engineer is required to appeal to the Board for additional funds. We believe that the \$9,000 limit is too low for major projects, and another figure is discussed in Recommendation 14.

The supplemental agreement procedure is used for major changes of scope to a project. Board approval is required in each instance in which this is used. State law sets a dollar limitation of \$10,000 or 10 percent of project cost, whichever is greater (See Figure 17, page 136). The decisions involved in making this kind of change are diagrammed in Figure 26. This summary logic reveals the fact that a great many people at various policy levels are involved in paperwork for changes of any size. These facts contribute to a high administrative processing time requirement which, for one large County project, averaged nearly six months, but for most projects valued at more than \$500,000 is approximately three months.

The improvements we have recommended would reduce the total time and dollars required by the construction phase. This, in the short term, will be accomplished by 1) shortening administrative time for processing change orders and supplemental agreements, 2) reducing the number of policy level approvals required for changes, 3) delegating authority for approving changes at increased dollar levels, 4) implementing new procedures to minimize change induced work stoppages, and 5) setting goals to reduce cost and time overruns due to changes. In the longer term, dramatic reductions of the cost in time and dollars will result from use of completely new construction management methods.

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The major product of this phase is a new County facility completed in accordance with previously specified design. Significant by-products include tile documents, which collectively define the design and the as-built variations from it.

EVALUATION PHASE

Project evaluation, when conducted, involves the steps diagrammed in Figure 27. However, evaluation properly is conducted continuously, and is not a phase>ba*cked on after project completion. For a more complete discussion of proposed evaluation system, see Recommendation 5.

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III. OTHER CONSTRUCTION SYSTEMS

INTRODUCTION

As part of the study of the construction practices of Los Angeles County, personnel of seven other major California counties, the State of California, the University of California and numerous private firms were contacted and information and data collected on the systems they employ for acquiring facilities. The results of the survey are discussed in this chapter, which is intended only to summarize the main features of the three major types of construction management systems in use today. Features of the various Systems that might be applicable to Los Angeles County and the pros and cons of their use are emphasized. When a technique seemed applicable to Los Angeles County, its use was included in an appropriate implementation recommendation. The three systems are: the Traditional or Sequential System, the Construction Management System, and the Design-Build System.

TRADITIONAL SYSTEM

Sequential Project Stages

An inherent feature of the method traditionally used to construct buildings is a sequential process of planning, designing, contracting and constructing. . Design work usually is obtained from architects and engineers for a fixed fee. After design is completed, the construction contract is let as a result of advertising for competitive bids. It is awarded to the lowest bidder for a lump sum. Bids are not taken until the working drawings are complete, thereby eliminating any possibility of obtaining lower costs either through the flexibility of designing and contracting in packages or utilizing a contractor's expertise at early design stages.

This system as used in Los Angeles County is illustrated in the flow diagram in Chapter II. It also is used in one form or

another by most counties in California. Its major advantage is that it easily accommodates the open competitive bidding for construction that is currently required by State law.

Project Management

Project responsibility often is fragmented in the design and construction of public buildings. The lack of a single operating authority with full responsibility and the resulting confusion and schedule slippage are perhaps the reasons, more than any inherent fault in the system, that have caused many organizations to search for new methods of managing construction projects.

In comparing the practices of Los Angeles County with those of other California governmental jurisdictions it was apparent that with the exception of one county, all exercise a greater degree of project management control than does Los Angeles. All the large, private firms surveyed acquire buildings by using a project management team approach. The owner is available as the ultimate authority but- the owner, project architect-engineer, and project administrator function as a team to run the project* This approach is used in varying degrees by the State of California, the University of California and most California cities and counties. The result is that projects managed by these organizations are more often completed on schedule and with fewer cost overruns than are projects managed by the County.

Control by Budget

Another important management feature seen in the other governmental units surveyed is control by budget. This involves the adoption and strict adherence to a budget, which contains an allowance for predictable contingencies and supplemental agreements and thus precludes numerous requests for changes.

The other governments surveyed had fewer client-imposed changes than Los Angeles County. We attribute this to a strict budgetary control and an executive management that says "no". In most cases, the client or using agency of the government is required to supply the additional funds for changes and even then the changes must be justified to the executive management. It should be noted that due in part to the size of its facilities acquisition program and to the complexity of its building projects, Los Angeles County has complications with which other governments do not have to contend.

Consolidated Authority

All the government agencies surveyed operate with the functions for acquiring facilities consolidated under one manager, generally either an agency head, a public works director, or a high level executive. This consolidation of authority facilitates the use of long-range planning for the facilities acquisition program, and control by budget and project management for individual projects. It should be noted, though, Los Angeles County's facilities development program is larger than all jurisdictions, including the State. It probably is easier for; the smaller agencies to implement control from one office.

CONSTRUCTION MANAGEMENT SYSTEM

The term construction management actually is a method of classifying a variety of management techniques used by various organizations. Construction management is new only in that it redefines traditional roles and relationships in the construction process to meet new time and cost demands, and it combines such proven techniques as phased construction, value engineering, design consultation, project budgeting, pre-purchasing, bid analysis, schedule control and on-site coordination.

Construction Manager

An essential aspect of construction management is that early in the conceptual stage of the project a construction manager is employed to work with the architect during the design stage. He is an integral part of the management team from project start to finish and is thus able to monitor both design and construction and to provide continuity to the project.

The trend is to employ a general contractor to fulfill this role, as it has been found in practice that the requirements of the job necessitate the expertise of a general contractor. The contractor may serve as a consultant on design and then bids competitively for the construction phases or he may serve only as a construction manager. However, the most common practice is for the contractor to not only serve as construction manager but to also construct the building for a guaranteed maximum price and a portion of any cost savings. Sometimes the contractor acts as the owner's agent for a fixed fee, much as does a professional consultant, and all major work is bought in the name of the owner from firms that normally would be subcontractors. The contractors own personnel then do little more than routine housekeeping chores on the job site. This arrangement leaves the construction manager especially free to represent the owner in an unbiased manner.

Whatever the particular arrangement, the construction manager serves important roles in establishing the project budget and providing the architect with timely information on market conditions and construction practices, as well as suggesting alternate designs that might reduce cost without detriment to the building form or function. This practice of suggesting alternate designs or equipment is referred to as value engineering. .

Phased Construction

The close cooperation between owner, architect, and contractor sometimes permits a phasing of construction -- the overlapping of various elements of design and construction. This technique, also termed fast track, is in contrast to the traditional construction process where all design is completed before any construction is started. Although phased construction increases the possibility of additional changes since construction is started before the total design is completed, this has not been found to be a significant problem by agencies using it. Rather, the flexibility of designing in elements or packages appears to be a major factor in cost savings as well as reducing the total time needed to complete the project. Construction on one element may proceed soon after it is designed and thus eliminate the possibility of cost increases on materials and labor which might occur while design is completed in other elements. Additionally, when subcontractors bid on specific elements, their expertise often reveals an alternate product or technique available at a lower cost than those specified. This method provides the management teams with an effective way of making cost-benefit analyses of all elements of the building.

Bonded Cost Commitment

According to the County Construction Projects Subcommittee, the single most important advantage of the construction management technique is the provision of a bonded construction cost commitment by a consulting construction management firm before plans are completed. This may then serve as security for advance sales of revenue bonds and administratively guarantee a maximum construction price in advance of preparation of construction plan documents.

Based on its three-year study of construction methods, the Federal General Services Administration has decided to use construction management on building projects of more than \$5 million in cost. Other public organizations that have experimented with this system include the University of California, New York City, and the U. S. Department of Health, Education and Welfare. Officials of the Associated General Contractors of California have gone on record approving the construction management method.

A major drawback to this system, and one that undoubtedly will prove a great hindrance to its use by public agencies in California, is the State law requiring open competitive bidding. The State law requires open competitive bidding to preclude favoritism or graft. Although under the construction management system, the construction manager as the general contractor can invite open bids from the subcontractors, under the State law even he must be selected by open bid with the contract awarded to the lowest bidder. This, of course, eliminates the consideration in selection of the construction manager of such factors as the contractors' experience, schedule performance and quality of work. These excluded factors are of prime importance in evaluating his probable performance as construction manager.

DESIGN-BUILD SYSTEM

Another innovative approach to construction is the design-build or turnkey system under which a single contractor is awarded a contract for the entire development of a facility including both design and construction. This technique is the ultimate in competition, since the entire project, from planning to design to construction, is open to competitive bidding. In a true turn-key operation even site acquisition is handled by the contractor.

Design-build is growing rapidly in popularity in the private sector as a method for procuring such facilities as warehouses refineries and other commercial or industrial installations. A majority of public and private housing projects are developed in this manner, and many of the Los Angeles construction firms contacted in the study stated they are regularly teaming with architects and engineers to form a joint venture to bid for an entire package.

The most notable public example of this method seems to be the U. S. Department of Housing and Urban Development's use of the system to obtain public housing. Local housing authorities are encouraged to contract with developers for entire public housing projects. The developer assumes the responsibility for acquiring the land, contracting with an architect to design the structure and a contractor to build. The housing authority agrees to purchase the completed project. HUD has learned that the high interest rates developers pay for construction financing serve as an incentive to their completing the project in a minimum possible time. Often there is considerable cost savings. It appears that this technique offers the greatest benefit for simple-design, moderate-cost projects.

Despite its merits, the County Counsel has advised that the design-build technique would require new legislation and that Government Code currently restricts the County from the fullest use of the system.

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IV. SUPPORTING DATA

This Chapter contains information which characterizes the capital facilities program in numerical terms. The contents are based on more extensive, detailed data that is on file at the Economy and Efficiency Committee offices and is available for examination on request.

There are three major sections, one describing the history and status of the total County program, one describing the background or 40 individual projects completed by the County between 1966 and 1971 and comparing County performance on those projects to performance of other developers on similar projects, and the last describing our estimates of potential savings.

Since interpretation of this information is discussed in the analysis of our recommendations in Chapter 1, most of the data is presented here with a minimum of discussion. The section on estimated savings is an exception; it contains detailed discussion of the basis for our estimates of savings.

