MORE FOR LE$$

JAIL CONSTRUCTION COST MANAGEMENT HANDBOOK

STATE OF CALIFORNIA
BOARD OF CORRECTIONS
PREPARED BY KITCHELL CEM

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Please contact the Board of Corrections regarding additional copies of this Handbook.

While it is always the responsibility of government to spend its citizens' money wisely, never has it been more necessary to get "more for less" than it is now. Our jails and prisons are bursting with prisoners, courts are issuing orders to maintain jail programs and services as if they were not crowded, and the taxpayer is requiring us to limit government spending.

This handbook was prepared for the purpose of assisting local governments to design and construct cost effective jails which will serve us well, long into the future. Regrettably, this document could not have been developed earlier for the counties which designed and constructed their jails in the past two or three years. It is from their experience that this information was developed, and we are grateful to them for sharing it.

The Board of Corrections is especially indebted to those of you who brainstormed with us to develop the contents and then polished the material to be more usable.

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Board of Corrections

ACKNOWLEDGEMENTS

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DEDICATION

This handbook is dedicated to Ed Smith in grateful acknowledgement of his tireless commitment to the work of the Board of Corrections and to those issues affecting local jails.

TABLE OF CONTENTS

I. INTRODUCTION 1

II. GETTING STARTED 3

A. Basic Concepts 3

B. Overview of Facility Development Process 10

C. Establish Your Team 17

III. COST CONTROL FROM INCEPTION THROUGH ACTIVATION 31

A. Needs Assessment Studies 37

B. Master Planning 43

C. Project Statement 51

D. Architectural Program 65

E. Schematic Design 71

F. Design Development 79

G. Construction Documents 85

H. Construction 93

I. Transition 111

IV. MAJOR COST COMPONENT VALUE MATRIX 113

V. RESOURCES 159

VI. REFERENCES 161

This Handbook was designed expressly for California counties planning to construct, renovate or remodel jail facilities. A jail is radically different than most construction projects you'll encounter because it combines housing, food and medical services, with elements of a library, a courthouse or an administration building in a complex inter-related operation subject to special security provisions.

More for Less provides management tools for construction projects in a system called Value Management. The tools help you control the design, function and cost of jail projects, whether large or small, simple or complex.

Doubtless you've heard of public construction projects that cannot be built or go over budget, of counties ending up with buildings that are not functional and not what they wanted. Both the public and the press pay a lot of attention to public construction projects that go awry. It happens too often with jails.

SURPRISE !

County's Construction Budget:	$9.2 million
Contractors' Bids:	
Contractor A	$11.80 million
Contractor B	$12.87 million
Contractor C	$13.18 million
Contractor D	$13.27 million
Contractor E	$13.28 million

Postscript: Due to a significant arithmetic error in his bid, the low bidder withdrew.
Closest bid - 29 percent/$3.67 million over budget.

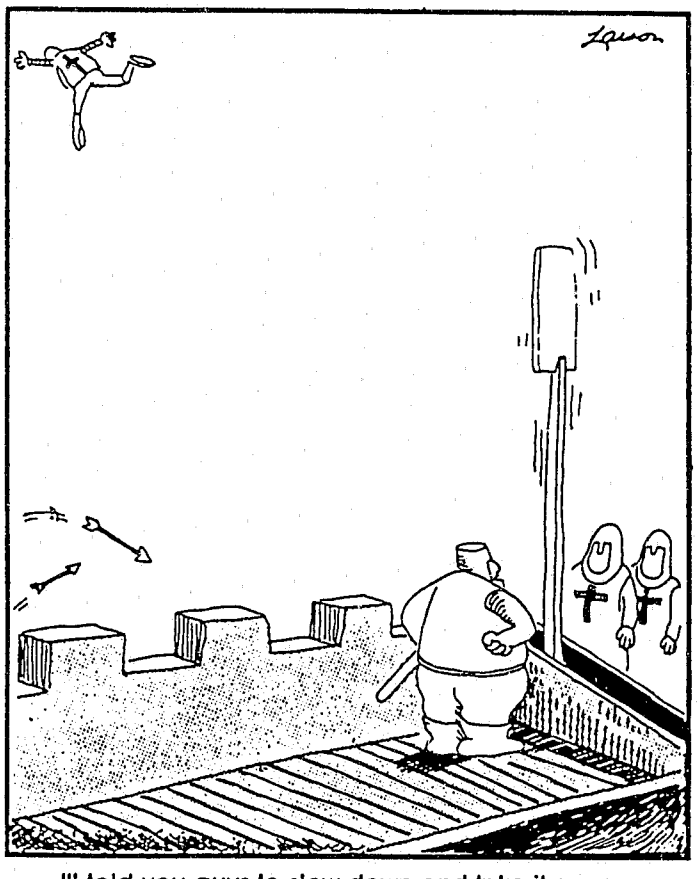
Slightly change the numbers, fill in the names and this could be a true story for any number of counties. They wind up with expensive, polished plans but can't build the jails as designed. In this scenario, the county may have hired an experienced architect and even cut some costs as design progressed. The problem was lack of a check and balance system from the very start of the project. Without such a system, a bad estimate can't be detected.

Cost control in the planning and early design phases of a project is extremely important. The bottom line: Before you can build it, you have to know what it costs and when you're going to get it. Value management helps you identify both at the beginning of a project . . . before it's too late.

Get Involved

The need to be involved in your project cannot be over-emphasized. This Handbook supplies the methods, but your county needs to assign someone to apply them, someone responsible for controlling costs. Value management isn't automatic, something you plug into a computer to get an answer with the push of a button. It requires human creativity, reasoning and problem-solving in many areas of expertise.

Value engineering identifies alternatives and their respective "values" in terms of cost/benefit. If you're involved, informed decision-making becomes almost automatic.



"I told you guys to slow down and take it easy or something like this would happen."

From Gary Larson's FAR SIDE, reprinted by permission of Chronicle Features.

II. A BASIC CONCEPTS

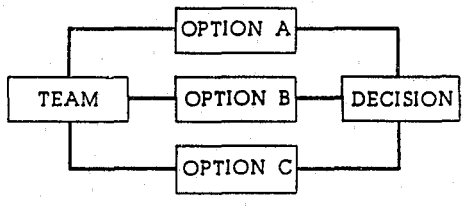
The facility development process is easier to understand and manage if you keep a few basic concepts in mind. These concepts define the underlying framework of the process. They also provide a base to return to whenever you get mired down in the numerous details of developing a complicated correctional facility.

PUTTING VALUE MANAGEMENT TO WORK

This Handbook will help you ask "why?" when your planner, architect, construction manager, sheriff or other parties propose a particular solution to the myriad issues that need to be resolved throughout the planning, design and construction processes. Your consultants should help you examine problems and identify alternative solutions, their related costs and their impact on operations. Your participation in the decision is imperative. It's your project, and your consultants may not fully understand all of the operational ramifications of each decision. You, not the consultants, will have to live with the way the facility operates and what it costs you to run it.

The value management system breaks a project down by function and by the components of each function, and helps you identify and compare alternative materials, spaces, equipment and operations that will have a significant impact on the initial and long-term costs of your new facility. Analyzing your project in this way can alert you to anything that simply adds cost without enhancing the function or operation of the space, so you can use your resources in the most effective manner.

VALUE MANAGEMENT



Value management is the management process advocated and practiced in this Handbook. This process will help you allocate finite dollar resources to their best use for your county's project. You use this management approach to identify all project components and their associated costs and to track those components and costs from the beginning of the project until the day you move in.

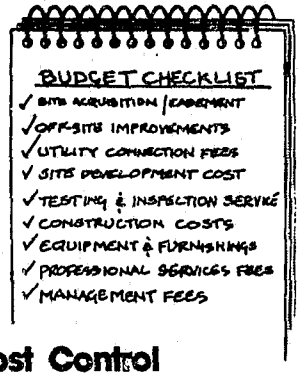
Value management defines what is valuable to the players involved and what elements are needed for the project. Goals are established for the project team (Sheriff, county executive, planners, architects, engineers, construction managers), so the members can plan, design and build the project by selecting options developed to achieve those goals and presenting these options to management for decisions.

Value Engineering

Value engineering, a part of this management system, is the technique which forces you to identify and evaluate your options during the process, so you can arrive at the best solution to a problem. Contrary to its name, value engineering is not a process only your engineers practice. Value engineering applies to all aspects of developing a project from early planning through construction.

To make value management work, the team players should work toward a common goal by identifying decisions to be made, such as facility location, and then analyzing various options for solutions — whether site selection, number of beds, or how many coats of paint to use. The discovery and exploration of these options is value engineering.

Project Budget

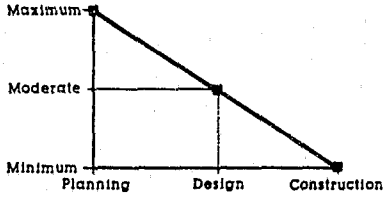


The **total project budget** includes all the cost components of the project, as follows:

Site acquisition/easements
Off-site improvements
Utility connection fees
Site development costs
Testing and inspection services
Construction costs
Equipment and furnishings
Professional services fees
Management Costs

Cost Control

Impact of Value Engineering



Cost control is the tool in this system which tracks costs once they are fixed, based on value engineering decisions. Cost control allows management decisions to be based on particular items relative to the overall first cost of the project, user needs, and life-cycle costs. If the project team finds during planning, design or construction that costs can or need to be adjusted, the team can adjust them to achieve the desired result. But the bottom line must remain constant unless the county chooses to seek additional funding.

Without a cost control process (described in detail throughout Section III) established at the beginning of the project, decisions are made without knowing their ultimate impact on your goals. In other words, without cost control, you don't know what option meets the need at the least cost over the life of the facility. **Major cost decisions are made early in the project!** Yet component costs can be altered later as long as the budget stays balanced.

Schedule Control

Add **schedule control** to value engineering and cost control, and you have value management. Controlling your project schedule is directly related to controlling your project cost. Failure to develop a thorough schedule from the outset almost always results in lost time because of a step forgotten or taken out of sequence. Time lost due to mis-scheduled activities can cost money in three ways: interest, inflation and temporary fixes because of delayed occupancy.

Interest. The longer a project goes on, the more you're bound to pay in interest.

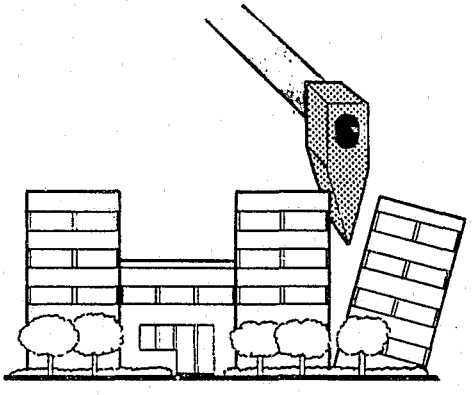
Inflation. Lost time at one point in a project often results in attempts to make up that time later by accelerating

design or construction schedules. Asking architects or contractors to accelerate their schedules inflates the price you'll have to pay.

Temporary Fixes. Accelerated design schedules can cost more money (if not properly managed) because of the increased likelihood of coordination mistakes. Similarly, accelerated construction schedules allow little time to solve problems and negotiate changes in a cost-effective manner.

It is nearly impossible to hire a cost analyst or other expert who can definitively estimate these hidden costs. An accelerated design schedule can cost 10 percent more at bid time because of reduced time for value engineering and coordination. An accelerated construction schedule can cost from 10 to 20 percent more, depending on conditions. For instance, a slip in your schedule which forces you to start construction in winter instead of spring has a cost impact. The only way to minimize the cost impact of schedule delays is to maintain a detailed project schedule and to use it to make decisions and plan the project. You face radical cost cutting if you don't apply value management techniques.

Cost Cutting



Cost cutting at the end means you're forced to settle for something less than originally intended. This is the least desirable facet of cost control, but unfortunately all too many projects face this final option when it's too late to take advantage of options available earlier. Cost cutting generally occurs late in a project when it becomes obvious that the original budget will not pay for the facility as designed. If your project is managed properly, cost cutting should not be needed or at least will be minimal.

When it's too late, however, to return to initial planning decisions, the cost cutting ax hacks away parts of the building, either whole wings (very painful) or little pieces. This process results in a facility which may never function as intended. The project may be delayed for years as the drawings are changed and fingers are pointed. Meanwhile, your project dollars drop in value daily. This painful method of cost control can be avoided if you start early with value management.

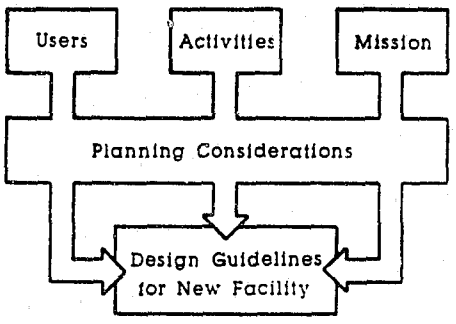
VALUE MANAGEMENT

Example: Planning Phase

For example, a county needing a second jail has several alternatives for providing food for its inmates. These options include:

Building a stand-alone kitchen for the new jail.

Using the existing jail's kitchen, either as is or with modifications/additions, for both facilities.