INVESTMENT IN FACILITIES

Tables 10, 11, 12, and 13 and Figures 28 and 29 illustrate the growth of the County's investment in facilities over time. Table 13 shows the current amounts of space available and in planning. Table 10 indicates the rate at which County investment in facilities has grown since 1962. Each entry in the Table is the dollar amount (in millions) committed in the year indicated from the indicated source of project financing. Note that policy commitments of one year become financed commitments in future years. From this data, the current annual rate of investment is about five times the level of ten years ago (annual growth of 17 percent). The levels shown for 1974 and 1976 are estimates based on our projections of current trends, assuming that policy commitments will be met.

Table 10. Capital Projects Annual Rate of Investment (\$000)

<u>Fiscal Year</u>	<u>General Fund</u> ⁽¹⁾	<u>Board of Retirement</u> ⁽²⁾	<u>Legal Commitments</u> ⁽³⁾	<u>Policy Commitments</u> ⁽⁴⁾	<u>Total</u> ⁽⁵⁾
61-62	15	10	-		25
62-63	21	15	14		50
63-64	31	9	0		40
64-65	23	4	3		30
65-66	36	9	30		75
66-67	39	13	0		52
67-68	22	20	2		44
68-69	41	17	1		59
69-70	41	27	24		92
70-71	73	43	19		135
71-72	49	29	28	6	112
72-73	70	20	8	150	248
73-74	90	23		82	195
74-75	120			166	289
75-76	120			241	411

Notes:

- (1) Excludes Airport Fund investments, includes pay-as-you-go capital investments, land purchases, plans, installed equipment, etc. Data is from County Annual Budgets.
- (2) Annual disbursements on a calendar year basis through December 31, 1971, from annual reports of Board of Retirement.
- (3) Includes Joint Powers Agencies, Non-profit Corporations, Parking Authorities, and General Obligation Bonds. Data is from CAO letter to Board dated May 8, 1972.
- (4) Includes Joint Powers Agencies and Non-profit Corporations. Data is from CAO letter to Board dated May 15, 1972.
- (5) Excludes State and Federal grants, general administrative costs, and overhead.
- (6) Estimates based on design and management requirements for projects committed by policy.
- (7) Estimated balance of payments to committed projects.

Table 11.

General Fund Budgets Adopted
For Capital Projects
(Millions of Dollars)

Fiscal year	Land*	Plans Co. Eng.	Plans Other	Const.**	Insp.	Equip	Total
61-62	2	2	-	20	-	1	25
62-63	4	2	-	42	1	1	50
63-64	8	1	3	26	1	1	40
64-65	11	1	2	14	1	1	30
65-66	21	1	2	50	1	-	75
66-67	19	1	2	28	1	1	52
67-68	13	1	1	27	1	1	44
68-69	19	2	4	30	1	3	59
69-70	18	2	4	63	2	3	92
70-71	24	312	87	2	7135	7	135
71-72	18	2	6	78	1	7	112
72-73	31	3	13	195	2	4	248

*Includes purchases from Accumulative Capital Outlay Fund as well as from General Fund.

**Based on General Fund budgets for construction plus all other sources of financing.

Table 12. Partial Annual Cost of Space

Fiscal Year	Debt Service	Rent Expenses	Estimated Continuing Rentals (1)	Estimated Future Commitments (2)	Total (3)
61-62	6,125	5,855			11,960
62-63	5,829	6,101			11,930
63-64	5,713	7,713			13,426
64-65	5,591	6,965			14,556
65-66	5,739	10,733			16,472
66-67	7,662	11,616			19,276
67-69	7,483	13,061			20,544
68-69	7,292	15,206			22,496
69-70	7,110	18,417			25,527
70-71	6,932	22,854			29,786
71-72	6,759	30,281			37,040
72-73	6,164	35,705			41,869
73-74	5,993		36,905	8,741	51,639
74-75	5,823		38,230	12,276	56,329
75-76	5,653		39,688	20,773	66,114
76-77	5,483		41,291	29,712	76,486

Notes:

- (1) Based on present commitments plus 10% annual increase in rentals from non-public agencies.
- (2) Includes Board of Retirement, Joint Powers Agency and Nonprofit Corporation Legal and Policy Commitments. Cost data is from CAO letters to Board (May, 1972), timing is estimated.
- (3) Does not include loss of tax revenue due to public ownership, general administrative costs, overhead, or maintenance costs.

Table 13. Space in Use and Planning - County Service Groups

<u>Groups of Services</u>	<u>Occupied Gross Area Sq. Ft.</u>	<u>Number of Projects in Planning</u>
Social Services	2,422,986	
Justice System	8,008,114	65
Health Services	8,121,190	57
General Government	1,667,914	57
General Services	1,533,897	50
Environmental Services	2,381,795	113
Cultural	_____	_____
Totals	<u>26,124,817</u>	<u>342</u>

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Table 11 illustrates the composition of annual budgeted expenditures for capital projects. The column headed construction includes both the projects financed by external sources as shown in Table 10 and projects financed on a "pay as you go" basis. Project costs for land, architectural work, inspection and super-vision, and equipment are included in the total. Note that the Table excludes years beyond 1973, reflecting the fact that capital budgets are only prepared on an annual basis. It is also note-worthy that payments to outside architects (column 4) have been increasing much more rapidly in recent years than other expenditures.

Table 12 pertains to the annual cost of providing space to house County services. It is a partial accounting, since the full range of information needed to estimate the costs with accuracy is not readily available. In particular, the cost of work in progress or suspended is not reflected.

The last Table in this series, Table 13, shows the amount of space now in use to house County. Services, and contains an approximate breakdown for each budget category (or group of services) of the space used, and the number of projects currently in planning stages. It is important to note that requirements for new facilities are generated in response to policy directives, which are often originally formulated by State or Federal authorities. Design or construction is now proceeding on 342 different projects, and County investment in new facilities will soon exceed \$200 million a year in commitments.

Figure 28 illustrates that investments have been growing much more rapidly than demand for services, indexed by population, would seem to require. It is important to understand that this doesn't tell the whole story, since the quality and types of services provided by County government have also changed.

Figure 29 shows the level of payments to contractors as it varies over time. Note the effect of the freeze in 1971. We think that

payments are not adequate as a measure of the cost of facilities, because the figures obscure the levels of long term investment and costs associated with them. Internal costs of administration, supervision, and services are also excluded.

FORTY COMPLETED PROJECTS

The data in this section summarize the time and cost of 40 projects completed by Los Angeles County between 1966 and 1971. In addition, some examples of the results of other, alternative management systems are presented, and illustrate the potential effects of certain of our recommendations. The time periods and costs used in this series of tables are defined in other Sections of this document.

Table 14 lists the 40 projects which were analyzed, and the elapsed time (in months) from the beginning to the end of each phase of work. Time elapsed between phases during suspensions of the work is excluded. A blank entry means that the data is not available - signifying either that the phase was not formally conducted or that the time it took was negligible.

The next two tables summarize the time taken in each phase according to the dollar value of the projects (Table 15) and according to the type of project (Table 16). The times are time elapsed, in months, from beginning to end of the phase, averaged over the 40 projects. The averages exclude cases for which there is missing information. Note that, as expected, the total time elapsed during design and construction increases as the dollar value of the project increases. However, total time does not follow a consistent pattern based on the type of project, which may mean that with today's building technology, all major facilities are similar in complexity.

Table 17 provides information to support savings and improvement goals that we have proposed for Los Angeles. It contrasts the

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Table 17. Design and Construction Times*
For Projects Greater Than \$1 Million

	Average Time (Months)		
	Design	Construction	Total
Los Angeles	34	27	61
Other Public Agencies in California	17	28	45
Private Developers	16	23	39

*Using traditional methods of sequential scheduling and including both office (administration) buildings and hospitals

time taken by the County to design and construct buildings with the time taken by other developers, using the same sequential management method. Direct comparison would be unfair, because the sample size for other developers is much smaller than the 40 project sample of Los Angeles County. Nevertheless, we believe that these average times represent reasonable and realistic goals for the County. '

The remaining tables in this section illustrate the effects of changes of all types on project time and cost. Table 18 shows that the steps involved in processing supplemental agreements take an average of about three months, exclusive of contract extension.

Table 19 illustrates how changes during construction affect the cost and time of the job, for a variety of project value levels. Note that, while the average increase in cost over original contract prices is normally about three percent and never exceeds five percent, the average time extension is about 35 percent of the original contract allotment and always exceeds 25 percent.

Tables 20, 21, and 22 provide a breakdown of the cost and time associated with changes by source of the change or cause of delay.

Table 20 summarizes the relationship between project size, in terms of dollar value, the sources of delay, and cost and time extensions attributed to changes. The data demonstrates expected patterns, in that larger projects are subjected to more changes and are delayed proportionally.

Table 21 shows that other counties, cities, governments and private developers operating in the Los Angeles region perform better than the County on elapsed time because they keep changes to a minimum. They are subject to about the same levels of time extensions for strikes and weather, but keep time extensions from

Table 18. Average Supplemental Agreement Processing Time
(40 Projects)

Processing Step		Elapsed Time (Days)
<u>From</u>	<u>To</u>	
RFQ Issued	Receipt of Bid	29.1
Bid Receipt	Board Letter	25.2
Board Letter	Board Approval	13.2
Board Approval	Authority Approval*	<u>16.5</u>
Average Total Processing Time		89.6
Average Contract Extension		78.9

*when required

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changes to 6-14 percent, contrasted with the 33.8 percent level for Los Angeles County. The direct contract cost of delays is comparable for all developers, about 3-4 percent. However, a goal based on the two percent level achieved by private developers would be reasonable. Again, the data are not presented to contrast one system with another, because of the sample sizes. They provide examples that we believe would serve as goals for Los Angeles.

ESTIMATED SAVINGS

The implementation of the recommendations contained in this section will create substantial savings and other benefits for the County and its taxpayers. The benefits result from: (a) a shortening of the total length of time which elapses between the date of starting a project's architectural design and the date of completing construction; (b) a reduction in rework, waste, administrative red tape etc.; and (c) more economy in construction.

Total quantifiable savings attributed to our recommendations are \$5,400,000, based on current workloads. If the planned longer term growth of the County program materializes, then the annual savings would be much larger.

The following breakdown details the quantifiable savings:

Reduced Construction Delays	\$1,400,000
Shorter Construction Phase	1,100,000
Shorter Design Phase	1,400,000
Reduced Redesign and Rework	800,000
More Economical Construction	<u>700,000</u>
	\$5,400,000

Other non-quantifiable benefits also result from improved management of capital facilities development. Briefly, these benefits are as follows:

- A management system which completes buildings more quickly permits the Board more flexibility in decision making.
- When appropriate, the Board would be able to defer commitment to a project until a later date and thereby take better advantage of new technology developments.
- The Board would have better analysis of needs and requirements for facilities*
- Buildings could be available to provide services earlier, when needed.
- The facilities program could be more responsive to changing needs for services.

Savings from Shortening Total Development Time

The largest source of quantifiable savings is the shortening of the currently excessive time which elapses between a project's initiation and its completion. This compression of the development schedule is the result of reducing delays during construction, speeding administrative approval processes, scheduling shorter, more timely design and construction phases, and managing the project with appropriate emphasis on timely completion.

These savings in time have a very substantial and quantifiable value. There are two aspects of the value: (1) during development the County expends resources on a new facility which are "tied up" until the facility is completed; (2) many administrative costs of facility development go on more or less continuously throughout development and a longer time period means more such costs are expended.

The time savings are large. We project that implementation of the recommendations will result in average savings of 23 percent of construction time and 30 percent of design time on newly started projects. For example, a typical facility now requires 28 months for construction and 34.4 months for design or a total of 62.4 months (more than five years). Under the improved system, the construction phase should be reduced to about 21.6 months and design should be completed in 24 months. The total project will require about 46 months resulting in a time savings of 16 months. Therefore, on the average, projects should be completed more quickly than now.

If the Board maintains the current schedule for completion of projects, then the compression of facility development schedules will result in a reduction in the total amount of funds which the County has "tied up" in partially completed facilities. To illustrate, if our typical project is to be completed in December 1978, its architectural design need not be started until February 1974 rather than in October 1972. This postponement of starting projects makes it possible for the County to reduce its commitments to design and construction below the level they would otherwise have been. Table 23 is an estimate of the total investment the County currently has made in expenditures for projects which are under development. It should be noted that this investment would be more or less constant if the County's rate of facilities development were not growing. As expenditures start on new projects, old projects are completed and their total costs would be removed from Table 23.

Implementation of our recommended changes would reduce this \$158,000,000 investment to about \$119,000,000 (See Table 24) -a total reduction in investment of about \$39,000,000. This reduction of investment in partly completed facilities is not a savings, however, it is a kind of windfall since the changes

Table 23. Investment in Partially Completed Facilities

Funds currently "tied up"	
<u>75 Projects in Construction</u>	
Value of construction contracts \$130,000,000	
!	Estimated total progress payments to date 45% \$58,500,000
Cost of architectural design	
!	Plans @ 8% 10,400,000
Cost of equipment (estimated) 15,000,000	
Value of inspection and construction in management for facilities in process. <u>5,000,000</u>	
\$88,900,000	
<u>261 Projects in Design</u>	
Value of projected construction \$471,000,000	
Projected cost of architectural design @8% - \$37,700,000	
•	Estimated total progress payments to date-50% <u>\$19,000,000</u>
\$19,000,000	
<u>Land Purchased for Projects Under Development</u>	
Last three years land purchases \$73,000,000	
•	Estimated portion applicable to projects under construction <u>\$50,000,000</u>
50,000,000	
Grand Total \$157,300,000	
<hr/> <hr/>	

Table 24

REDUCTION IN INVESTMENT RESULTING FROM
IMPLEMENTATION OF RECOMMENDATIONS

	Current Investment (\$000)	Percent Reduction	Revised Level of Investment (\$000)	Reduction in Investment (\$000)
Projects in Construction (excluding land)	88,900	23 ⁽¹⁾	68,400	20,500
Projects in Design (excluding land)	19,000	30 ⁽²⁾	13,300	5,700
Land under Development	50,000	25 ⁽³⁾	37,500	12,500
TOTALS	157,900		119,200	38,700

NOTES:

(1) A 23 percent reduction in time was derived as follows:

- Contract extensions average 35 percent of original schedule for contracts over \$500,000 (80 percent of dollars spent are in this category). These probably could be cut in half by implementation of all recommendations included in this report. (Strike and weather delays are not subject to much reduction.) Time reduction for each contract (and on an annual average) would be 17.5/135, or a 13 percent savings.
- Compressing Construction Phase - Projects studied showed an average construction period of 28.2 months, including authorizations delays. By controlling and speeding changes, we established a goal of a 13 percent reduction in overall time by cutting delays in half. In addition, it should be possible to reduce scheduled construction time by at least ten percent.

(2) Compressing Design Phase - Projects costing over \$500,000 and completed during the past five years required an average of 34.4 months from execution of SA to Construction Award. As a goal, it is feasible to cut this to 24 months even for construction procured under the traditional sequential approach. This goal is still roughly twice the time required for design of comparable private-sector facilities.

(3) Deferring Date of Land Purchase - A reduction of 23 percent in construction time and 30 percent in design time results in land not being needed until nearer the scheduled completion date of the facility. It is estimated that time during which land is awaiting development or under development could be cut 25 percent.

will provide a multiyear period during which each year's new obligation for facilities can lag the previously anticipated rate of obligation.

The Board could choose to accept facilities on the current (sometimes too late) schedule and thereby reduce the County's obligation by \$39,000,000. Alternatively it could accelerate the delivery of facilities without increasing total County obligations. If delivery were accelerated, then needed services would be available to the public at an earlier time.

If the Board decides to reduce obligations by \$39,000,000, then real annual savings will occur. This- savings are estimated at 10 percent per year of the reduced obligations - or \$3,900,000 (see Table 25. It consists of: reduced interest paid due to a lower level of borrowing or increased interest earned on funds available for investment, less rent paid for rental of alternate space during facility development, less sustaining administration and management for shorter projects, less risk of abandonment, technological change or other major change in the need or use of a facility, increased property taxes collected on land due to deferring the date of acquisition of parcels earmarked for development, reduced costs for contractor overhead, change management and contingencies.

We estimate that this savings would be apportioned among there commended changes as follows:

Reduced Construction Delays	\$1,400,000
Shorter Construction Phase	1,100,000
Shorter Design Phase	<u>1,400,000</u>
	\$3,900,000

This annual savings from shortening total development time is substantial. However, there are also two other areas of savings, Reduced Redesign and Rework and More Economical Construction.

Table 25. Estimated Annual Savings Due to Reduced Investment

Reduction in Investment	\$39,000,000
<u>Savings:</u>	
• Interest	}
• Less rent on alternative facilities	
• Less administration and management	
• Less potential for abandonment of project or major change	
• Increased property tax collections prior to land purchase;	
• Reduced contractor costs for administration, changes, contingencies	
	\$3,900,000

Reduced Redesign and Rework

Improved project management and preparation of architectural programs will reduce the number of changes on projects. This reduction will save the current waste that results from redesign and rework. Of course, the total cost of change will not be saved since much of that cost is associated with providing additional facilities capability. However, architectural programming and project management should result in a great reduction in the waste which comes from incorporating changes into a facility after construction has been initiated. We estimate that these savings will be a minimum of \$800,000 per year.

More Economical Construction

In addition to saving development time and reducing the waste of redesign and rework, the recommended improvements should permit the County to manage design and provide for more economical construction. The County might set a target for cost reduction at 2-4 percent of construction costs (currently about \$70,000,000 annually). For the County to attain such a target would require setting tighter initial planning estimates and being less lenient in permitting increases in the cost estimate during the construction phase. The implementation recommendations will provide the tools and capability for the County to tighten up on construction estimates without jeopardizing the quality of County facilities.

We believe that 2-4 percent of construction costs could be saved in the near term, but to be conservative we have only projected a one percent savings. This annual savings would total \$700,000 on the current \$70,000,000 rate of expenditure on construction.

V. CASE STUDIES

INTRODUCTION

An in-depth review of the administration and management of the Central Jail Addition and Arraignment Courts, the Traffic Courts Building and Martin Luther King, Jr. Hospital has been conducted with the objective of learning how the County's facility development process works, how it might be improved, and what impact the changes might have on various projects.

Although these three projects have been evaluated as examples of how the County develops facilities, it should be noted that they are not "typical" examples, if there is such a thing. However, they are worthy of particular examination for several reasons. Each project is large, and has encountered delays in construction; each has been the source of frustration and controversy at the executive levels within the County; and each has certain unique aspects. At the present time, the combined projects represent a County investment of \$71,551,151. The average total of planning, design, and construction time for these was over seven years.

Extensive data was collected on all three projects in the areas of cost overruns and time delays, early estimates of cost and completion, budgeting, interviews and chronology. The following report represents a summary of the collection of information from the voluminous documents maintained by the CAO, County Engineer and other departments. Details of this information are available in the E&E Committee office.

Martin Luther King, Jr. Hospital was occupied by the Department of Hospital staff in January, 1972. The Traffic Court is scheduled for completion in the Fall of 1972. The Central Jail is not scheduled for completion until the second half of 1975. None of the three projects have been accepted by the County

TABLE 26. Construction Phase Summary Data for Three Selected Los Angeles County Capital Projects

	Traffic Courts	Jail Addition	King Hospital	Total
Orig. Contract	\$14,975,000	\$29,168,396	\$24,733,552	\$68,876,948
Change Orders	79,697	129,662	172,604	381,963
Supp. Agreements	397,358	874,734	1,020,148	2,292,240
Cost to Date	\$15,452,055	\$30,172,792	\$25,926,304	\$71,551,151
% Cost Overrun	3.1	3.6	4.6	3.8
Orig. Contract	900	1095	840	2835
Change Orders	8	51	-	59
Supp. Agreements	252	162	140	554
Time to Date	1160	1308	980	3448
% SA-CO Time Overrun	22.4	16.3	14.3	17.8
Weather, Strikes Etc.	277		195	472
Total Time to Date				
Days	1437	1308	1175	3920
Years	3.93	3.58	3.21	10.73
% Total Time Overrun	59.6	19.4	39.8	38.2

* Project construction not completed - all numbers will change.