Constructing a kitchen in the new jail that would serve both new and old facilities.

Building a kitchen in the new jail that would serve both new and old facilities, plus additional beds that are to be added to the system later.

Contracting with a private vendor for food services.

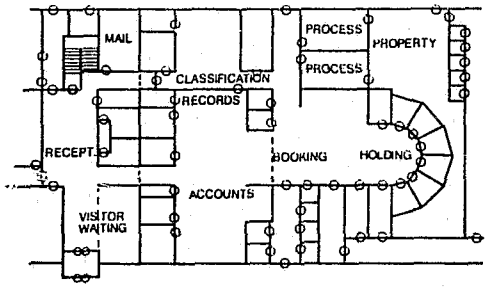
In its decision-making, the county needs to evaluate the initial costs (construction, vehicle(s), equipment) and operational costs (staffing, transportation) of each of these options. Other attributes to be compared include the ability to provide nutritional meals at their appropriate temperatures, availability and locations of trustee cooks, and compatibility with the county's philosophies and goals.

If the county determines that centralizing food storage and preparation will be the least costly in the long run, but that food quality will be relatively poor, it should explore variations of that alternative — things that would keep cost down but improve food quality, such as better food carts or a cook-chill system.

If variations fail to solve the problems or create new ones, perhaps independent kitchens would work better. Their additional life-cycle costs may be justified and manageable.

Granted, analyzing major issues like food services is not easy if a county truly considers all costs and attributes. Your county may wish to employ a food service consultant. But once your county has collected and analyzed all of the data from a value management perspective, an informed decision can be made. At the completion of the initial planning stage, when the county has determined what it needs in the new facility and how these needs can be met within its budget constraints, another set of decisions must be made.

Example: Design Phase

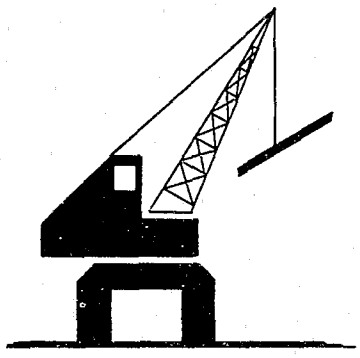


One of the first such decisions is: What material is the building to be constructed of? Frequently in jail design, the obvious conclusion reached is that the inmate housing portion of the facility must be constructed of high security materials such as concrete or masonry. Then, without looking at alternatives for other areas in the facility, the county assumes that it should construct the entire facility of the same expensive materials. If this happens, you may pay 10 to 20 percent more for your administration space than is necessary. The extra cost accrues in high security doors, locks, light fixtures, etc. When using a thorough value engineering system, these kinds of assumptions would not just happen.

The security and durability needs of each space should be assessed before a decision on the construction system is

made. Usually there are areas such as administration, maintenance and support services which may not require such "hard" construction. These areas should be identified and perhaps grouped together so an appropriate construction system, from a cost and needs perspective, can be selected. Money saved here can be used to obtain other project needs and wants.

Example: Construction Phase



The project is finally under construction, you're on budget and things are progressing. You visit the project one day with your boss and notice that the cell window detail is not quite what you wanted. Inmates could conceal contraband in a small crack. You discuss the problem with your architect and contruction manager and come up with a solution. You're told it will cost $200. Two hundred dollars sounds insignificant in a multimillion dollar budget so you tell them to go ahead and change the detail. You did not understand that the $200 covered only one window.

Two weeks later you get a phone call from your boss. He's obviously hot. He yells, "How could you approve a quarter-million dollar change order without letting me know?!" You wonder what in the world he is talking about until he rattles off figures like: $200 per cell window, 1,000 cell windows, plus contractor's mark-up . . . .

If you had stopped to explore the full impact of that simple $200 change or if a step in the process had forced you to consider the full impact of your decision, you would not have had to suffer through that phone call. Chances are the change order never would be implemented because of the check and balance process. Unfortunately, the cost of such decisions on design detail often is not questioned.

Now You Try It.

You can take this decision-making to many levels. Value engineering involves going from the general to the very specific. Use the following tests to consider your own assumptions and then develop similar tests to ensure that your County's decisions are sound and won't be regretted later.

8 SAMPLE VALUE ENGINEERING TESTS

To evaluate a jail laundry

As part of the functional and architectural programming process, a recommendation is made to build an 800-square-foot laundry to be staffed by one full-time county employee and two inmates for one eight-hour shift per day. The recommendation calls for 12 washers, 12 dryers and dry cleaning equipment. The jail is not required to provide inmates with work.

1. Can a laundry at the new facility be eliminated without impairing the function (providing clean clothes, sheets, towels, etc.)?
   YES | NO | MAYBE
2. Can any parts of the process be eliminated, such as dry cleaning?
   YES | NO | MAYBE
3. Does the recommendation call for more space than is necessary for the equipment, people and processes?
   YES | NO | MAYBE
4. Are there more cost-effective methods of meeting the same needs, such as reducing the number of machines and space and double-shifting, or sending the laundry to the existing jail's laundry?
   YES | NO | MAYBE
5. Could someone else (a vendor) meet the same needs for less?
   YES | NO | MAYBE
6. Could clothes and linens be washed less frequently (volume driving space requirements) and still comply with standards?
   YES | NO | MAYBE
7. Could security and the supervison of the two inmates be handled more cost-effectively other than by a full-time county employee?
   YES | NO | MAYBE
8. As a taxpayer, would you build the 800-square-foot laundry as opposed to pursuing your other options?
   YES | NO | MAYBE

If any questions are answered "YES" or "MAYBE", alternatives should be explored to ensure attainment of best value.

To evaluate a cell door

It has been recommended to the management team that the best cell door operator for the jail is a fully automatic system of sliding doors. Door, frame and operating mechanism total roughly $3,000 each.

1. Can the door have fewer automatic fectures without impairing function (safety, security, operations, programs)?
   YES | NO | MAYBE
2. If not, does this door do more than is necessary? (Generally these doors are used in the highest security level areas.)
   YES | NO | MAYBE
3. Can any function or part be eliminated without impairing the operation, such as limiting doors to electric locking only?
   YES | NO | MAYBE
4. Is there a more cost-effective method of meeting the same needs? (For instance, would staffing have to be increased to supervise the handling of manual doors and how would that compare with the likely higher cost of maintaining a fully automatic door?)
   YES | NO | MAYBE
5. Would a standard, "off-the-shelf" model accomplish the same desired functions or must it be modified to fit the requirements?
   YES | NO | MAYBE
6. Could the device be produced for less and still be an acceptable product?
   YES | NO | MAYBE
7. Is the device produced by enough suppliers to ensure competive bids?
   YES | NO | MAYBE
8. As a taxpayer, would you refuse to buy it because it costs too much?
   YES | NO | MAYBE

If any questions are answered "YES" or "MAYBE", alternatives should be explored to ensure attainment of best value.

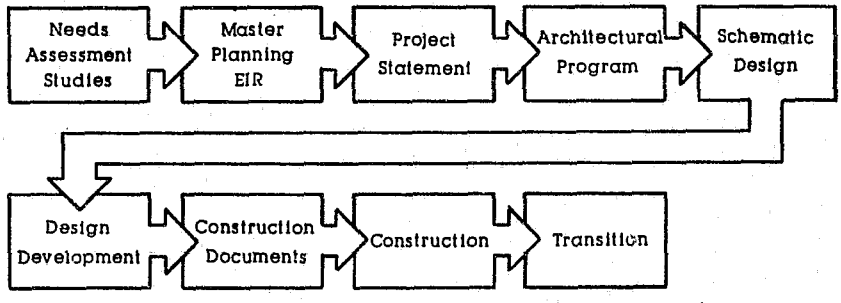
Before delving into a detailed discussion of the planning and construction process, you may want to get a more general picture of what to expect while pursuing your project. The following overview provides very brief descriptions of the steps in the facility development process. Section III presents more detailed discussions of each step.

Although the following sections of this Handbook are presented in a step-by-step chronological order, keep in mind that the process is very fluid in reality. Every project develops differently. Activities may happen in a different order or even simultaneously.

The Process Begins

The key to controlling costs during this fluid process is understanding which activities must occur for your project, knowing how much each will cost, and having a plan to achieve each activity. Remember, additional costs for design fees and lost time are common when a project team discovers a step in the process has been forgotten or left incomplete or when costs are not managed from the beginning. Oversights require redesign and/or rethinking of other decisions.

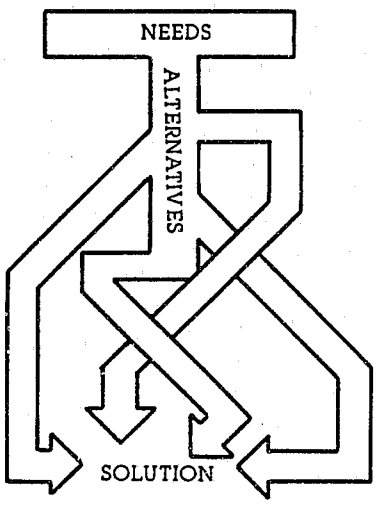
The facility development process begins when your county recognizes a need for additional cells or support space within the jail system. The process ends when this need has been met with new or renovated facilities. Between these two points, the following activities must take place.



Needs Assessment Studies

This first step involves defining what your county needs immediately and over the long term. Also included in this study is an analysis of your existing jail facilities, population projections and a general idea of how these needs tie into your existing system.

Master Planning



Through master planning, your county develops alternative methods of meeting the needs identified in the needs assessment study. After consideration of the alternatives by your Jail Project Team and Board of Supervisors, your final Master Plan records the decisions regarding which alternatives will be included in the new project. Variables such as site selection, upgrading of existing facilities, and provision of services countywide should be considered during this phase. Attaching costs to alternatives and matching those costs to available and future dollar resources will determine which scenarios appear feasible.

Each alternative includes either a specific site, such as the block north of the old jail, or a type of site, such as 10 acres within 15 minutes of the courthouse. Site selection provides a major opportunity to control costs — both initial (e.g., site acquisition) and life-cycle (e.g., transportation between jail and courthouse).

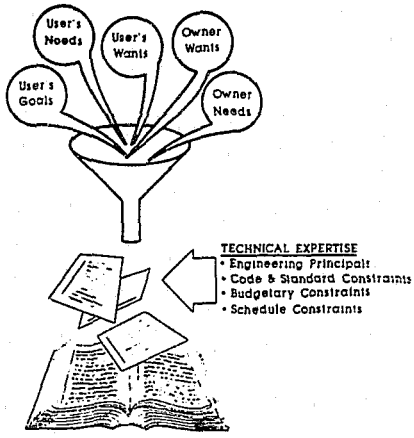
To help understand the spectrum of alternatives, most counties find it essential to observe other recently constructed jails. You'll want to talk to staff (and perhaps inmates) to find out how well these new facilities are working. See Corrections Planning Handbooks (Board of Corrections, 1981) for additional discussion of jail planning.

Environmental Impact Report

In most cases, an Environmental Impact Report (EIR) will required, although some counties will be able to use negative declarations. To avoid costly project delays, it is wise to involve the public early in the site selection process. By discovering community concerns about the environmental impacts of various sites, you may be able to mitigate them before going through all of the work of developing the report. Timely consideration of environmental impacts helps prevent litigation which slows down or stops site acquisition and development.

From Gary Larson's FAR SIDE, reprinted by permission of Chronicle Features.

Project Statement



This key document compiles previous planning decisions which led to this project. If your county opts to pursue more than one project, each should have its own project statement. The project statement briefly highlights what the project will include and what means will be used to accomplish the end goal of opening and operating the new facility. To produce it, your Jail Project Team and Board of Supervisors must reach a consensus.

A thorough project statement covers all of the owner's needs and objectives for the project, defines basic assumptions about the site and building, and outlines a preliminary budget based upon these assumptions. It also may include an outline of categories of spaces which will satisfy those needs. This document provides a base for decisions to be made during the following steps in the process. This is the first step which focuses solely on this project.

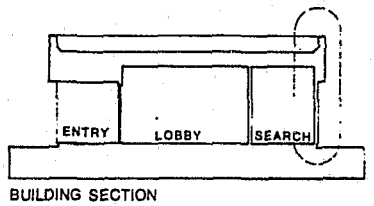
Architectural Program

Architectural programming moves the project from a general definition of needs established in the project statement to a more detailed presentation of how those needs will be met. The program describes all spaces, the activities to take place in those spaces and the users. It also defines the relationship between particular spaces.

The project statement is written for the layperson. The architectural program translates and expands the project statement into technical information necessary for the architect to design the facility you need, want and can afford. Decisions about the project design will be incorporated in the myriad data detailed in this architectural program.

Architects do not necessarily have professional programmers on their staffs. Make sure whoever writes your program has the appropriate expertise.

Schematic Design

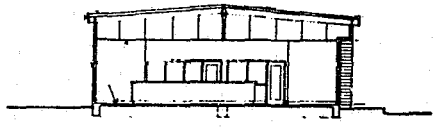


BUILDING SECTION

Schematic design involves taking the information and conceptual ideas developed so far (documented in your project statement and architectural program) and finally putting them in drawing form. Site plans, floor plans, elevations and major building sections are developed.

Major decisions made at this point depict how the new or renovated facility will function in physical terms and what construction materials will be used.

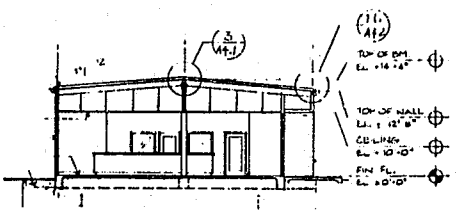
Design Development


BUILDING SECTION

One step closer to the final product, design development is just what it sounds like — further development of schematic design. All materials and most finishes should have been chosen by now. Any changes now most likely will increase project cost and possibly increase design fees.

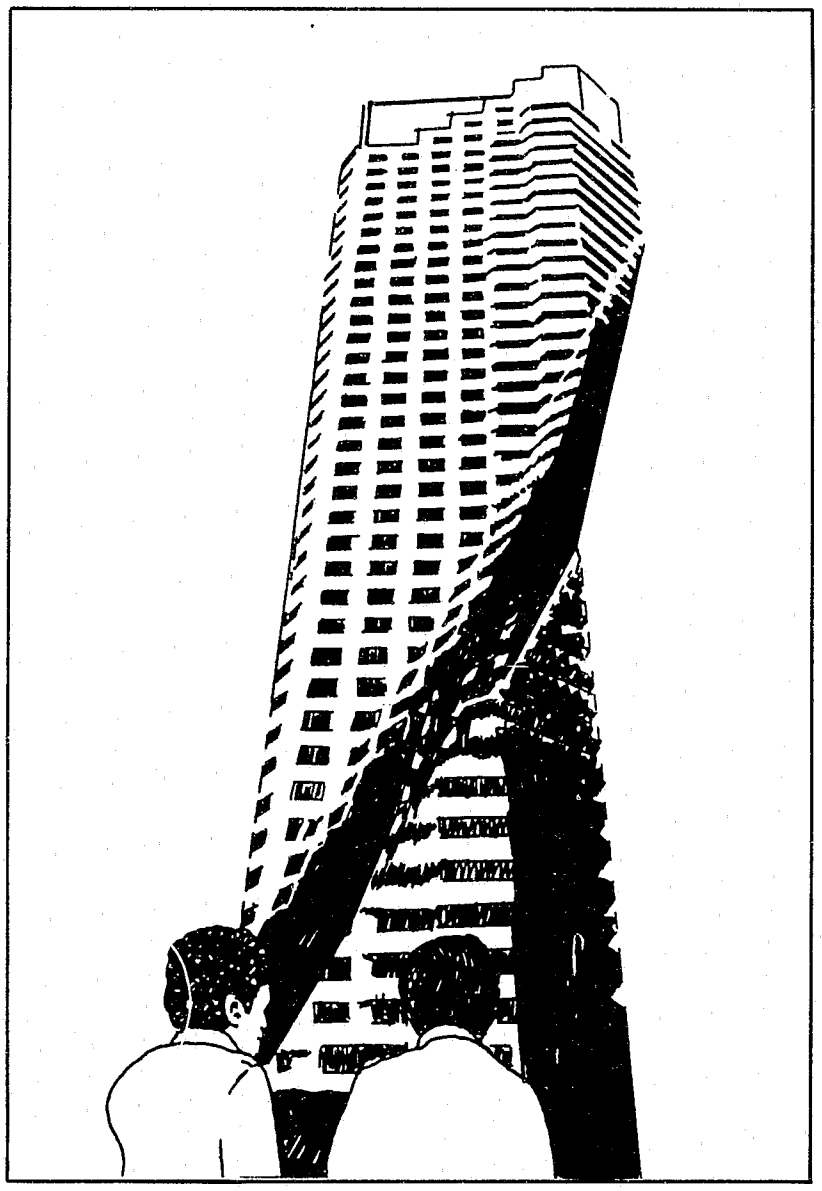
This should be the last time you make any major changes in the building. From here on, the design is simply production work for the architect and the architect's consultants. Any changes may increase fees and delay the project.

Construction Documents



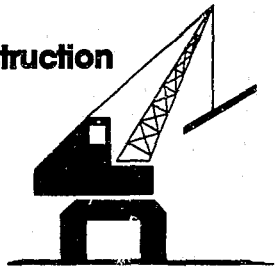
6 BUILDING SECTION

This is the last phase in completing drawings and specifications. Check the details. There shouldn't be any surprises during this last design effort. Details are spelled out, such as what kind of ceiling tile you want in the cells or what size rebar is needed in your concrete walls. Some small decisions remain, such as numbering cells and rooms and placement of T.V. monitors, benches, etc.



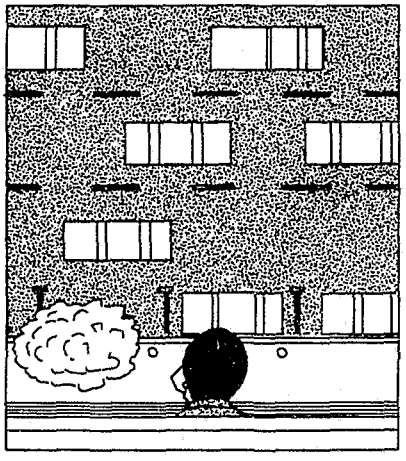
"It was only after we'd finished construction that we realized our drawings had a crease!"

Construction



Finally, everyone goes to the groundbreaking and construction work actually begins. Decisions and management from this point on involve making sure the project is being built according to plans and specifications, is on schedule and is avoiding excessive change orders (extra charges by the contractor for items incorrectly designed and changed, inadvertently forgotten or unanticipated).

Transition And Activation



The big day is almost here. It's time to prepare for the ribbon-cutting ceremony during which the Board of Supervisors, the rest of the team and other folks will be present to take credit. (Hopefully the project has been a success, is under budget and on schedule. Then everyone will want to come.)

Casually, you call the contractor to ask when he's bringing in the furniture and the rest of the kitchen and medical equipment. There is silence on his end of the phone. A lump grows in your throat. You open your office window and look at the street 10 floors below . . .

You can avoid this predicament by planning for both transition and activation. An on-schedule, within-budget facility is of little value unless the facility is equipped and owners and users know how to operate and use it.

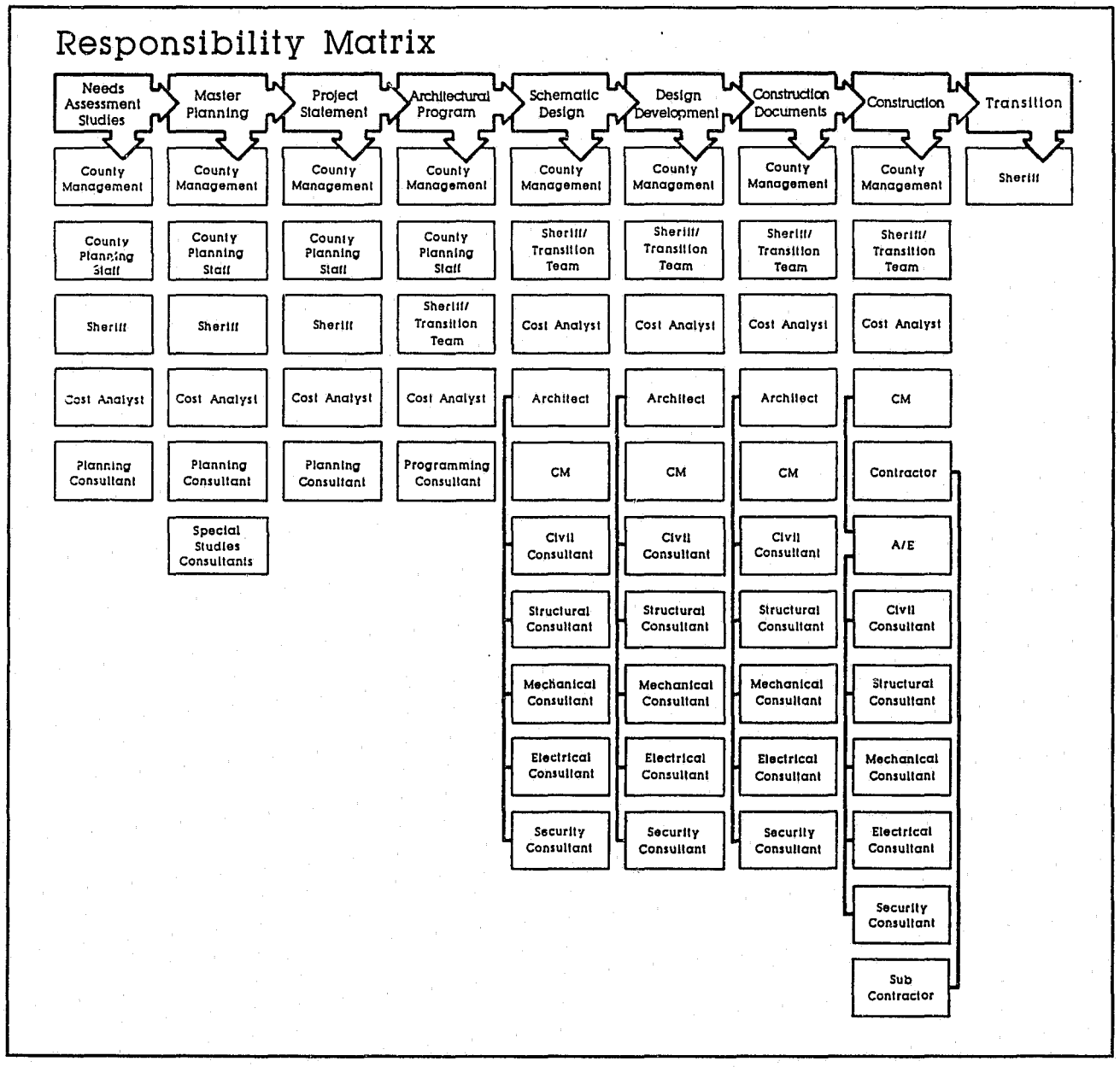
Transition planning continues all during planning and construction, while activation takes place during a relatively short period before the new facility is occupied. Transition and activation require extensive forethought and planning. Even if you've made operational decisions prior to design, you still need to train staff to use the facility.

Planning for transition from one facility into another and for activation of the new facility should begin early in the design phase. If you are to have a smooth transition and rapid occupancy, staff training must commence prior to construction completion. Most counties desperately need the new beds the day they decide to pursue the project. It's almost inexcusable to let a newly completed facility sit idle even for a day.

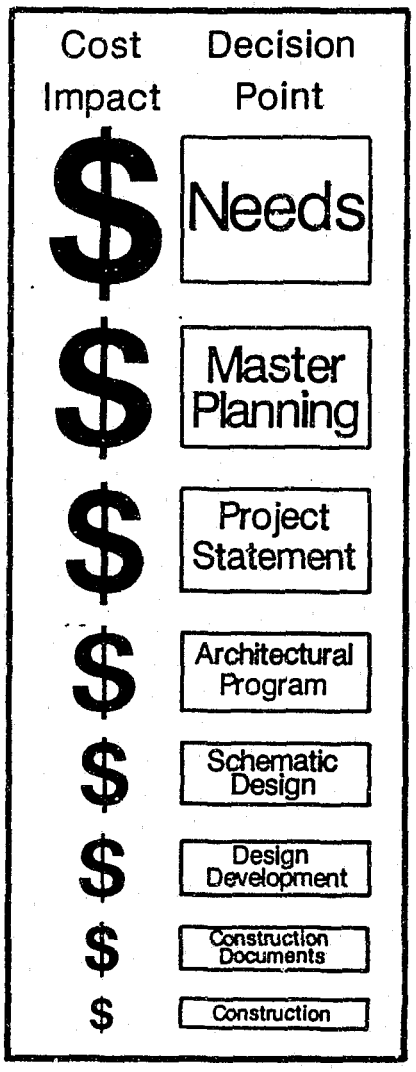
Regardless of the size of your project, transition and activation activities must be worked into your master schedule. Staffing patterns, determined in the planning and programming stages, should be detailed during schematic design to allow time to orchestrate hiring and training. The Board of Corrections manual, Transition Handbook: Opening a New Facility, can assist you with this important planning activity.

Who Handles All Of This Work?

The following matrix provides a rough idea of whose participation is needed to accomplish all of the steps. Sections II.C and III detail the roles of those involved and the activities they must accomplish.



DIMINISHING COST IMPACT



Now that you're acquainted with the process, it's imperative that you understand that **your ability to have an impact on total cost diminishes as the project develops.** A decision such as whether the facility is a high-rise downtown or a low-rise in an outlying area will greatly impact first costs and operating costs for years. The monies saved or spent to follow up on such a decision will greatly affect what can be achieved with the dollars available. Decisions arising late in the project, such as reducing the number of coats of paint to reduce cost overruns, will have little or no impact on the project cost and may result in much higher maintenance costs in the future.

NOTE: Additional information on the facility development process can be found in the Corrections Planning Handbooks published by the California Board of Corrections in 1981. (See Section VI, References.)

WHY A TEAM?