Engineer. The data contained herein is subject to change because of the status of the three projects.

One feature of the project descriptions contained in this chapter which may be a source of confusion, is the way in which the total project cost figure varies from phase to phase. While the specific numbers vary, the pattern which they follow is generally the same. An initial budget estimate is set for the project in the annual general fund budget document. By the time an ASA for schematics is prepared, the cost has dropped to a lower figure. Then the cost is often raised by approved schematic and preliminary plans based on many County agency requirements. Another and higher figure is usually set in the project bids specifications. This number is often increased if higher contractor bids are received. Finally project cost increases by 3-5 percent over bid price, during construction. For example, the Jail Addition cost estimates were \$20,560,350 in 1963, \$18,411,000 for schematics ASA, \$25,965,707 for completed schematics, \$29,164,000 in bid specifications, and final cost is estimated at between \$33-34 million. Some remedy for this confusing cost fluctuation will be found in adopting a firm project estimate in the project program plan and building to that figure.

MUNICIPAL TRAFFIC COURT BUILDING

SUMMARY

The Municipal Traffic Courts Building is an eight-story building of 232,000 square feet of floor space. Planning began in 1963, an architect was appointed in April, 1964, and a site for the building was selected a year later. The 1965 cost estimate for the building was \$7,567,000, to include 210,000 square feet of floor space. The final cost is expected to be approximately twice the original estimate, or in the \$15-16 million range. The contract cost of \$14,975,000 has increased 3.1 percent to \$15,452,055 through change orders and supplemental agreements.

The construction contract called for the facility to be completed in 900 days. The actual time will be approximately 1,437 days or 59.6 percent longer than the contract allowed. This large time increase also occurred in the design phase where the 480 days originally planned for completion of schematics, preliminary, and working drawings ran to 1,166 days or 143 percent more time than planned. The total time to complete this project from pre-programming through construction will be in excess of 7 years. Completion of construction is expected in the last quarter of 1972.

There appear to have been two principal problems contributing to increases in cost and time:

1. Budget and site selection planning should have been finalized before appointing an architect to proceed with schematics. Because this was not done, the architect began drawing plans based on a facility program that was three years old. The E&E Committee's recommendations on project management, program plans, long range budget, and policy commitments, if implemented, will help prevent or reduce similar problems.

2. User input should have been nearly complete during programming, permitting review and minor changes during design. Inputs from user or tenant departments basically would be confined to the project program as described in the E&E Committee recommendation concerning that subject.

FACILITY DESCRIPTION

The Los Angeles County Municipal Traffic Court Building is an eight-story building located in the central area of the site bounded by Hill Street on the east, Olive Street on the west, Washington Boulevard on the north, and Twenty-first Street on the south, with a three level subterranean garage for approximately 1,900 cars occupying the entire site. A separate one-story structure, (vehicle inspection station) to be operated by the Marshall, will be located at the Twenty-first Street end of the site.

The building will provide space for the Municipal Court Clerk, City Attorney, Juvenile Authorities, Public Defender, Marshal, one master calendar court, three arraignment courts, and 10 traffic courts.

Dedication is scheduled for October 1972 and completion is expected to be in January, 1973. Court facilities include judges' chambers, jury deliberation rooms, and detention facilities adjacent to each courtroom, court reporters' offices, and attorney conference rooms. Space is also provided for an officers waiting room, jury assembly room, and employees' lunchroom, and an auxiliary master calendar courtroom, which can be used for functions such as traffic schools and driver education.

The tower structure is an eight story Type-I construction with mechanical equipment penthouse, containing approximately 232,000 gross square feet. Foundations are reinforced concrete on normal spread footings. The building is steel frame with reinforced concrete roof and floor slabs on steel beams. Exterior and interior

load bearing walls, as well as shear walls and walls in prisoner detention, are reinforced concrete. All areas of the tower are air-conditioned except for those not regularly occupied, such as restrooms, storerooms, and janitors' closets, which are power exhaust ventilated. The subterranean garage areas (levels A,B,C) which also are power-exhaust ventilated, contain approximately 276,237 square feet, have a reinforced concrete beam and column structural frame and pre-cast concrete double tee beams for the floor.

The motor vehicle inspection building is of steel frame precast concrete wall panel construction and contains approximately 9,500 gross square feet, with an enclosure for an office, locker room, and toilet facilities. It is an open, drive-through operation which will have its own individual air-conditioning unit.

Site development includes such work as site clearance, parking area for approximately 48 cars, walks, ramps, directory signs, retaining walls, exterior lighting, landscaping and sprinklers, drainage facilities, and extension and connection with all existing utilities.

PROJECT HISTORY

The following briefly describes all salient points of interest relative to each phase of the construction process. It is a summary only; more or other specific details may be found in the chronology of important dates.

Preprogramming (2/7/63 to 4/20/64, 437 days)

In February 1963 the Chief Administrative Officer presented a forecast of the courts' needs for years '70, '75 and '80. This document, in effect, constituted the municipal courts estimated

requirements for the next 20 years and, ultimately, was used as the facility program. The CAO requested monies for land acquisition to initiate the development of the traffic court in FY 63- 64 proposed budget; however, it was not approved by the Board and was postponed until the following year. In anticipation of the budgeting of monies for land acquisition in FY `64-65, the architect was appointed on April 21, 1962. The delay during this phase seems to have been due to a lack of available information concerning probability of budgeting monies to initiate the project. This is very much related to the lack of a long-range plan and needs analysis for all county construction projects and the relationship between capital and operating financing.

Programming (4/21/64 to 5/25/65, 399 days)

The programming phase began when the architect was appointed on 4/21/64; however, no money was budgeted until FY 64-65. Once the FY 64-65 year began and money was incorporated in the budget for this development, the search for a site was begun. It was not completed until April 1965.

One source of problems during programming was the apparently premature appointment of the architect; however, the significant time delay during this phase was related to the problem of land acquisition. Depending on which begin and end dates are used, the amount of time spent on site selection appears to have been approximately nine months. After a considerable amount of debate over a site, one was selected, but was later eliminated because of possible severance damage costs associated with acquisition. These costs were overlooked by the CAO during initial investigation. Subsequently, another site was selected. This whole process took more than one year. The period is even longer if the September 1963 CAO request to the Regional Planning Commission to begin a land search is considered to be the real starting point for site selection.

Problems during the preprogramming and programming phases of this project seem to indicate that for construction projects of this size, a definitive program regarding site selection and financing is desirable. Problems relating to land and money required from 2/63 (CAO forecast) to 5/65 (Schematic ASA) to resolve.

Schematics (5/26/65 to 6/8/66, 378 days)

The Schematic Architectural Services Agreement (CASA) was approved by the Board on 5/11/65 with estimated construction costs of \$7,567,000. The estimated time allotted for schematics was 120 days; however, interaction with the user group delayed drawings from 7/7/65 to 3/24/66, a period of almost 9 months.

Major sources of problems during the Schematics phase are as follows:

1. User group suggestions had a pronounced effect on the overall timing. The involvement of user groups, especially on jobs of this size, should be initiated during the programming phase to limit the loss of time during the drawing phase.
2. Due to the delay during preprogramming and programming, the architect was using a facility program more than three years old by the time he was ready to complete schematics. This presented problems related to additions/deletions to the facility program.
3. Questions related to underground vs. surface parking should have been resolved prior to initiation of schematics. As responsibility for the project was transferred to the CE, the CE became concerned that the underground parking would lead to expenses of over \$1,000,000 which were not necessary.

The Board approved the schematic drawing on 6/8/66, estimating the construction cost to be \$9,635,000.

Preliminary Drawings (6/9/66 to 3/7/67, 271 days)

A combined ASA for preliminary and working drawings was approved on 6/30/66. The planned time for preliminaries was 90 days. A scope change regarding above-ground parking was still being considered after schematics were approved. The fact that the change to above-ground parking was not made illustrates the difficulty of introducing cost-saving changes once the concept for the building complex has been generally accepted.

During the preliminary drawing phase, the contract architect's cost estimates were consistently lower than CE estimates. This discrepancy is caused by a number of factors including the fact that the CE estimate contains contingencies and forecasted escalation. Another factor is that the contract architect is pressured into adopting an optimistic view in order to stay within the confines of his original instructions.

Although it is strictly a matter of hind-sight, it is easy to conjecture that if the issue of above-ground parking had been settled before sketches and floor plans became available, above-ground parking would have been acceptable, and real savings would have been made on this project.

The Board approved preliminary plans on March 7, 1967, at an estimated construction cost of \$10,818,000.

Working Drawings (3/8/67 to 8/6/68, 517 days, planned time 270 days) In excess of two months was spent by user groups in progressive reviews of the working drawings. Involvement by user departments

during the later stages of drawings appears to be influenced more by the tenants than technical requirements or planned approval procedures. The process appears slow and undoubtedly could be improved. The E&E recommendation covering project programs would mitigate this problem by providing specific time restraints so as to process reviews in a more efficient manner.

Construction Award - (8/7/68 to 10/1/68, 54 days)

The bidding period was completed in less than two months which is quite good, considering the size and scope of the project.

Construction - (10/2/68 to present, over 4 years, originally planned as a two-year project)

Delays due to inclement weather amounted to 98 days. Currently a request for an additional 12 days is planned. Strikes caused 61 days of delay, and a request is currently planned for an additional 60 days due to a prior floor layers strike. Additional strikes are possible in the coming months. There appears to have been insufficient continuity of management by the contractor on this job. He has had three superintendents, 5-6 assistant superintendents, and 2-3 detailers on the job since its inception.