You probably know of a house specially designed and built for a couple — a team of two. They lived together, reportedly happily, for years and years prior to launching this undertaking. You'd think they'd have known right off what spaces they needed, what features were really important, what would be nice to have if they could afford it, and how much they could spend. Bad assumption.

It took them months of discussions and negotiations to work out the details, at least the facets they knew to address. The couple employed an architect, a builder and a banker to help figure out what they could afford to build and how to get the most for their money. Even with this help, they went over budget and had to do without some things they really wanted.

Increase the complexity of the above scenario one hundred-fold and you begin to get a glimpse of what's involved in building a jail. Jail projects encompass many more people with vested interests; more people controlling the purse strings; many more needs and wants, some conflicting; far more details; and, unavoidably, a much more difficult challenge in reaching a consensus. Not everyone wins everything — some parts don't get built, don't function right, or cost too much.

Participate Or Get Stuck!

Without formally establishing your team and defining members' responsibilities, decisions will be made by default. This will cost you money and may produce a lemon when you wanted a lime.

If one partner of the couple building the house had relented, saying to the other: "OK, you make all of the decisions," the house would have been built faster. But once it was completed, the other partner might wonder why the kitchen is so small; why the bathroom tile is chartreuse; why the table saw won't fit in the workshop; why they both have to moonlight to pay for it all.

Again, all the above is magnified a hundred-fold on jail projects, particularly when a county doesn't "get its act together."

Just whose act is it? Obviously the sheriff runs and is responsible for the jail. But he can't finance it, and he may not have the expertise to determine what size it should be.

The Board of Supervisors and the Chief Executive Officer allocate the monies, but they don't know exactly what's needed, what it will cost, or how it will function. They haven't worked in that environment daily or stayed current on jail costs.

Others get into the act too — the Public Works Department maintains county properties, the county architect reviews county plans, and the jail staff practically live in the county facilities. The county Planning Department promises the community efficient organization, the Board of Corrections answers

to the taxpayers for the responsible spending of their money and consultants offer state-of-the-art expertise in very specialized fields.

The Whole Is Better . . .

The act, then, involves all of them. Why? Because all of the complexities in planning, building, operating, and funding a jail demand multi-disciplinary expertise to do the job right. One facility must satisfy myriad goals, values, needs, and wants. These goals, values, needs and wants must be clearly identified and evaluated to find the best, most cost efficient ways to meet all the critical ones and most of the less critical.

No single person knows about all current and future needs; the county's philosophies; the county's priorities; jail operations; local, state and national codes and standards; construction costs; operational costs; the county's revenue and budget; and the special needs and programs for general population inmates, the mentally ill, and public inebriates. Nor is one person responsible for all of this.

RECIPE: Build a Better Jail

INGREDIENTS

1 Board of Supervisors	1 Board of Corrections
1 County Executive	1 "Know-It-All"
1 Sheriff	1 Project Manager
Consultants (according to taste)	Other County Staff

Mix all ingredients together in a moderately warm conference room. Raise heated arguments to boiling point and then simmer for 6 months. Remove the Know-It-All and add clear roles, goals and objectives.
In a few months, jail should begin to rise.

Still, too many cooks spoil the broth. They may demand too many compromises or take six months to agree on a recipe. So — your team must have all the right experts, but not too many of them.

How many is too many? Each county must decide this independently. Problems inherent to group undertakings, such as difficulty in making recommendations and decisions, can be diminished, if not eliminated, by clarifying roles and decision-making processes. These topics are addressed in the following two sections.

WHO SHOULD BE ON YOUR TEAM?

Four or five groups play major roles in developing a jail a county needs and can afford. These groups include people who study issues and make recommendations, those who make decisions, and those who take action to implement decisions.

The **Board of Supervisors** makes decisions on recommendations presented by the **Jail Project Team**. The Jail Project Team is the working body of representatives from all county departments that will be impacted by the new jail. In part the Jail Project Team's recommendations are based on data, analysis, and recommendations from their staff and **Consultants** in the areas of corrections/detention, planning, design, construction, value engineering, and program and construction management. Some funding for the entire endeavor and for the consultants involved is provided by the **Board of Corrections** (BOC). The BOC also is charged by the Legislature with reviewing documents and plans for compliance with standards, codes and regulations.

The Board Of Supervisors

The Board makes decisions. Its members are in charge of the Team, although they appoint an in-house Project Manager (described later in this chapter) to run the project on a day-to-day basis. The Board also appoints the members of the Jail Advisory Committee and hires consultants. The Board's decisions must take into account county priorities and fiscal commitments, as well as general operational philosophies and policies. The Board approves the size, mission, scope, and budget of construction and renovation projects. When projects are over budget, the Board shares the public heat and must find and approve solutions.

The Jail Project Team

The Jail Project Team, which makes recommendations to the Board of Supervisors, gathers and analyzes information regarding how the jail must perform and how to keep the project within budget. The Team formulates recommendations and presents them to the Board. Although the Team receives substantial input from other county administrators, staff and various consultants, it bears a tremendous responsibility for reaching consensus on:

- The mission, goals, objectives, and philosophy of the corrections/detention system.
- How many beds are needed overall and by type (including those for public inebriates and the mentally ill).
- Inmate programs and services.

- Relationships and roles of new and existing jail facility(ies), and the courthouse.
- Site(s).
- Operational methodologies (e.g., direct or indirect supervision).
- The image of the jail building.
- The project budget, including available State and county funding.
- Transition and activation.
- Recommendations of consultants to assist them in the process.

Can the ideal jail for your county, as defined in the first seven items above, be built for the proposed project budget? If not, the Team is charged with finding out how the vital and most important needs, wants, and goals can be satisfied within the available budget.

Who Should Be On Your Jail Project Team?

To represent all bodies that directly impact both what is needed and what can be spent, the Team should include:

In-House Project Manager to represent the Board of Supervisors and to run the project daily on behalf of the county. For most projects, the duties demand a full-time manager. The best choice is an individual who is perceived as neutral and who has a good understanding of the county's policy and decision-making process, someone who can move the project forward. The Project Manager may be selected from the other Project Team members listed below. The Board must have confidence in this person and give him/her decision-making authority on routine issues. This person also needs the respect and full cooperation of the sheriff and jail administration.

County Executive Officer/County Manager or his/her representative (such as a seasoned administrative analyst). This person must be able to speak for and with the Board of Supervisors.

County Sheriff and/or Jail Commander/Administrator or representative(s) of the entire Sheriff's Department and jail administration.

County architect or engineer familiar with applicable codes, regulations, and physical condition of existing jail(s).

Transition Team Coordinator/Manager who may be one of the above. (Refer to discussion of Jail Transition Team later in this section.)

In addition to those people listed above, your county may want to include as Project Team members or as available resources one or more of the following:

Correctional officer/deputy/line staff representing jail staff.

Board of Supervisors member who is interested in and/or has expertise in jails, planning, financing, or construction.

County planner(s) familiar with population projections, facility planning and development, and the county's facility and site-related plans for all departments.

Public representative to reflect the county "pulse" regarding what the jail should do and be.

Consultant, such as a justice or facility planner, value engineer, or architect, the roles of whom are discussed in more detail later.

Local fire marshal to ensure compliance with fire and life safety codes (or your county can submit drawings for his review).

County person charged with monitoring compliance with **handicapped** accessibility requirements.

Judge/court administrator and/or representatives of other justice departments, such as the public defender and district attorney offices or the city police department.

County counsel or private attorney to ensure that the project's approach and the resulting building meet all legal requirements.

County health department representative to ensure that your project complies with all local health codes.

Local building official to ensure you'll be able to get all of the permits necessary to build the project.

The structure of the successful project team is not etched in stone. You have many alternatives — the important point is that you approach the project with a structure.

For instance, a county may want to form a two-tiered Jail Project Team made up of workers and reviewers/recommenders. The workers gather and analyze information. The reviewers/recommenders are then briefed and formulate recommendations for the Board of Supervisors. The reviewers/recommenders should be administrators, such as the sheriff. The workers should be the administrators' staff, such as the deputy sheriff responsible for department planning.

Two-tiered teams may work better for medium and large-sized counties. Small counties may prefer a single committee. Another option is to establish subcommittees.

Team Requisites

If the project is to succeed, each and every member of the team must:

- Know his/her role and responsibilities. On a two-tiered committee, each must know his/her tier and act accordingly.
- Be committed to the general goals of getting what the county needs within its budget.
- Devote the time required to sort through information (depending on your county's use of consultants, this may include collecting and coding data); to debate and reach consensus on goals, objectives, and philosophies; and, most important in relation to this Handbook, to develop, review, analyze, and reach agreement on myriad alternatives. Alternatives will be both macro-scale, such as adding onto an existing jail versus building a branch jail, and micro-scale, such as using a less expensive and less secure cell locking system to keep the project within budget.
- Be assertive and speak up, even in the face of opposition, to truly represent his or her area of knowledge and point of view, without being aggressive, antagonistic, or domineering. All team members have the same freedom to express their opinions.
- Have a flexible enough schedule to be able to participate in meetings at various times of the day and week.

Jail Transition Team

In addition to the jail project team, it is critical that your county establish a Jail Transition Team. Other counties have learned that the earlier the transition team is formed, the better. A transition team helps ensure that the right staff will be hired in time and that existing and new staff will receive adequate training with regard to new equipment, systems, layouts, procedures and programs. The transition team should include, at a minimum, a jail administrator and members of the jail staff.

The Board Of Corrections

The California Board of Corrections, provider of this Handbook, is both a regulatory body and an excellent resource for state-of-the-art jail operations and design techniques, alternative financing methods, inmate programming and classification and state jail requirements. The BOC also can refer you to others in the State who've worked on similar projects.

In controlling the cost of your jail project while meeting your county's needs, the BOC's role will include:

- Provision of minimum jail standards.
- Provision of construction cost regulations and maximum State funding levels.

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- Advising, when desired, on everything from small details such as types of cell lighting to broad operational concepts.
- Reviewing and approving (before disbursement of funds):

  Architectural plans.

  Plans for separating juveniles, the mentally ill, and the publicly intoxicated.

  Documentation regarding the use of alternatives to incarceration.

  A master plan for county detention facilities.
- Reviewing and commenting on: each county's needs assessment study, project proposals, staffing plans, life-cycle costs, and construction cost levels.

CONSULTANTS

To supplement your in-house expertise, several types of consultants are a must. Several others may prove valuable in order to get your jail built within your budget. Although you may wonder where all of the money to pay these consultants will come from, proper use of the right consultants will more than pay for your investment.

"I'm trained, yes, but not highly trained."

From KINGS DON'T CARRY MONEY, copyright 1981 by Charles Barsotti. Reprinted with permission, all rights reserved.

The types of consultants you may wish to engage range from planners to program managers. All the consultant expertise you require may be provided by a single firm or by a number of different firms. The roles they may play in your construction project are explained below.

It is essential that you establish a plan at the beginning of your project which outlines which consultants will provide the required expertise needed and when you will need them. Allow yourself enough time to properly solicit proposals, interview those firms which seem appropriate, check references, and process contracts. If you do not allow for the months this process often requires, you may end up with less than what you need or want.

How to hire consultants

1. Cl 

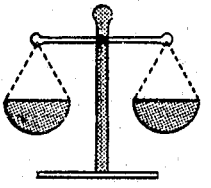
y what service(s) you need, fees, schedule, liability, rules

2. 

Visit their past projects and ask users how well the projects are working and how successful the consultants were in staying within budget.

3. 
Check references. Investigate in what capacity they were involved. Did they do all of the work they lay claim to? Find out how they performed, how they were to work with. Check on individuals who will be assigned to your project.

4. 
Cover all the bases – make sure you have all types of consultants you may need and that everything you are seeking is included in your contracts with them.

5. 
Check and Balance – have someone in addition to the A/E do value engineering/cost estimating.

Cost Analyst

The only way to know the cost impact of decisions being made is to have someone onboard as cost analyst as early in the process as possible. This service may be part of program management or construction management services. The key is to initiate the process with this person designated and in place. The cost analyst should have experience in the type of facility you are building, not simply construction. Correctional facilities involve many specialty items and nuances.

Involving the cost analyst in the process is crucial. Too often counties rely on an architect to handle this role. This person probably doesn't have knowledge of alternative ways to achieve your goals. Even if the architect has the knowledge, a cost analyst will evaluate assumptions from a strict cost-benefit standpoint and will provide a check and balance to help ensure that the cost is within budget.

A true cost analyst should not simply provide estimates for what has been designed. This person should actively participate in the process, possibly doubling as the value engineer.

In hiring a cost analyst, consider what kind of support team the individual has access to. Many estimators or cost analysts do not have individual expertise in all disciplines such as civil engineering or electrical and mechanical systems.

Planners And Programmers

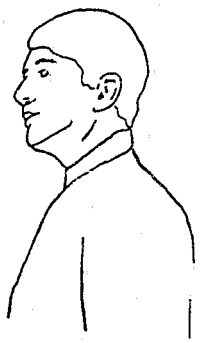
As emphasized throughout this Handbook, the best and least painful way to fulfill your county's facility-related needs and wants and stay within your budget is through thorough planning. Planners may be part of a construction/program management firm, a planning/architectural programming firm or an architectural firm. They develop needs assessment studies, systemwide long-term master plans, project planning guides, and architectural and operational programs. Environmental planners research and write EIRs.

Planners provide objective analyses, alternatives and recommendations as to cost-effective ways of accommodating your jail population. They also may be able to help you reduce your need for jail beds by recommending appropriate uses of alternative pre-sentence and sentencing programs.

Planners do not work in a vacuum. Rather, their expertise is in knowing what resources to tap, including members of your project team, and having knowledge of state-of-the-art alternatives. Their function is to provide information on alternatives so you can make informed decisions.

When hiring planning and programming consultants, make sure that the firm and its people who will be working on your project are trained and experienced in the particular service they will be providing. Many firms claim they are "full service" and provide planning and programming services, but do not really have staff who are trained as planners or programmers or who have much experience.

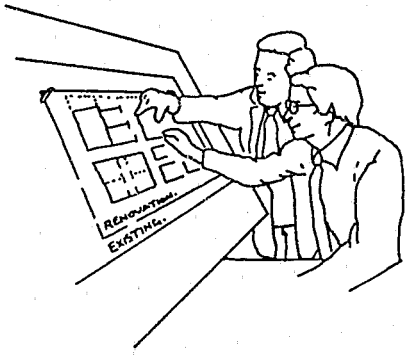
Correctional Consultants



If the planners or architects that you are contracting with do not have expertise in jail operations, you may wish to contract with a correctional consultant. A correctional consultant will supplement and complement your county's experience and knowledge regarding operational issues.

Your county will be faced with numerous decisions regarding types of surveillance and security systems, food service systems, staffing patterns, and so forth. A seasoned correctional consultant with a different set of experiences than may be available in your county can help you make the right decisions. This may help control both initial and operational costs.

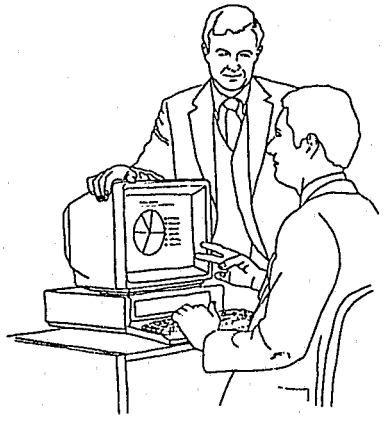
Architects And Engineers



After you have clearly defined your project through needs assessment study, master plan, project statement and operational/architectural program, it's time to bring the architecture and engineering (A/E) firm onboard. This is the latest point the A/E should be added. You may want to involve the A/E during programming, especially if the firm is equipped to do the programming.

The A/E's objective is to meet all the needs, desires, and criteria stipulated in the architectural program by designing a building that is within your budget. The ideal A/E firm provides expertise in jail design and engineering, cost estimating and budgeting, and alternative analysis/value engineering. The A/E, however, should not be your sole value engineering resource in the design due to "pride of ownership."

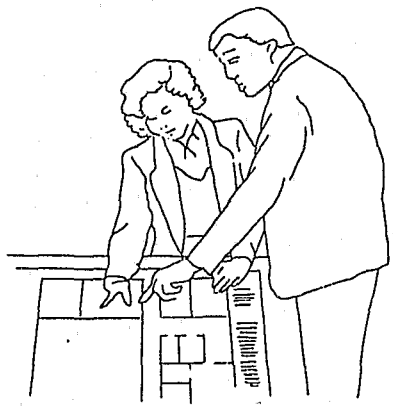
Value Engineers



If your county's other consulting firm(s) does not have value engineering expertise, you may wish to use a value engineer consultant. Value engineering is one of those specialities which everyone claims to offer, but "seeing is believing." The value engineer, either as a specialty firm or as part of a multi-disciplinary firm, carefully reviews design as well as written documents (e.g., specifications) and drawings to look for the most cost-efficient means of meeting the same objectives.

Establish a process for approving and implementing this person's ideas. The major ideas should be presented to the Jail Advisory Committee for consideration. If given the green light, the ideas should be presented to the decision-making body, the Board of Supervisors, to determine whether they should be implemented.

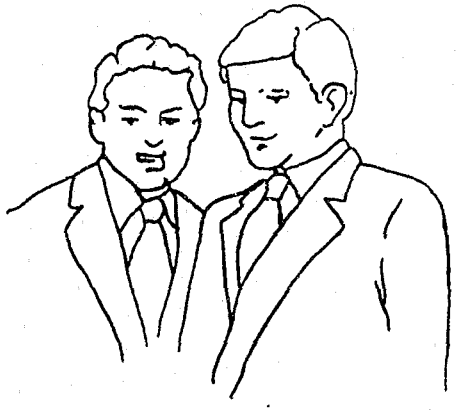
Construction Managers



Jails are very complex buildings. In constructing one, you will most likely develop stringent cost limits and schedule demands. Construction managers (CM) provide expertise in scheduling, keeping track of budgets, reviewing constructability, reviewing drawings and specifications, ensuring construction quality, and minimizing exposure to claims during construction. Construction managers also develop independent estimates to help ensure that other estimates are realistic.

Although many people perceive the construction manager's role as beginning on-site after the drawings and specifications are complete, you definitely should have someone providing the above services during schematic design. The value of your construction manager's participation prior to bidding far outweighs that received after the documents are complete and out to bid. Participation of a construction manager prior to construction also will familiarize the CM with the project before moving on-site.

Program Managers

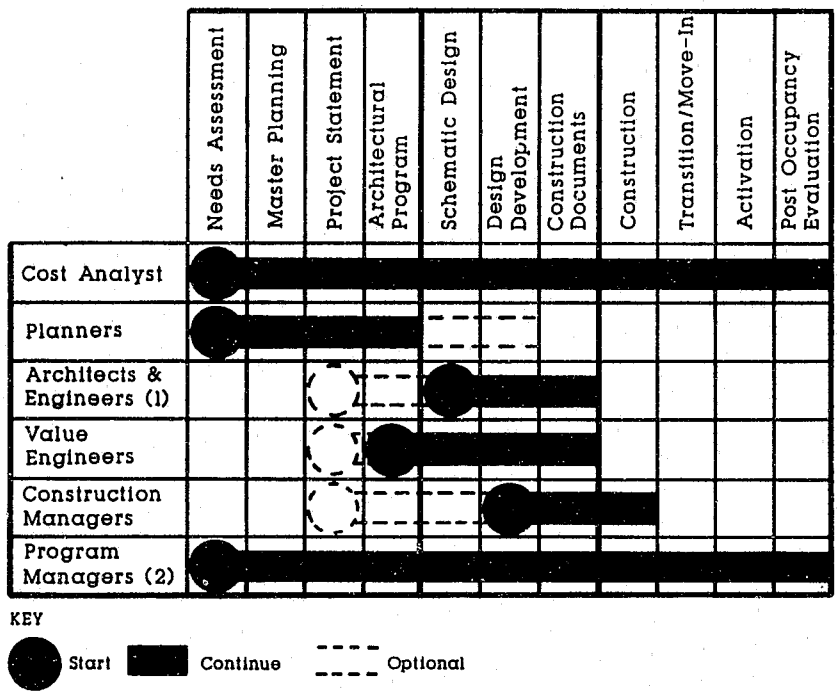


Rather than trying to gather all of the required expertise from many disciplines, manage these experts as well as the Team, and endure the time-consuming responsibility of bringing all of these people up to speed when they're brought onboard, you may want to employ a program management firm.

These firms are staffed to provide all of the services described above except design — from planning activities through construction management. Program managers serve as your advocate with the A/E, reviewing the design for compliance with the program and for less expensive or more efficient alternatives. They also can assist with move-in preparation and post-occupancy evaluation.

Program managers employ planners, programmers, cost estimators, schedulers, architects, all varieties of engineers including value engineers, and construction managers. Program managers develop systems at the outset which track cost, space allocation, and alternative analysis/value engineering through facility activation.

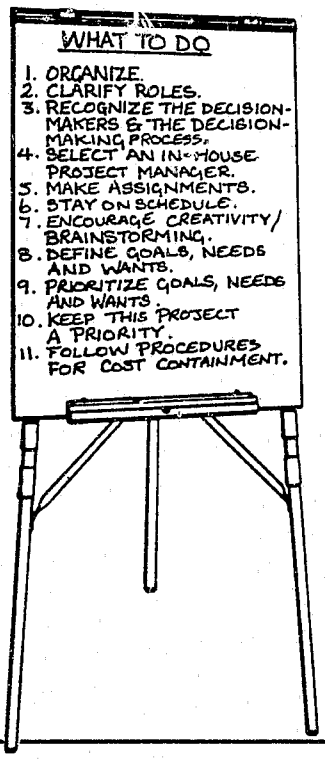
When to Bring Consultants on Board



(1) Some A/E firms have capability to do some or all planning activities.

(2) During design, program managers review A/E's work for compliance with codes, criteria the program, professional know-how.

PUTTING THE TEAM TO WORK



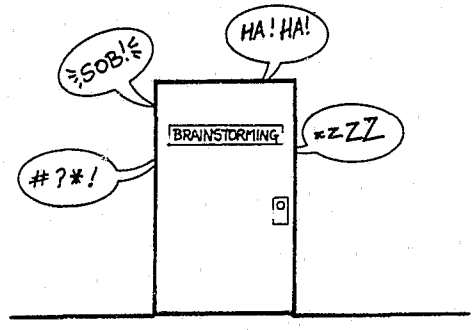
Okay — now that you have figured out who you need on your team, how do you get them to work together?

Organize. With this Handbook as a guide, determine what needs to happen throughout the facility development process and how it will happen.

Clarify Roles. As early as possible, form your Jail Advisory Committee and determine who will be involved in the first steps — planning (both in-house and consultants). All the way through your project, stay a step ahead in determining what needs to happen and who will make it happen.

Recognize the Decision-Makers and the Decision-Making Process. The Jail Advisory Committee needs to be cognizant of its relationship with the Board of Supervisors. The committee recommends and the board approves repeatedly throughout the life of the project.

Select an In-House Project Manager. This person will be the county's focal point. The manager will chair the Jail Project Team and interface with consultants, the Board of Supervisors and the Board of Corrections. For most projects this position requires a full-time person, preferably with strong management skills and familiarity with planning, design, and construction. **Choose someone capable of making day-to-day decisions, and give this person decision-making authority.**

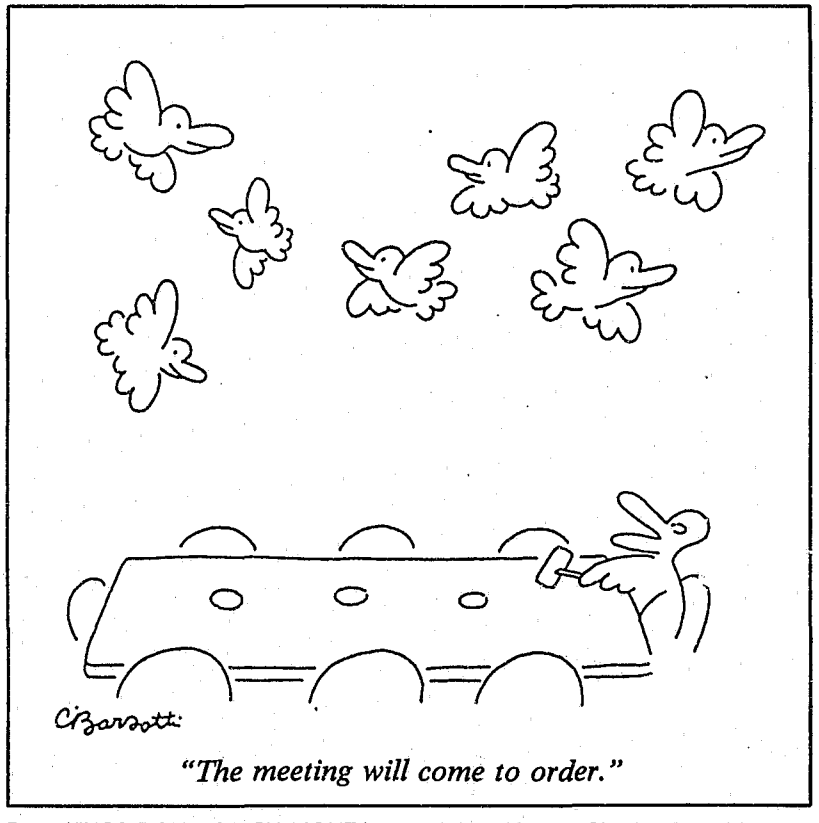


Make Assignments. Your Jail Advisory Committee will have a lot of work to do. Avoid inaction or passing the buck by letting each person know what is expected of him or her, task by task.

Stay on Schedule. Cost containment procedures need to stay in step with the whole process from needs assessment to facility activation. The old cliche rings true: Time is Money. You don't want to add to the cost by looking too long at ways to contain costs.

Encourage Creativity/Brainstorming. When exploring ways to meet your needs and your budget, encourage team members and others to offer ideas regardless of how outrageous or humorous they may sound at first. Don't criticize or make fun of one another; this stifles creative brainstorming. What first appears as a crazy idea may save your county millions of dollars without forsaking safety and security.