Summary of Construction in Days*

900	planned
98	weather
61	strike
252	S/A
8	C/O
12	weather-planned
60	strike-planned
<u>69</u>	other delays
1,460	

* Assumes County Engineer Estimated Completion of 10/1/72

Delays of 252 days were granted by Supplemental Agreements and eight days were granted by Change Orders. Most of these delays were caused by technical changes (changes in technology, regulations, or standards or design errors) and not tenant-initiated changes.

Summary of Construction in Dollars

\$14,975,000	Original Construction Bid
79,697	Change Orders
<u>397,358</u>	Supplemental Agreements
<u>\$15,452,055</u>	

*Contractor claims for work not included in original scope may be forthcoming.

SUMMARY OF PROBLEM

Planning

1. There was a conspicuous lack of information available concerning the probability of budgeting monies to initiate this project.

Programming

1. The appointment of an architect appears to have been premature.
2. A significant source of delay during this phase was related to acquisition of land. As early as 1963 the CAO had requested the Regional Planning Commission to begin site selection.
3. No definite project program was produced.

Schematics

1. The facility users had a pronounced effect upon design. Their inputs should have been solicited, in detail, early in programming.
2. Due to delays during planning and programming such facility program as did exist was approximately three years old.

Preliminary and working Drawings

1. Client agencies consumed a large amount of time in plan review.

Construction

1. There were a large number of delays due to strikes and weather totaling approximately 300 days.
2. A large number of days delay, 260, were also attributable to change orders and supplemental agreements.

SUPPLEMENTAL AGREEMENTS

The Traffic Court Building, which has not been accepted by the County Engineer, has had 12 supplemental agreements costing approximately \$397,358 and causing 252 days of delay. This represents 2.5 percent increase over original cost and 28 percent increase over the original construction time of 900 days.

CHANGE ORDERS

The Traffic Court Building has had 50 change orders, costing \$79,697 and causing eight days delay. These changes represent a 0.6 percent increase in cost and a negligible delay due to time extensions.

The Board, on five separate occasions, approved the County Engineer's request to increase the limit of the total cost of change orders from \$9,000 to \$90,000.

Project Chronology

2/7/63 Forecast of Municipal Court future requirements sent to Capital Projects Division.

8/27/63 Board instructs CAO to submit report on feasibility of building new traffic court.

9/25/63 CAO requests Regional Planning Committee to begin land search.

4/21/64 Architect appointed - William Allen, Ala.

4/23/64 Judges committee decides on site area.

10/23/64 CAO recommends site area to Board.

11/5/64 Capital Projects Division request County Engineer for preliminary appraisal of sites.

1/7/65 CAO recommends to Board one site.

1/12/65 Board approves site.

1/18/65 CAO/Capital Projects Division request County Engineer to review approved site and select alternative as approved site found to be unfeasible.

4/15/65 Board of Supervisors approves new site.

4/26/65 Architect sends CAO estimate: \$7,567,000 for 210,000 square feet building plus parking for 1,000 cars.

5/11/65 Board approves schematic ASA panned 120 days}.

7/7/65 Judge Noel Cannon, Municipal Court, requests Supervisor Kenneth Hahn review suggestions for new courthouse.

7/28/65 Judge Cannon' S letter sent to CE for review

8/10/65 County Engineer responds to Supervisor Kenneth Hahn.

7/65-1/66 Judge's Cannon's Facility suggestions under consideration.

3/24/66 Judge's Committee approves schematics

3/30/66 Architect William Allen requests land survey by County Engineer.

4/6/66 County Engineer begins topography studies.

5/19/66 County Engineer sends topography studies to architect.

6/20/66 Board approves foundation investigation.

4/26/66 Architect submits schematics to County Engineer for initial review.

5/5/66 Review of County Engineer's comments on schematics completed.

5/28/66 Final schematic plans review before approval

6/8/66 Board approves schematics (\$9,635,794) 277,000 ft., plans parking for 1,000 cars.

6/30/66 Preliminary and working drawings ASA signed (budgeted 90 days preliminary, and 270 days working drawings).

9/23/66 Meeting with architect, County Engineer, and CAO on rise in estimated cost from \$9,635,794 to \$12,502,000 for 282,500 ft.)

10/28/66 Architect submits preliminary drawings to County Engineer.

11/29/66

12/1/66 Architect estimates cost at \$10,399,957

12/2/66 CE estimates cost at \$12,460,291

1/30/67 Estimating unit reviews discrepancy in cost/estimates.

3/7/67 Board approves preliminary drawings, (Estimated cost \$10,818,327)

3/26/67 Board approves extra services quote from architect for pneumatic tube and hoist (estimated cost - \$95,000).

3/16/67 Fire Department and Building & Safety Department don't agree on egress and fire separation requirements.

6/9/67 Fire Department and architect meet to discuss requirements.

6/14/67 Architect submits estimated cost of \$28,000 to County Engineer to meet new fire requirements*

7/17/67 Working drawings 50% complete.

8/2/67 Judge's committee requests changes in working drawings.

10/10/67 Board approves Judge's requests (cost - \$16,350).

2/1/68 Architect submits to CE set of working drawings for comments.

2/27/66 County Engineer's plan review comments sent to architect.

4/30/68 Board approves extra services for sheriff, municipal court and communications (cost - \$8,910).

6/1/68 Architect submits costs estimate to County Engineer (\$12,037,750)

6/68 Board of Supervisors approves Board of Retirement lease.

6/11/68 Board approves equivalent materials procedure.

7/23/68 Equivalent materials procedure specifications established.

8/6/68 Board of Retirement advertises for and receives construction bids

9/18/68 Bids opened

9/25/68 Lowest bidder selected - Walter Kidde Constructors, Inc.

10/4/68 Building permit issued.

11/1/68 Waterworks & utilities Division's letter to City Bureau of Street Lighting requesting removal of existing light standards.

11/6/68 Letter to CAO requesting budget adjustment for relocation, installation, and removal of certain utilities.

11/25/68 CAO letter to County Engineer requesting negotiation with Architect for extra services to include the Juvenile Traffic Court in the unfinished portion of the 8th floor.

12/12/68 By Architect's request original tracings were released to his structural consultant.

2/12/69 Letter CAO authorization to negotiate an extra service with Architect for completion of 8th floor for Juvenile Traffic Hearing

4/8/69 Board approval of extra services for eighth floor completion for Juvenile Rearing

6/17/69 Architect submitted supplemental original tracings on Juvenile Traffic Facility.

10/7/69 Extension of construction time approved by Board.

11/10/69 Increase in Change Order funds \$9,000 to \$27,000.

2/9/71 Comments received from Municipal Court on interior signs.

2/71 to Construction continues
6/72

6/27/72 Approve supplemental agreement number 13 for \$42,881.

8/22/72 Increase change order funds from \$90,000 to \$108,000.

9/72 Going through building final check list although
parking and motor vehicle testing stations are not
complete.

10/4/72 Anticipated building dedication date.

12/4/72 Court sessions should begin.

MARTIN LUTHER KING HOSPITAL

SUMMARY

Martin Luther King, Jr. General Hospital is a 597,688 square foot, six-story facility which will provide 394 acute care beds in South Central Los Angeles. Planning for the hospital was a reaction to the Watts riots and began in December 1965. The project architect was appointed in March 1966, and design began the last half of that year. The 1966 cost estimate for this project was \$21,400,000 while the estimate in the architectural services agreement was \$23,540,000. Project changes to date have resulted in a total cost of \$25,926,304 or 4.6 percent over the original construction bid price. The building is occupied but has not been accepted by the County.

The contract called for construction to be completed in 840 days. The actual time required was 1,175 days or a difference of 39 percent which is accounted for by 140 days due to changes and 195 days due to weather and strikes.* Although the deadline for obtaining \$8.4 million in Hill-Harris matching funds was met, the design phase actually required 575 days or 16 percent over planned time. The total project time from beginning through construction was 5.4 years.

The principal problems contributing to apparent increases in cost and time are:

- Architects were appointed before the County had an adequately detailed definition of facility needs. This problem would be eliminated if the recommendation regarding project programming is implemented.

*The contractor has submitted a request to the County Engineer to extend the completion time 157 days (weather, strikes). The request is still pending.

- Inadequate plan checking and coordination of designs by separate architects for the acute care unit and the central heating/air conditioning plant resulted in technically inconsistent plans. Design management, Recommendation 4, would consolidate responsibility for review, coordination and approval of design work.
- The schedule urgency of the project resulting from requirements of the Hill-Harris grant program caused the deferment of technical reviews and contributed to costs and delays during the construction phase.

FACILITY DESCRIPTION

Martin Luther King, Jr. General Hospital (MLK) is an acute care general hospital located on a 30-acre site on 120th Street, between Wilmington Avenue and Compton Boulevard. It was formerly the site of the County-owned Palm Lane Housing Project. The hospital has 394 beds, with unfinished areas for 76 future beds. It has been designed for the addition of another 290 beds, for an ultimate total of 760 beds. The main hospital building has 583,388 gross square feet, and the central heating and air conditioning plant building has 14,300 gross square feet.

The hospital building provides for outpatient clinics, teaching facilities, emergency services, nursing units, admitting services, X-ray, surgeries, OB delivery, central service, dietary and all ancillary elements.

Floor by floor, the facilities are:

- The basement, containing space for the morgue and autopsy, records, social service, nuclear medicine, radiation therapy and receiving supplies;

- The first floor, providing for administration, personnel, pharmacy, walk-in clinics, emergency and admitting services;
- The second through fifth floors, containing beds and equipment for intensive care, coronary care, pediatric, obstetric, dental and surgical units;
- The sixth floor, containing mechanical equipment.

Adjoining the hospital to the west is the central heating and air conditioning plant, maintenance shop building, and service building. The auditorium, located to the east of the main building, seats 200 people, and is connected by a covered passageway.

The buildings will be Type I structures, with reinforced concrete walls and floors. Exterior treatment consists of various combinations of textured, scored and/or smooth concrete surfaces and facia with brick spandrels; windows are steel sliding sash with aluminum sunshades where required. Interior finishes are appropriate to the operation, maintenance and functions required for the project.

As additional service and supply needs were established, programs of mental health, post-graduate school and residence facilities took shape, and additional parking and power from the central plant became necessary. The master plan developed for the King Hospital complex includes these additional phases of construction:

1. Realignment and improvement of 120th Street and intern's residence.
2. Services and supply building.
3. Community mental health center and clinical sciences unit.
4. Addition of 76 beds to acute care unit.

5. Medical arts building.
6. Child care facility.
7. Final addition of 290 beds to the acute care unit.
8. Central plant expansion.
9. Parking.

The master plan indicates that the estimated total cost of the entire Martin Luther King Hospital complex will be more than \$65 million. The anticipated completion date is 1976.

PROJECT HISTORY

Pre-Programming (8/65 through 2/66, 180 days)

Pre-programming for King Hospital began with the formation of the McCone Commission after the August, 1965, Watts riots. In its report of December 2, 1965, the Commission indicated that South Central Los Angeles needed a general acute care hospital. Its reasoning was that the Watts area had a greater average incidence of poor health than the rest of the City of Los Angeles and did not have adequate accessible medical facilities within the community.

In February 1966, the CAO and Department of Charities (now the Department of Hospitals) at the request of the Board of Supervisors investigated and substantiated the Mc Cone report that a hospital was needed in South Central Los Angeles. First estimates by the State Hospital Advisory Council indicated a need for a 438-bed hospital.

Programming (3/66 through 7/66, 120 days)

The project architects were appointed on March 8, 1966, and included three firms: Neilson, Moffat & Wolverton; Carey Jenkins; and Adrian Wilson.

Programming of the hospital started with the first meeting of the Watts Hospital Policy Task Force on March 14, 1966. This group, made up of hospital personnel from Los Angeles County/USC Medical Center and the CAO's Capital Projects and Budget Division, was charged with the responsibility to develop a program for submittal to the architects. They developed a Narrative Program Statement defining required facilities, which was subsequently given to the architects. Estimated cost during this phase was \$21,400,000 of which the County's share was \$12.3 million and the State-Federal share was \$9.1 million.

The Watts Community was not involved in this initial planning stage. Their later involvement in construction related directly to scope changes in plans and delays in construction. Client planning was performed by personnel from County/USC Medical Center, since there was no MLK organization at this time. As Martin Luther King Hospital staffs were hired during design and construction stages, they made changes in construction and equipment specifications.

Schematics and Preliminaries, Combined (7/66 - 2/67, 210 days)

The Programming Task Force first met with the architects in July 1966, to begin the schematic-preliminary phase; and a joint venture of three architectural firms was appointed to design the main hospital building in March 1966. The Architectural Services Agreement (ASA) was signed on July 19, 1966; the estimated project cost was \$16,120,160. This agreement combined the usually separate schematics and preliminary stages, and indicated that the CAO was the County representative until schematics and preliminary drawings were approved by the Board of Supervisors. The ASA included a tight schedule mandated by the CAO to insure that the hospital would get through the design and bidding stages quickly to meet the Federal Subvention Schedule. A separate ASA was signed with an architect other than the three joint venture firms

for the central plant and its equipment on June 21, 1966, although both the acute unit and the central plant are part of the same building shell. This caused problems in three areas:

- Communication between the two architects in developing the plans.
- Added time to check and coordinate both sets of plans.
- Construction changes as a result of plans not being coordinated, particularly when the actual interface of equipment and systems between the two facilities was necessary.

After seven months in this stage, the Board of Supervisors approved the schematics-preliminaries on February 10, 1967, for a 390-bed hospital. (To meet the State subvention requirements, the capacity had to be reduced from the original 436 beds. Although the County Engineer Architectural Division was involved in the preparation of these drawings their formal review was not completed until after the drawings were approved by the Board of Supervisors. This meant that the corrections resulting from the review were incorporated into the final working drawings, adding work and review time in the working drawing stage. The estimated cost of the hospital at this stage of approval was \$18,256,628. This \$2 million increase from the July 1966, estimate of \$16. 1 million was due to an increase in floor space.

Financing

King Hospital was to have been financed originally by general obligation bonds. However, on June 7, 1966, a vote of the people failed narrowly to reach the 2/3 margin necessary to approve the financing. Subsequently, a Joint Powers Authority was formed and, on May 14, 1968, this Authority issued and sold bonds in the amount of \$22.5 million to finance the construction of the

hospital and also received \$8.4 million in Hill-Harris funds (State and Federal matching funds). Additional bonds in the amount of \$2.8 million were issued on April 20, 1971.

To qualify for the Hill-Harris funds, a tight design schedule had to be met to insure that construction bids were received in March 1968. Initially, the schedule called for completion an approval of schematic-preliminary drawings by December 1966, and final drawings by October 1967. This overall tight schedule reduced not only the time needed to draw the schematics-preliminaries but also the County Engineer Architectural Division review.

Working Drawings (2/67 through 2/68, 365 days)

The first and second reviews of the schematic-preliminary drawings were completed by March, 1967, by the County Engineer and Department of Hospitals and, in April, by the Departments of Purchasing and Stores, Roads, Parks and Recreation, and Communications. Changes resulting from these reviews were incorporated into the final working drawings which were scheduled for completion on November 7, 1967.

The architects sent the final working drawings to the County Engineer for review in September, 1967, but the Architectural Division indicated they were incomplete and could not be reviewed. The drawings were resubmitted in November. In January, 1968, the County Engineer Department indicated it would not check, correct and recheck as is usually done, but would continue to review final drawings through the preparation of equivalent Materials Procedure (EMP), and the bid and award phases. Their final changes, issued as a two-volume addendum to the original plans and specifications, would be included after bids were received and prior to construction.

During this stage, the architects' estimated construction time of 930 days was cut to 840. Final drawings were approved by the

Board of Supervisors on February 27, 1968. Final estimates were as follows:

394-bed Acute Care Unit	\$20,912,062
Central Heating Plant	365,587
Central Heating Plant Equipment	1,623,095
Site Development	1,088,000

This estimate was higher than that of the schematics preliminaries because of: 1) redesign and modification of the trash and linen systems; 2) increase in space; and 3) provisions needed in basic design unit to accommodate future addition of a 76-bed unit and a 290-bed unit for a total capacity of 760 beds.

Bidding and Award (3/68 through 5/68, 90 days)

During this phase, the County Engineer continued to review plans and comment on them. After approval of the final construction documents (and working drawings), the Hospital Authority authorized advertising to receive bids on March 6, 1968; bids were opened on April 10, 1968. Robert McKee submitted the low bid of \$23,540,000 (architects' estimate was \$23,988,744). The Board of Supervisors on April 16, 1968 and the Hospital Authority on May 14, 1968, approved award of the low bid to Robert McKee, and approved an additional \$1,470,000 for supplemental agreements, change orders, and unit price increases and County Engineer's services. Breakdown of the low bid was:

\$20,967,000 - Main Hospital (\$35.07/square foot)

\$2,673,000 - Central Plant (\$25.05/square foot)

On May 14, 1968, the Hospital Authority awarded bonds to the Bank of America. During construction, the lack of coordination between the plans of the hospital architect and the plant architect became evident. Unfortunately, no one was responsible for coordinating the two sets of drawings, particularly when interface

of equipment was necessary. Several change orders reflect this oversight. Inevitably, the contractor requested changes and information from one architect on several occasions, only to find that the other architect was responsible for the information he requested.

Construction (6/68 through 1/72, 1,175 days)

Construction began on June 19, 1968, with a completion date of September 28, 1970 (840 days). Architect-estimated construction time was 930 days. Delays due to weather (64 days) and strikes (125 days) extended the completion date to April 5, 1971. Four supplemental agreements added another 140 days of delay, thus establishing August 23, 1971 as the new completion date. All delays were approved by the Board of Supervisors and the Hospital Authority. The contractor has requested 28 additional days as a result of bad weather, and 129 days because of strikes. This request is currently pending approval by the County Engineer's Office before submission to the Board of Supervisors. These two delays extended the completion date to January 29, 1972. The first segment of the hospital was occupied by the Department of Hospitals staff in June, 1971. Patients were first admitted on March 27, 1972.

Construction delays and cost increases (excluding weather and strikes) were the result of technical and scope changes. Technical changes in construction may result from incomplete plans or code requirements. Scope changes may result from Department of Hospitals and community requests, technological advancement in the medical field, or economical and functional reasons.

It should be noted that change orders and supplemental agreements relating to the Central Plant totaled approximately \$220,000. This was a cost overrun of about 10 percent over the original bid of \$2.2 million for the plant (excluding the building shell for future beds).

There was a cost overrun of approximately three percent for the main hospital due to change orders and supplemental agreements. Site improvement and unit price increases are not included.

SUMMARY OF PROBLEMS

The impetus for Martin Luther King, Jr. General Hospital came from the Watts riots and the McCone Commission report, which resulted in an urgency to build a hospital in the Watts area. Political and emotional pressure to meet Federal and State subvention requirements was great, particularly in the design development to the hospital. The following summarizes problems encountered throughout the course of the project.

Programming

1. Early community involvement in MLK was not present.
2. There were no MLK personnel to do programming.
3. Two different ASA's were signed for the acute care unit and the central plant located in the same building.
4. There was no outside consulting firm to produce the architectural program.
5. Architects were appointed prematurely.
6. Initially, there was no master plan. It was started in February, 1969 and approved in March, 1970, when construction of the hospital was half complete.

Schematics -Preliminaries

1. These stages of design were combined.
2. The CAO-County representative for these stages was not the County Engineer.
3. The County Engineer did not formally review schematics-preliminary drawings until after approval by the Board of Supervisors.

4. The County Engineer changes to the Schematic-Preliminary drawings were incorporated into the final working drawings.

Final Drawings

1. County Engineer continued to review the final drawings after Board approval and during the bid phase.
2. Drawings for the acute care unit and central plant were net coordinated.
3. Plans were rushed to meet the Hill-Harris deadline.

Bid

1. One bid was advertised for the acute care unit and the central plant although two separate ASA's were signed. One contractor had to communicate and coordinate plans with two different architects and their representatives.