Define Goals, Needs and Wants. Before costs can be estimated, your advisory committee must agree about overall goals, needs, and wants. These goals, needs and wants need to be interpreted into an idea of building type and size.



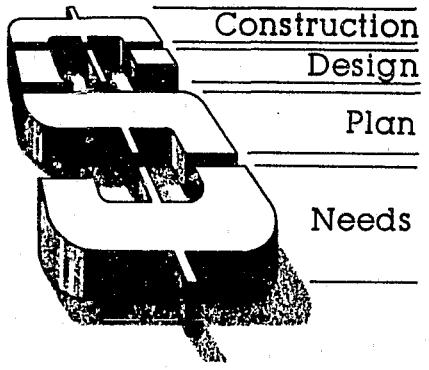
"The meeting will come to order."

Prioritize Goals, Needs and Wants. Assuming your county is not sitting on top of a giant oil well, you won't be able to afford everything. It is imperative that your committee prioritize its goals, needs, and wants.

Keep This Project a Priority. All members of the Advisory Committee must make this project their priority. Its meetings and their assignments must take precedence over their other roles. From the very beginning, if they know they can't make such a commitment, they should assign an appropriate representative to take their place. Continuity is vital; the team cannot keep changing.

Follow Procedures for Cost Containment. The essence of containing costs throughout the facility development process is described in detail in Section III. Your team must follow these steps. **Once cost control is lost, it is extremely difficult to regain.**

Introduction



You need to know at all times what your project will cost and when you will get it. Remember: your project budget must cover more than just construction costs. (Refer to the list of project budget components in Section II.A.)

The following steps outline how to control cost during the numerous activities which might occur on any one project from the time a need is identified until the new facility is activated. As stated earlier, the process actually is very fluid. It may include all of the activities below, combine some of them or involve a different sequence of activities. For scheduling and management purposes, it usually proves helpful, if not essential, to label the project phases even though the process never actually starts and stops. For presentation purposes, the following discussion is structured by phases in a likely chronological order.

Budgeting and cost control will take two different forms during the following activities. From needs assessment through master planning, budgeting will be identified by ranges of costs for different scenarios. The ranges will be based on costs of similar projects, combined with whatever information is available about potential sites and the facility. The accuracy of this information will depend upon the depth of the study and how much time and resources you're able to devote to these endeavors. The accuracy also will depend on the expertise of those individuals who prepare the studies.

Budgeting takes on another form and tracking of costs begins once a particular scenario is selected. This scenario should meet county needs (as expressed in the Project Statement) while remaining realistic in terms of funds available. As presented in this Handbook, the decision selecting this scenario would be reached at the end of the Master Planning stage.

This is the point when you, as decision-makers, may concur, "Okay, we're going to build a 400-bed jail for $30 million." You've chosen your goal and set your budget. Be forewarned: Two years later someone may ask, "Why did you build only 300 beds and run $10 million over budget, to boot?"

Applying a cost control system, you can answer confidently, "Look at our cost control report for the $30 million, 400-bed jail. That goal did not include the fountains, artwork or 400 color T.V.s with video cassette players added later!" You may still be unemployed, but at least you have a record of all the political and non-political items either tacked onto or dropped from that original project.

Preferably though, each time someone suggests a new desire for the project, you can respond, "Well, that's a wonderful idea, but since it's not in the budget, we must either raise more money or cut something else out. Which would you prefer, tennis courts and cardboard walls or secure concrete walls as planned?"

In essence, this is cost control and value management. Cost control is knowing what is in your project and how much it will cost. Value management is using this information to make decisions on what you need — putting your dollars in the right places.

Your first cost control report should be prepared when the decision, 400 beds for $30 million, has been made. This report will be an abstract cost model representing how you plan to build your goal within your budget.

What Is A Cost Control Report?

The Cost Control Report lists all of the project's components and their projected costs. Even though you may not have a lot of information, it's essential to make the assumptions required to produce a bottom line. The detail of the report will vary depending on the complexity of the project, the information available, the amount of time committed to this activity, and the expertise of the person(s) responsible for establishing this initial budget.

Begin with the original budget column found in the following examples. This will record your starting point. Depending how intensively you need to track project costs, you may increase the number of columns in your report as the project progresses. All of your project's components should be covered, including land costs, fees, contingencies, equipment, off-site costs and payments for utilities, roads, etc.

Organize your cost control report after considering how you intend to pay for your project in terms of phased construction, bid packages, different funding sources, contingencies, construction, fees, etc. Although you may not know all of this information initially, the original report should reflect known assumptions. It can be modified as required throughout the project, but the fewer modifications, the easier the process will be. Your cost control report should reflect assumptions made in your schedule.

Example 1

Assumptions:

NOTE: These examples are hypothetical. Consult the Board of Corrections for information re: actual jail construction costs.

(1) Site improvements, demolition and onsite utilities costs vary substantially.

(2) Fees are based on the following percentages:

Project Manager/ Construction Manager	4.0%
Architect/Engineer	7.0%
Miscellaneous	2.0%
	13.0% Total

(3) Offsite cost may vary substantially.

(4) For this example, equipment cost is estimated at $3,200/bed.

(5) Based on January 1987 values.

Preliminary Budget

Alternative 1	Gross Square Footage	$/Square Footage	Total Cost
500-bed Pre-Trial Facility	175,000	$ 150	$ 26,250,000
250-bed Medium-Security	87,500	140	12,250,000
250-bed Minimum Security	75,000	105	7,875,000
Facility Service Space	90,000	115	10,350,000
Site Improvements (1)			2,000,000
Demolition (1)			1,500,000
Onsite Utilities			2,500,000
Total Construction Cost			$ 62,725,000
Contingency (5%)			3,136,250
Fees (13%) (2)			8,154,250
Subtotal ($74,015 bed)			$ 74,015,500
Offsite Utilities (3)			1,000,000
Equipment (4)			3,200,000
Site Acqusition			5,000,000
PROJECT TOTAL (5)	427,500		$ 83,215,500

Example 2

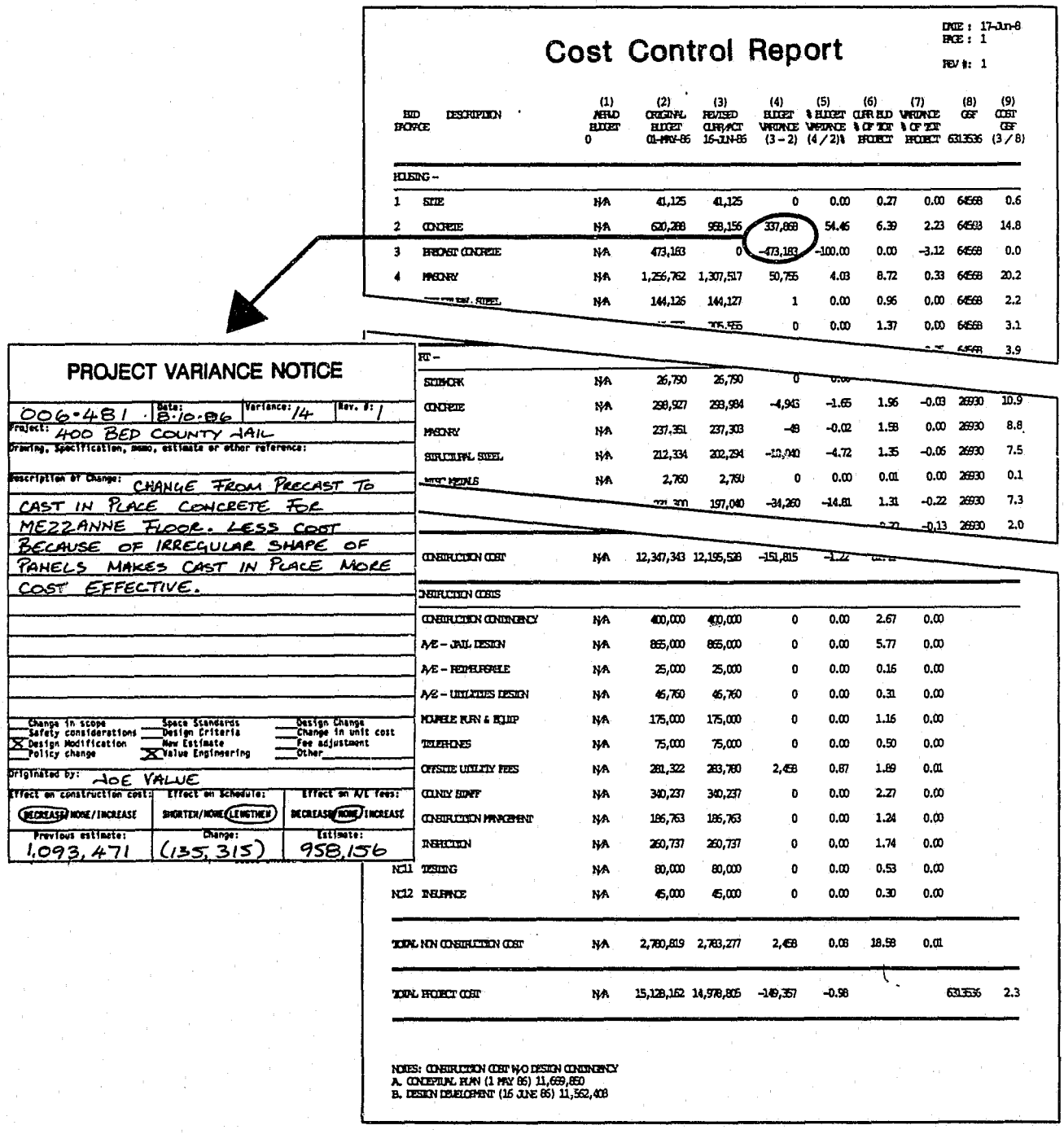
PROJECT : 168C0
DATE : 13-Jan-87
TIME : 09:20 AM

COST CONTROL REPORT

PAGE : 1
REVISION : 3

	(1) ORIGINAL BUDGET 25-JUN-85	(2) PREVIOUS BUDGET 15-SEP-86	(3) CUR/ACT BUDGET 17-DEC-86	(4) BUDGET VARIANCE (CUR - ORG)	(5) GROSS SQUARE FT	(6) COST/ SQUARE FT	(7)	(8) CHANGE ORDERS	(9) TOTAL COMMITMENT
CONSTRUCTION									
CONSTRUCTION									
OVERLOT GRADING	70,000	49,998	49,998	-20,002	154100	0.32		1,490	51,488
ONSITE UTILITIES	307,771	177,000	177,000	-130,771	154100	1.15		0	177,000
DEEP FOUNDATIONS	212,553	139,260	139,260	-73,293	154100	0.90		0	139,260
CONCRETE,MASONRY & PRECAST	3,956,904	0	0	-3,956,904	154100	0.00		0	0
[illegible]	1,472,769	0	0	-1,472,769	154100	0.00		0	0
[illegible]	0	5,203,000	5,203,000	5,203,000	154100	33.76		0	5,203,000
DETENTION HARDWARE		747,620	747,620	-52,380	154100	4.85		0	747,620
GLASS & GLAZING	196,757	[illegible]	[illegible]	-3,137	154100	1.26		0	193,620
METAL SIDING	365,063	92,000	[illegible]	[illegible]	154100	0.60		0	92,000
ROOFING	444,085	371,300	371,300	[illegible]	[illegible]	[illegible]		0	371,300
ELECTRICAL & MECHANICAL	3,990,734	3,990,734	4,000,676	9,942	154100	[illegible]		[illegible]	[illegible]
FOOD SERVICE	400,000	400,000	377,000	-23,000	154100	2.45		0	[illegible]
LAUNDRY SERVICE	90,000	80,000	88,800	-1,200	154100	0.58		0	88,800
WALLS & CEILINGS	647,337	446,595	446,595	-200,742	154100	2.90		0	446,595
CARPENTRY	411,947	870,000	870,000	458,053	154100	5.65		0	870,000
FLOOR FINISHES	121,356	121,356	121,356	0	154100	0.79		0	121,356
TILE	61,821	61,821	61,821	0	154100	0.40		0	61,821
ELEVATORS	110,716	110,716	110,716	0	154100	0.72		0	110,716
ASPHALT & CONCRETE PAVING	363,317	363,317	363,317	0	154100	2.36		0	363,317
LANDSCAPING	127,145	127,145	127,145	0	154100	0.83		0	127,145
[illegible]	14,190,275	13,545,482	13,541,224	-609,051	154100	87.87		1,490	13,542,714
EQUIPMENT									
MEDICAL EQUIPMENT	126,172	133,427	133,427	[illegible]	[illegible]	[illegible]		0	133,427
VEHICLE MAINTENANCE EQUIPMENT	62,262	40,000	40,000	-22,262	[illegible]	[illegible]		[illegible]	40,000
DETENTION FURNISHINGS	433,408	433,408	433,408	0	154100	2.81			
TOTAL	621,842	606,835	606,835	-15,007	154100	3.94		0	606,835
CONTINGENCY									
CONSTRUCTION CONTINGENCY	768,951	768,951	768,951	0	154100	4.99		0	768,951
BID SAVINGS	0	607,235	511,493	511,493	154100	3.32		-7,157	504,336
[illegible]	1,840,300	1,844,854	1,894,854	54,554	154100	12.30		0	1,894,854
TOTAL OVERHEAD	1,840,300	1,844,854	[illegible]			[illegible]		0	1,894,854
TOTAL PROJECT COST	17,967,245	18,000,000	18,000,000	32,755	154100	116.81		0	18,000,000