Construction

1. Delays (140 days) excluding weather and strikes, were mainly caused by: community and hospital department requests, and changes -in scope to accommodate for future expansion of the hospital. Only four of the total of 24 supplemental agreements accounted for all of the above delays.
2. The project had 103 change orders, partly because the plans were rushed and not adequately checked by the County Engineer. These changes caused no delays. By comparison, Olive View Hospital had 128 change orders which caused 19 days' delay.

Summary of Construction in Days

840	planned
64	weather
125	strikes
<u>140</u>	supplemental agreements
1,169	
157	pending approval (strikes and weather)

Summary of Construction in Dollars

\$23,540,000	Original Construction Bid
1,094,870	Supplemental Agreements
<u>162,368</u>	Change Orders
\$24,797,238	

SUPPLEMENTAL AGREEMENTS

Martin Luther King, Jr. Hospital, which has not been accepted by the County Engineer, had 24 supplemental agreements which cost approximately \$1.02 million, and extended the original completion time by 140 days, or an increase of 3.9 percent in costs and 16.6 percent in time. Four of the supplemental agreements, two for enlargement of dental care and coronary unit, and two for modifications-to the central plant, accounted for all 140 days of delay. The supplemental agreements reflect the changes in scope of the -hospital and its future expansion.

CHANGE ORDERS

Martin Luther King, Jr. Hospital had 103 change orders which cost approximately \$172,604, an increase in cost of 0.7 percent. No delays resulted from these change orders.

During the construction of this hospital, the County Engineer requested that the Board increase the change order fund on nine occasions (increased funds from \$9,000 to \$189,000).

PROJECT CHRONOLOGY

8-65 Watts Riots

12-2-65 McCone Report recommended hospital in Southeast Los Angeles

12-7-65 City of Los Angeles requested Los Angeles County to study feasibility of hospital in Southeast Los Angeles.

12-14-65 Board ordered CAO and Department of Charities (now Department of Hospitals) to confer with State Hospital Advisory Board on construction of a hospital in Watts.

2-10-66 CAO and Charities Department report submitted to Board substantiating McCone Report for need of hospital.

2-15-66 Board approved a County medical facility in Southeast Los Angeles and ordered \$100,000 in proposed 1966-67 budget to purchase Palm Lane Housing Project site from the County Housing Authority.

3-3-66 Watts Service Area needs 438 beds based on State report.

3-8-66 Three project architect firms are appointed.

3-14-66 Watts Task Force formed to develop a hospital program for the architects.

6-7-66 General obligation bond proposition failed in primary election. This led to the formation of the Joint Powers Authority with the City of Los Angeles.

7-5-66 Orientation meeting of architects and Task Force members to start work on Schematics-Preliminaries. Estimated cost \$16.1 million.

7-19-66 Architectural services agreement signed for Schematics Preliminary drawings (combined).

10-31-66 50 percent schematics-preliminaries submitted to County Engineer.

12-27-66 Joint Powers Authority created by City and County of Los Angeles, called the Southeast General Hospital Authority.

2-10-67 Schematics-Preliminary drawings approved. Estimated cost of hospital is \$18.2 million.

3-67& 4-67 Reviews of the Schematics-Preliminary drawings performed by County Engineer, Department of Hospitals and service departments.

6-6-67 50 percent of final working drawings submitted.

11-67 Review of final drawings by the County Engineer, Hospital Department and other agencies.

11-28-67 Board approved offer to consider equivalents.

2-27-68 Board approved final drawings. Estimated cost is \$23,998,744.

4-10-68 Bids opened. Low bidder is McKee Company - \$23,540,000 (19 percent below architects' estimate)

5-14-68 Hospital Authority approved contract award to Robert McKee and approved sale of bonds to Bank of America.

6-10-68 Construction began. Original completion date is 9-28-70 (840 days).

6-25-68 Southeast General Hospital renamed Martin Luther King, Jr. Hospital.

5-23-69 Board approved 64-day extension (strikes) - new completion date is 4-5-71.

11-25-69 Board approved 125-day extension (strikes) - new completion date is 4-5-71.

12-8-69 Progress report #13 - construction 43 percent complete.

1-13-70 Board approved 58-day extension as a result of a supplemental agreement to expand dental clinic new completion date is 6-2-71.

4-28-70 Time extension of 50 days approved for a supplemental agreement to modify Coronary Care Unit - new completion date is 7-22-71.

6-5-70 Progress report #19 - construction 63.8 percent complete.

7-7-70 Time extension of seven days approved for supplemental agreement to complete conduit and value work - new completion date is 7-29-71

8-4-70 Board approved a supplemental agreement for mechanical changes. Time extended 25 days - new completion date is 8-23-71.

12-7-70 Progress report #25 - construction 80.3 percent complete.

6-7-71 Progress report #31 - construction 94.7 percent complete.

6-15-71 Maintenance Building ready for occupancy by Department of Health staff. Other areas of hospital continued to be occupied by Health Department staff on an ongoing basis.

1-5-72 Progress report *38 - construction 99.5 percent complete.

1-10-72 Hospital basically occupied by Hospital staff.

2-5-72 Martin Luther King Hospital dedication.

3-27-72 Martin Luther King Hospital opened for patient occupancy. King Hospital has not been accepted by the County Engineer as of this date. There are 157 days of extensions still pending with the County Engineer (28 due to weather and 129 for strikes). This delay (pending approval) extended the completion date to 1-28-72.

CENTRAL JAIL ADDITION AND ARRAIGNMENT COURT

SUMMARY

Additions to the Central Jail will provide four arraignment courts and facilities to handle 2,200 inmates. Planning for the 440,000 square foot building began in 1963. The project architect was appointed in May, 1968, and design work began the last quarter of that year. The 1963 cost estimate for the project was *20,560,35 While the 1968 architectural services agreement included an estimate of \$18,411,000. The 1969 estimate based on schematics was \$25,965,708; the construction contract was \$29,164,000, and the final cost is estimated to be \$33-\$34 million. The building is 25 percent complete. The construction contract price of \$29,868,396 so far has been increased 3. 6 percent through approved changes to \$30,172,792.

The contract called for construction to be completed in 1,095 days. At this early point in project history, it is estimated that actual time required for construction will be about 1,600 days, a time increase of approximately 60 percent. The design phase took 708 days or 17 percent more than the 605 days planned. Total time required to take this project from pre-programming through construction is expected to be six to seven years. Sixteen hundred days from project construction start of 4-19-71 means that the project is expected to be completed in the second half of 1975.

The two most significant problems contributing to time and cost overruns on this project are:

1. The architectural plans were approved with the knowledge that they were incomplete and inaccurate. This accounts for a 1.6 year delay and \$2,500,000 in costs. This problem is addressed in the recommendation dealing with management of project design, which would provide for validation, review and approval of adequate design work.

2. "As built" drawings for the building previously occupying the site were part of the project file. They clearly showed the presence of subsurface debris. Lack of attention to these drawings has caused some unknown time delay associated with removing the debris. Project management would reduce instances of this problem by establishing one unit with total responsibility for the design and construction of capital projects.

FACILITY DESCRIPTION

The project comprises, generally, the construction of an addition to the main to provide housing for 1,226 maximum security beds, housing for a trusty work force of 812, additional infirmary facilities to house 218 beds, additional ancillary functions to include control stations, supervisors 1 offices, employee lavatories, barber shops, housekeeping supply rooms, interview rooms, roof exercise control room, chapel, employee dining room and visiting area, a new inmate reception area to replace the existing one, additional space for the transportation bureau, as separate arraignment courts building containing four arraignment courts and a separate multi-deck parking structure for 1,452 cars. The project also provides for expansion of the central heating plant, necessary mechanical and electrical work, site development, and the installation of an air temperature control in both the existing jail facility and the new structure.

New jail addition will be a four-story, Type I construction, consisting of approximately 350,000 gross square feet with partial basement and jail cell mezzanine on the second floor. Foundations will be a combination of reinforced concrete belled caissons and spread concrete footings, reinforced concrete bearing walls and flat slab floors and roof.

New infirmary building addition will be a two-story, raised-on-stilts, Type I construction, consisting of approximately 50,000

gross square feet with parking under and to be reinforced concrete girder, beam and slab construction.

New courts building will be a one-story, raised-on-stilts, Type I construction, consisting of approximately 90,000 gross square feet with parking under and to be reinforced concrete girder, beam and slab construction.

New multi-deck parking structure will be a three-level, Type I construction, consisting of approximately 270,000 gross square feet and to be `post-tensioned concrete beam and slab construction.

New visitors' parking structure under courts building and infirmary will be a two-level, Type I construction, consisting of approximately 362,000 gross square feet and to be reinforced concrete beam and slab construction.

Site development will include demolition to accommodate new construction, grading as required to meet new conditions, landscaping and fully automatic sprinkler system for same, outside utilities, exterior facilities, paving, fencing, and all necessary work to provide for a completely operable facility. Construction time: 1,095 calendar days from date of execution of contract.

PROJECT HISTORY

Preprogramming (1/6/66 to 5/22/68 - 136 days)

In January, 1966, the CAO published a memo, based on meeting with the client department, CAO personnel, and the County Engineer, which indicated a need for jail facilities expansion based on 1980 jail demand. " This resulted in a comprehensive "space" document in February. During March, the Board of Supervisors

discussed choice of a project architect which inadvertently resulted in selection of four architects. Eventually, a team of two architectural firms was appointed to the project: Wing & Wing, and Charles Luckman.

The project was delayed in this phase while the State Department of Corrections evaluated the Lincoln Heights Jail, abandoned by the City, as an adequate alternate facility. The Lincoln Heights Jail was found to be inadequate. Additional discussions finally resulted (1/26/68) in the County Engineer-prepared document, "L. A. County Central Jail Expansion Planning Digest," containing conference notes, diagrammatics, and an estimated "1972 cost" of \$20,560,350. Initial project conferences with the architects began on 22 May 1968.