Example 3



Cost Control Report

DATE : 17-Jun-8
PAGE : 1
REV #: 1

BID PROPOSE	DESCRIPTION	(1) AWARD BUDGET 0	(2) ORIGINAL BUDGET 01-MAY-86	(3) REVISED CURRACT 15-JUN-86	(4) BUDGET VARIANCE (3 - 2)	(5) % BUDGET VARIANCE (4 / 2)%	(6) CURR BID % OF TOT PROJECT	(7) VARIANCE % OF TOT PROJECT	(8) GSF 631536	(9) COST GSF (3 / 8)
HOUSING -										
1	SITE	N/A	41,125	41,125	0	0.00	0.27	0.00	64568	0.6
2	CONCRETE	N/A	620,288	958,156	337,868	54.46	6.39	2.23	64568	14.8
3	PRECAST CONCRETE	N/A	473,163	0	-473,163	-100.00	0.00	-3.12	64568	0.0
4	MASONRY	N/A	1,256,762	1,307,517	50,755	4.03	8.72	0.33	64568	20.2
	[illegible] STEEL	N/A	144,126	144,127	1	0.00	0.96	0.00	64568	2.2
				[illegible]	0	0.00	1.37	0.00	64568	3.1
									[illegible]	3.9
FT -										
	SCAFFOLDING	N/A	26,790	26,790	0	0.00				
	CONCRETE	N/A	298,927	293,984	-4,943	-1.65	1.96	-0.03	26930	10.9
	MASONRY	N/A	237,351	237,303	-48	-0.02	1.58	0.00	26930	8.8
	STRUCTURAL STEEL	N/A	212,334	202,294	-10,040	-4.72	1.35	-0.06	26930	7.5
	MISC METALS	N/A	2,760	2,760	0	0.00	0.01	0.00	26930	0.1
			[illegible] 301	197,040	-34,260	-14.81	1.31	-0.22	26930	7.3
								-0.13	26930	2.0
	CONSTRUCTION COST	N/A	12,347,343	12,195,538	-151,815	-1.22				
CONSTRUCTION COSTS										
	CONSTRUCTION CONTINGENCY	N/A	400,000	400,000	0	0.00	2.67	0.00		
	A/E - JAIL DESIGN	N/A	865,000	865,000	0	0.00	5.77	0.00		
	A/E - REIMBURSABLE	N/A	25,000	25,000	0	0.00	0.16	0.00		
	A/E - UTILITIES DESIGN	N/A	46,760	46,760	0	0.00	0.31	0.00		
	MOVABLE FURN & EQUIP	N/A	175,000	175,000	0	0.00	1.16	0.00		
	TELEPHONES	N/A	75,000	75,000	0	0.00	0.50	0.00		
	OFFSITE UTILITY FEES	N/A	281,322	283,780	2,458	0.87	1.89	0.01		
	COUNTY OVHD	N/A	340,237	340,237	0	0.00	2.27	0.00		
	CONSTRUCTION MANAGEMENT	N/A	186,763	186,763	0	0.00	1.24	0.00		
	INSPECTION	N/A	260,737	260,737	0	0.00	1.74	0.00		
NC11	TESTING	N/A	80,000	80,000	0	0.00	0.53	0.00		
NC12	INSURANCE	N/A	45,000	45,000	0	0.00	0.30	0.00		
	TOTAL NON CONSTRUCTION COST	N/A	2,780,819	2,783,277	2,458	0.08	18.58	0.01		
	TOTAL PROJECT COST	N/A	15,128,162	14,978,805	-149,357	-0.98			631536	2.3

NOTES: CONSTRUCTION COST W/O DESIGN CONTINGENCY
A. CONCEPTUAL PLAN (1 MAY 86) 11,699,860
B. DESIGN DEVELOPMENT (16 JUNE 86) 11,562,408

PROJECT VARIANCE NOTICE

006-481 | Date: 8-10-86 | Variance: 14 | Rev. #: 1

Project: 400 BED COUNTY JAIL

Drawing, Specification, memo, estimate or other reference:

Description of Change: CHANGE FROM PRECAST TO CAST IN PLACE CONCRETE FOR MEZZANNE FLOOR. LESS COST BECAUSE OF IRREGULAR SHAPE OF PANELS MAKES CAST IN PLACE MORE COST EFFECTIVE.

Change in scope	Space Standards	Design Change
Safety considerations	Design Criteria	Change in unit cost
X Design Modification	New Estimate	Fee adjustment
Policy change	X Value Engineering	Other

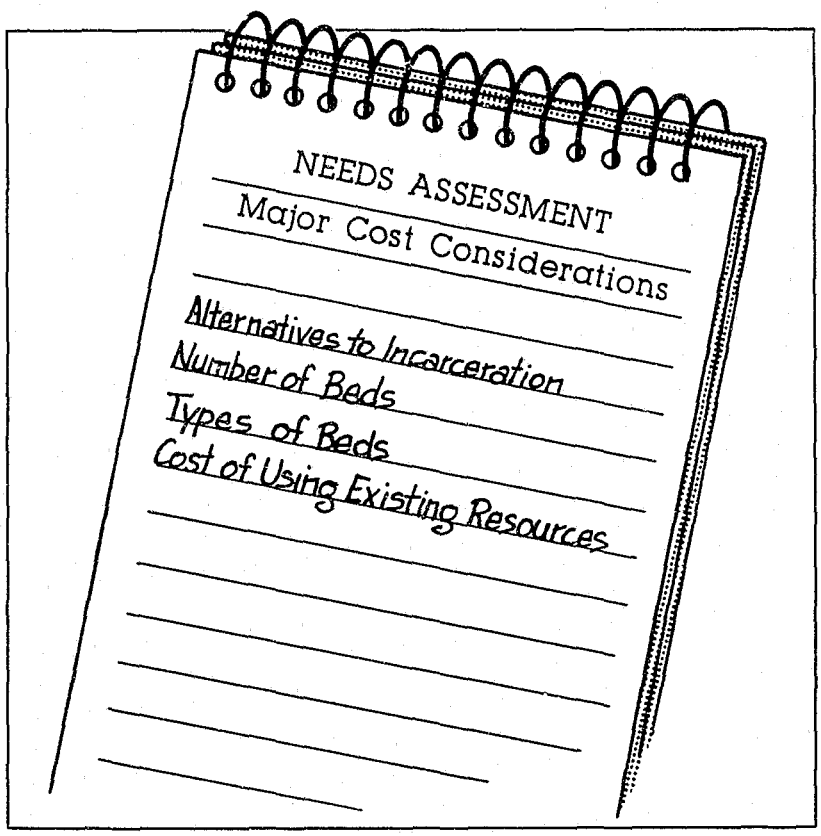
Originated by: JOE VALUE

Effect on construction cost:	Effect on Schedule:	Effect on A/E fees:
(DECREASE) NONE/INCREASE	SHORTEN/NONE/(LENGTHEN)	DECREASE/(NONE)/INCREASE
Previous estimate:	Change:	Estimate:
1,093,471	(135,315)	958,156

Design-To-Cost Model

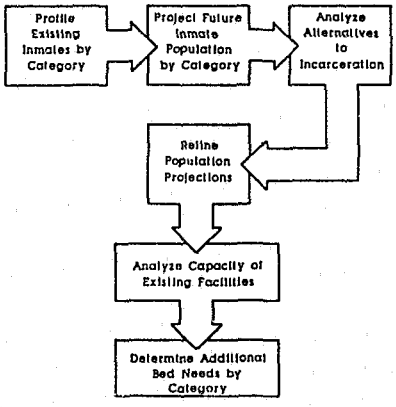
By establishing a budget at the outset, your entire team (including planning, design, and construction management consultants, equipment procurement staff, etc.) will have budget parameters to work within throughout the project. This approach, designing a facility to meet established budgetary goals, is referred to as a "Design-to-Cost Model" approach to cost control. Although some of the original assumptions may not prove or remain accurate, management decisions on variances (see Example 3) as they arise can be made in reaction to particular problems within the context of the whole budget picture.

See the Project Statement chapter for more information on establishing your initial project budget. Succeeding chapters explain the levels of budget detail necessary for cost analysis through the process.



What Is A Needs Assessment Study?

Needs Assessment



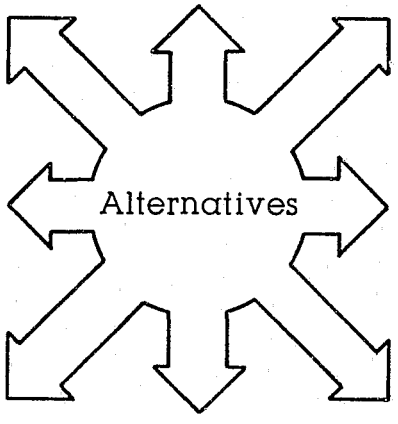
A Needs Assessment Study is a systematic process that results in:

- A profile of existing inmates by category (e.g. pre-sentenced females, maximum security sentenced males).
- Inmate population projections for between 5 and 20 years, by category.
- An analysis of alternatives to incarceration, both for pre-sentenced and sentenced inmates (thereby reducing jail beds).
- Refined future population projections based on the projections and alternatives.
- An analysis of the ability of existing jail facilities to meet future needs.
- Based on all of the above, a determination of how many additional beds will be needed, by category, for future years. A thorough step-by-step guide to population projections can be found in the Corrections Planning Handbooks, "Handbook Three: Assessing Current and Future Corrections Needs." (See Section VI, References.)

The Needs Assessment phase of a project provides one of the primary opportunities for a county to control costs, both construction and operational. If your county is serious about limiting costs, now is the time to take a hard look at just who needs to be locked up.

Unavoidably, your county will be charged with locking up a sizable inmate population – those individuals sentenced to serve time in a county jail. A detailed description of alternatives your county should consider is contained in the Corrections Planning Handbooks, "Handbook Three, Step 4: Consider and Evaluate Alternative Programs." (See Section VI, References.) The following are some options excerpted from that chapter.

Seriously Consider Alternatives



Alternatives for pre-sentenced inmates that could reduce your space/cost requirements include:

- Use/increase the use of release on own recognizance (O.R.) for people charged with misdemeanors as well as low-risk felonies, including a supervised O.R. program.
- Reduce bail amounts.
- Eliminate cumulative bail for people facing multiple charges.
- Expedite the decision-making process regarding whether or not to press charges, including the acceleration of:

  Law enforcement agency preparation.
  Case forwarding.
  District attorney's charging decision.

- Accelerate arraignment on weekends and/or evenings.
- Provide duty judges at booking facilities in the evening and on weekends to facilitate pretrial release decision-making.
- Expand the use of citation release.
- Divert public inebriates (those charged solely with public inebriation) to county hospitals and public or private treatment programs.
- Broaden the use of Penal Code 1000.6 (special proceedings in cases involving domestic violence) and Penal Code 1001 (misdemeanor diversion) diversion authorities.
- Divert mentally ill people from the criminal justice system.
- Expedite Penal Code 849 (release from custody) release decisions by assigning deputy district attorneys to the jail to review charges.

Consider Expediting Court Processing

Means to Expedite Court Processing

- Provide arraignment immediately following preliminary hearings.
- Expedite pre-sentence investigations.
- Limit continuances in criminal cases.
- Accelerate the trial calendar for in-custody defendants.
- Provide witness assistance programs to assure readiness and presence for giving testimony.

Explore Sentencing Alternatives

Alternative Sentencing Examples

- County parole.
- Intensive probation.
- Restitution.
- Community service.
- Weekend sentences.
- Work/educational furloughs.
- Community-based substance abuse programs.
- Community-based mental health programs.
- Home detention.
- Work in lieu of incarceration.

First, your county must project populations, decide if there are acceptable ways to reduce bed needs (initial and life-cycle costs), and measure the impact of implementing them. Then it is time to assess how many of the needs can be met by your existing jail system, at present and into the future. Refer to Corrections Planning Handbooks, "Chapter 4.2, Step 2: Evaluate Existing Facilities for Continued Use, Remodeling or Expansion." (See Section VI, References.)

You must learn:

What are the most appropriate uses for your existing jail(s), both "as is" and with renovations?

What needs to be done to the building(s) for the existing jail(s) to:

1. Be structurally sound.
2. Be safe and secure (from fires, earthquakes, assaults, escapes).
3. Meet all applicable codes and standards, including Title 15.
4. Be consistent with your county's philosophies and goals (e.g., for comfort, humane conditions and supervision).
5. Provide adequate space for all needed and wanted programs and services.
6. Extend its useful life by 10 years, 20 years, 30 years.

"Hey, Durk! . . . New roommate, Durk! . . . New roommate! . . . Friend, Durk! . . . Friend! . . ."

From Gary Larson's FAR SIDE, reprinted by permission of Chronicle Features.

What are the initial costs of the above needs, compared with average new jail construction costs?

What are the annual staffing and utility costs of the above needs, compared with those for new facilities?