Programming (5/22/68 to 10/7/68 - 135 days)

Discussions beginning in May resulted in an architectural services agreement on 8 August with an estimated total project cost of \$18,411,000. This estimate, of course, could be expected to be below the final cost because of the County Engineer 5 January figure, based on a fair amount of project detail, of \$20,560,350. Project kickoff meeting was held 13 August and recorded suggestions for project changes began immediately. Apart from the space budget or the general County Engineer's diagrammatic presentation, there was never a project program produced possessing the same content as is contained in the present E&E Committee commendations.

Schematics (10/7/68 to 2/17/69 - 138 days)

The schematics ASA was signed in October with a project estimated cost of \$18,411,000. By 30 December, the architect's project estimate was \$25,965,707. On 11 February 1969, the budget estimate was reduced to \$23,535,639. The Board of Supervisors approved the schematic plans on 18 February.

Preliminary Drawings (2/20/69 to 7/22/69 - 153 days)

The architect signed the preliminary architectural drawing agreement on 17 March 1969 with 90 days as the time allowed to produce the preliminary drawings. The Board approved site soils investigation because of a growing concern regarding the problem of subsurface debris. The soils investigation revealed a fairly large amount of high density subsurface debris. The Board approved preliminary drawings on 9 June 1969, including an estimated project cost of \$23,535,639.

Working Drawings (7/22/69 to 10/13/70 - 417 days)

On 22 June, a County Engineer memo records the fact that the preliminary drawings were submitted to and approved by the Board without noted corrections having been made. Pressures were exerted beginning in the preliminary phases to complete work on or before schedule so that the County could take advantage of advantageous Board of Investment financing. It was realized that the pressured schedule would result in errors but it was believed that costs to modify plans errors would be offset by savings resulting from lower interest rates available through the Board of Retirement. Consequently, some effort was made to include all preliminary plan changes in the working drawings and meet the working plans scheduled completion date. On 6 October, the County Engineer sent a letter to the Board requesting permission for EMP advertising on project final plans, which indicated a project estimated cost of \$27,728,714.

Bid & Award (10/13/70 to 2/17/71 120 days)

On 13 October, the Board approved advertising for EMP and the final plans. During the remainder of this phase, the project architect continued to make corrections to the final plans, evaluated EMP submissions and prepared plan corrections addend to the project specifications. By comparison with other projects,

120 days is a large amount of time for this phase. Notice to bidders was published and bids opened on 17 February 1971. Construction (2/17/71 to 1975 Estimated Completion Date)

The architect recommended award of a construction contract to Gust K. Newberg for \$29,164,000. Between bid award date and the end of March, the project architect continued to submit plan revisions to correct errors and modify to meet various codes. On 25 March, the Board approved a project of \$29,164,000 plus \$9,000 for change orders, \$20,000 for unit price work and \$182,000 for sewer connection plus \$340,000 for prison furnishings plus \$450,000 for stainless steel plumbing fixtures, or a total project of \$30,505,000. On the day that construction began, 4/19/71, there were approximately 480 requests for information (RFI's) to the architect to provide clarity for- apparent errors in the drawings. The number of RFI's continues to grow along with the number of change orders and supplemental agreements. It has been unofficially estimated that the finished facility, which will be delayed approximately 600 days, will cost in the neighborhood of \$34,000,000. This represents not quite double the schematics estimated cost of \$18,411,000.

SUMMARY OF PROBLEMS

Many of the problems encountered in the other two projects have also been found in designing and building the Jail and Arraignment Courts. These include: No complete project program; no long-range capital budget, no clear commitment to a specific budget; and no specific schedule. However, the two most significant problems contributing to time and cost overruns on this project are:

- The architectural plans were approved with the knowledge that they were incomplete and inaccurate. This will probably account for as much as two years delay and \$2,500,000 in cost overruns.

- "As built" drawings for the building previously occupying the site were part of the project file. They clearly showed the presence of subsurface debris. Lack of attention to these drawings has caused some unknown time delay associated with removing the debris.

SUPPLEMENTAL AGREEMENTS

Supplemental agreements are changes in the scope of the original contract. Therefore, they must be approved by the Board of Supervisors (4/5 vote) and the Board of Retirement, which in this case, is the funding agency. Thus, the Central Jail Addition and Arraignment Courts project has had 12 supplemental agreements. These agreements have caused delays of 315 days and cost \$1.4 million. The supplemental agreements reflect the incomplete and inaccurate architectural plans and soil investigation.

CHANGE ORDERS

Change orders are technical changes, which are not changes in the scope of the original contract. This project has had 63 change orders, which have cost \$148,519.40 and delayed the project 51 days.

Project Chronology

6-10-57 Impetus for the Men's Jail is a grand jury report. On this date, CAO sent a letter to the Board of Supervisors suggesting that they appoint an architect and place \$40 million in bonds on the ballot.

6-11-57 Board of Supervisors appointed Albert C. Martin as architect.

10-1-57 County Counsel transmits Architectural Services Agreement (ASA) with estimated construction cost of \$28,882,325. Records Hiatus

3-21-66 CAO letter noting that Board of Supervisors, unable to agree, finally appear to have chosen four architectural firms to do the work - Wing E. Wing, A. C. Martin, Charles Luckman, and William Allen.

12-67 County Engineer prepared "L.A. County Central Jail Expansion Planning Digest" which contains detailed budget, summary data, present facility at site, conference notes, and diagrammatics.

7-17-68 CAO communication notes turn down Lincoln Heights Jail as an alternate, and suggests that ASA be for schematics only so that more precise construction estimate may be made; this in view of project complexity, i.e., remodeling of existing structure. Total financed project cost estimate set at \$18,411,000.

7-29-68 Architect Charles Luckman Associates (CLA) construction estimate for ASA for schematics.

8-5-68 Original schedule: 8/68-11/68, Schematics; 12/68, Review;

1/69-4/69 Prelims; 5/69-6 69, Review; 7/69-4/70, Finals; 5/70-7/70, Review; 6/70-11/70, Advertise and Award.

10-7-68 CAO letter to County Counsel with signed ASA with project estimate of \$18,411,000.

12-30-68 Architect schematic budget estimate of \$25,965,707.

2-11-69 Architects later reducing project estimate to \$23,535,639.

2-17-69 CAO letter transmitting schematics for Board approval (2-18-69)

2-20-69 CAO letter transmitting ASA for prelims.

3-17-69 Architect signs prelims ASA.

6-11-69 Board approves prelims ASA.

6-25-69 ASA for preliminary drawings with project cost estimate of \$23,535,639. Architect given 90 days to produce preliminary drawings.

7-9-69 CAO letter recommending Board approval of prelims

7-15-69 CAO schedule for preliminary drawings submission.

7-22-69 Board approves preliminary drawings with County Engineer notification that needed preliminary corrections not made.

8-28-69 Architects bill for working drawings, \$298,760 (50 percent complete)

8-4-70 Architect applied for Building Permit.

9-21-70 County Engineer completes working drawings review.

10-6-70 County Engineer letter to Board requesting Equivalent Material Procedure (EMP) advertising on project estimated to cost \$27,728,714. (Board approval 10-13-70). County Engineer notified Board that working drawing corrections not made.

11-12-70 Equivalent Material Procedure (EMP) deadline.

12-8-70 County Engineer's Construction Division review comments completed.

12-8-70 Sanitation Division notified Architectural Division of sewer connection change to city sewer.

12-29-70 Board approved EMP evaluation, plans and specifications.

1-7-71 Bid notice published.

2-17-71 Bids opened.

2-17-71 Architect recommended award to Gust K. Newberg (\$29,164,000).

3-25-71 Board approved bid of \$29,164,000 + \$9,000 CO's + \$20,000 unit price work + \$182,000 for sewer facilities + \$340,000 for prison furnishings + \$450,000 for stainless steel plumbing fixtures = \$30,505,000.

3-25-71 County Engineer recommended award of construction contract.

4-6-71 Board approved award of construction contract.

4-14-71 Newberg contract with Board of Retirement (B/R) for \$29,164,000; initial job conference.

4-19-71 Construction started; by this date, 480 RFIs had been issued.

4-30-71 Permit issued by Building & Safety.

11-1-71 Supplemental Agreement (SA) *3 for various sewer modifications and remove old street. Total cost is \$32,134.07 (B/R and B/S approval 12-1 and 11-23, respectively).

12-17-71 SA *4 for various changes due to "Notice to Bidders E" not included in original contract due to press of schedule. Cost of \$109,663.80 and 15 days (B/S approval 1-4-72).

12-20-71 Board of Supervisors approves architect fees of \$69,880 for changes associated with the computer room (Board of Investments, B/I, approval 8-14-72).

12-31-71 Board of Supervisors (1-11-72) increase in change order money, \$27,000 to \$54,000 (B/I approved 1-10-72).

1-3-72 SA #5 for various electrical changes resulting from "Notice to Bidders F" being prepared during bidding period by the architect. Cost of \$21,122.60 + 12 days (B/S approved 1/18/72).

1-11-72 CAO SA #5 letter seeking B/S approval (1-18-72).

1-18-72 Board of Supervisors approved increase in change order money, \$54,000 to \$135,000 (B/I approved 3-8-72).

2-15-72 SA #7 increases unit price funds from \$130,000 to \$300,000 with time delay to be determined based on work performed (B/I approval 3-8-72).

3-13-72 SA #8 for various electrical, air conditioning, ceiling, etc., problems. Cost of \$187,856.64 + 60 days (B/I approval 4-12-72; B/S approval 3-28-72).

3-20-72 Board of Supervisors approved architect fees of \$2,437.50 for \$30,000 building changes.

5-5-72 SA #9 for various electrical control door changes, plumbing and structural work. Cost of \$132,069.85 + 60 day delay.

6-2-72 SA #10 for lighting, cooling equipment, architectural and structural modifications. Cost of \$79,635.53 + delay of 25 days.

- 6-30-72 SA 11 for electrical, plumbing, structural and architectural changes. Cost of \$117,581.56 and no delay.
- 8-15-72 SA #12 submitted for redesign of the third floor and modifications to the elevator and sprinkler systems. Cost of \$210,079.43 + 68 days delay. (This agreement is pending Board approval.)
- 9-30-72 Construction will continue on the Central Jail addition until the latter half of 1975.

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