Armed with data regarding current and future needs and costs, your county can develop and compare facility development alternatives in the next step, Master Planning.

Number Of Beds

The cost per jail bed ranges from a rock-bottom low of $20,000 to more than $100,000. Most single-celled, medium to maximum security jails with all of the basic services and programs run between $50,000 and $80,000 per bed (assuming no double-celling). Renovating can cost as little as several thousand dollars per bed or as much as or even considerably more than new construction, depending on what is done.

Types Of Beds

The types of beds to be built are a major cost consideration. In general, the higher the security level, the higher the initial costs. So, if your county already has maximum security beds and all types of beds are needed, you may wish to focus on medium or minimum security beds and buy more of them.

Staffing

The biggest cost factor is staffing. It is determined by layout and configuration, as well as county goals, philosophies and means of operation. For example, a jail having a staffinmate ratio of 1 to 4 and offering an average annual salary and benefit package of $50,000 would cost $12,500 per bed per year to run (excluding food, utilities, supplies, clothing, etc.). Over 30 years, that cost would total $375,000 per bed, far exceeding the initial cost per bed.

NEEDS ASSESSMENT

To make sure your county is ready to move on to master planning, answer the following questions:

1. Are the Advisory Committee and the Board of Supervisors comfortable with the population projections?

YES NO NOT SURE

2. Do the projections indicate expected populations for all subcategories (pre-sentenced females, mentally ill, etc.)?

YES NO NOT SURE

3. Have **all** pre-sentenced alternatives to incarceration and means of reducing jail time been seriously considered (such as release on own recognizance)? Have the most feasible ones been studied?

YES NO NOT SURE

4. Have **all** sentenced alternatives to incarceration and means of reducing jail time been seriously considered (such as intensive probation)? Have the most feasible ones been studied?

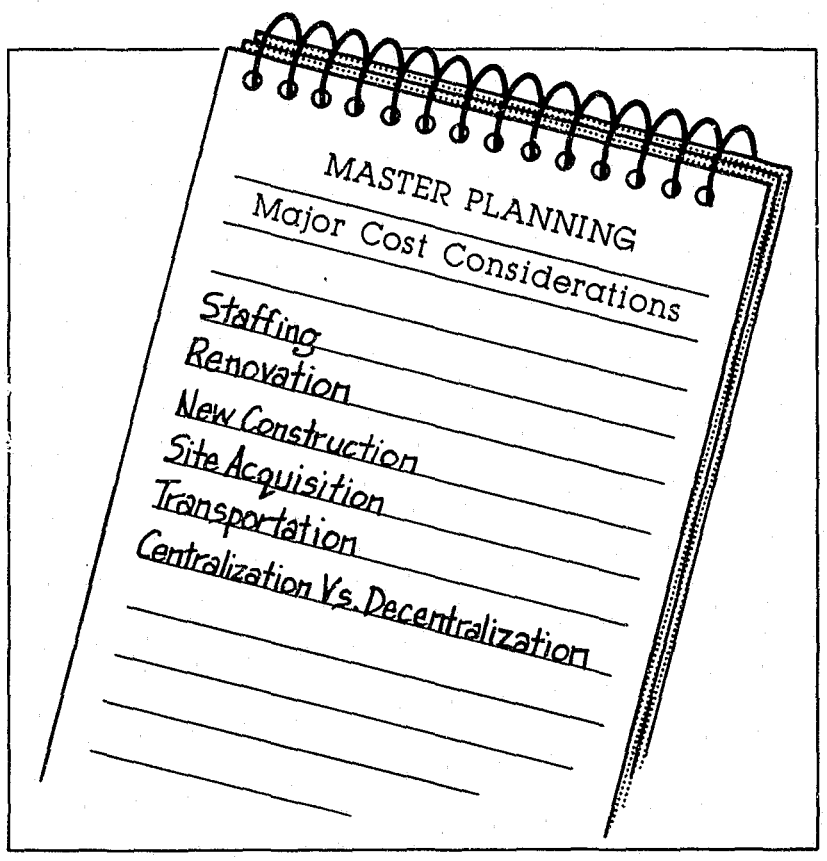
YES NO NOT SURE

5. Have all existing county jails been thoroughly studied regarding their most efficient and effective use for the future.

YES NO NOT SURE

6. Would you bet money that all of the beds identified as needed in the future will indeed be needed? (Your county will be betting on it.)

YES NO NOT SURE



With your needs assessment completed, what do you do with all of the information you've painstakingly gathered?

Most counties face more than one option. Some alternatives are better than others depending upon criteria, which include costs. Master planning involves defining needs on a global level and then exploring alternative ways of meeting them. For instance, should you build courtroom space in a new facility or transport inmates to arraignments at your existing courthouse? This exploration requires creativity and problem-solving abilities. It is time-consuming but not expensive in the overall scheme of things.

At this stage, your county has tremendous control of cost. Make major decisions now on initial costs and life-cycle costs for your jail system and, to the extent possible, your entire justice system.

Types Of Costs

Costs to be studied while developing and analyzing master plan alternatives include:

- Major renovation of existing facility(ies).
- Minor renovation of existing facility(ies).

- New construction for current needs.
- New construction for projected needs.
- Aesthetics (often related to the site location).
- Site location, acquisition and development.
- Utility connections.
- Transportation between courts and pre-sentenced jail(s).
- Transportation between other justice departments and jail(s).
- Staffing for existing facility(ies) "as is."
- Staffing for existing facility(ies) with renovations.
- Staffing for a new facility.
- Efficiencies/inefficiencies of centralizing or decentralizing:

    1. Food preparation
    2. Laundry
    3. Intake/release
    4. Administration
    5. Visiting
    6. Populations (e.g. females, pre-sentenced)

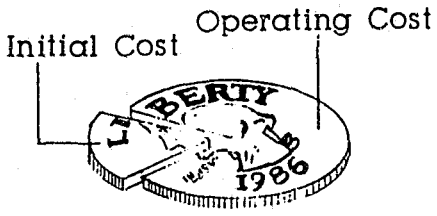
- Space and programs for inebriates.
- Space and programs for mentally ill alleged and convicted offenders.
- Life-cycle implications of all of the above.

Other Criteria

Obviously, cost is not the only consideration. Master plan alternatives also should be evaluated for their ability to satisfy your county's:

- Philosophies.
- Goals and objectives.
- Program requirements.
- Desired means of operations.
- Other financial constraints.
- Other needs and wants, both current and anticipated, for the next 20 or more years.

Life-Cycle Costs



Although this Handbook focuses on initial project costs — largely construction — you should be aware of this general rule of thumb for jails: initial costs total no more than 10 percent of life-cycle costs over a 30-year period. The National Institute of Corrections claims the initial cost percent is even smaller. NIC reports that the operating costs of a jail over 30 years are usually 16 times the cost of construction. With most jails remaining operational far longer than 30 years, initial costs become an even smaller percentage of total costs.

Staffing is the single most important cost factor of a new facility. Because staffing is the primary component of all operational costs, you must give it considerable attention. Staffing also significantly impacts your initial costs because it drives the configuration of your new facility. Make sure you know what your staffing decisions (such as staff-inmate ratio and the number of control rooms) will cost you up front and during the life-cycle of your project.

The 10 percent rule of thumb, however, is not a formula. County X's $100 million jail won't cost exactly $900 million for staffing, utilities, supplies and food over 30 years. During master planning, however, County X can control whether its operational costs will approximate $700 million or $1.1 billion.

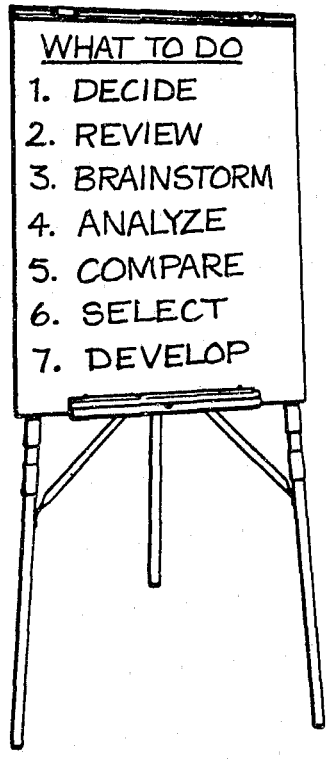
Site Selection, EIRs, Aesthetics

Deciding where your new jail is located also will impact costs other than staffing and transportation. If the site's adjacent residents strongly oppose the location, they may protest through comments on the EIR or a lawsuit, either of which can kill the site and put the project on hold for many months. Such delays often add substantially to construction costs.

Location also can affect what your jail looks like — its aesthetics — and impact costs. For example, a new jail adjacent to a historic courthouse should complement its neighbor in form, materials and/or in details. Even if county administrators are opposed to spending money on looks, the EIR may require visual compatibility. This can drive costs. Even with the most creative architect, jails for which aesthetics are important cost more than buildings with facades that simply combat penetration.

Bearing all of this in mind, other factors may cancel or outweigh the cost of aesthetics such as the cost of transporting inmates between an outlying jail and the downtown courts.

What To Do



Use your Jail Advisory Committee plus consultants to develop and analyze master plan alternatives and to make recommendations to your Board of Supervisors. More specifically, follow these steps:

Step 1. **Decide** who on your Advisory Committee has the time and expertise to plan, analyze and estimate costs. (Refer back to Establishing Your Team, Section II.C.) Consultants experienced and up-to-date in master planning correctional facilities and estimating costs prove very valuable at this point.

Step 2. **Review your Needs Assessment Study,** particularly focusing on how many beds are needed for a given time period (adjusted for alternatives to incarceration) and your existing system's present and future capabilities.

Step 3. **Brainstorm alternative solutions** to an inadequate number of beds. During this exercise, all possibilities, regardless of cost, should be listed without attaching any values. Examples may include:

A new "full service" jail to replace or supplement existing facilities.

A supplemental facility for one or more of the following:

1. Pre-sentenced inmates
2. Sentenced inmates
3. Work-furlough inmates
4. Public inebriates
5. Mentally ill defendants/offenders
6. Women
7. Maximum, medium or minimum security inmates
8. Food services or other support services
9. Classrooms or other programs

Addition to an existing jail for one or more of the purposes listed above.

Renovation to meet current standards, codes, programs, and populations.

In addition to purpose, other features of each alternative must include:

Design bed capacity.

General location (proximity to courts, other jails and justice offices).

Approximate size of your site.

Centralization/decentralization of functions such as laundry, food preparation, intake/release, and infirmary.

Discuss them. Those that appear obviously inappropriate or unrealistic for your county should be eliminated. They do not warrant additional time.

Step 4. **Analyze.** Those alternatives that appear to be workable (usually somewhere between three and seven alternatives) require further study. They must be defined further, addressing an estimate of size, total up-front costs (including construction), estimates of staff (including those required for transportation to jails and courts), annual staffing costs and utility costs.

For each alternative the committee and consultants need to identify: operational efficiency, compatibility with the county's justice system, consistency with county goals and objectives, ability to meet current and future needs, and compliance with applicable codes and standards.

Step 5. **Identify and evaluate sites for each alternative.** Since a part of each alternative has a specific site or site criteria and since all sites have various acquisition and development costs, sites must be identified and then evaluated. For those that meet all set criteria, site-related costs are estimated. To make comparisons, estimates should include purchase price; added construction costs when poor soils are present; landscaping; moving or demolishing existing structures; and staff and visitor parking, surface or in a parking structure.

Step 6. **Select the superior alternative.** Then present your choice and supporting logic to the Board of Supervisors and the Board of Corrections (if State funding is sought) for their concurrence.

Step 7. **Develop your Master Plan.** With the selected alternative in hand, the Committee and consultants should develop a plan for its implementation. When needs exceed financial resources, an incremental master plan should be developed (i.e., building in stages). The detailed master plan includes an estimate of all major initial and operational costs

Step 8. **Prepare the appropriate environmental document.** Your county must comply with the relevant environmental regulations. Unless a project receives a negative declaration, an EIR is required. Generally the EIR is prepared by a consultant who will need input from numerous county personnel. The draft document evaluates the project's impacts on the environment and the surrounding community and the ways these impacts can be mitigated. The EIR must go through an extensive public review and approval process for which you need to budget adequate time. Work on the environmental document should begin as early as possible once a site has been selected.

"This year I'm gonna finish off the basement!"

MASTER PLANNING

To be sure your chosen alternative is the best of the lot, try answering these questions:

1. Does it meet all of your county's major objectives?

YES NO NOT SURE

2. Is it consistent with your county's philosophies?

YES NO NOT SURE

3. Does it meet all or most of your needs, both now and in the distant future (e.g., 15 or 30 years)?

YES NO NOT SURE

4. Is it one of the most efficient ways to provide needed beds now and in the more distant future?

YES NO NOT SURE

5. Does it meet all codes, standards, and agreed-to guidelines?

YES NO NOT SURE

6. Is it the least costly initially? If not, does it give the biggest bang for the buck?

YES NO NOT SURE

7. Is it the least costly to operate per inmate?

YES NO NOT SURE

8. Can you afford the first phase of the alternative you selected?

YES NO NOT SURE

9. Are the cost estimates on which you based your decisions realistic?

YES NO NOT SURE

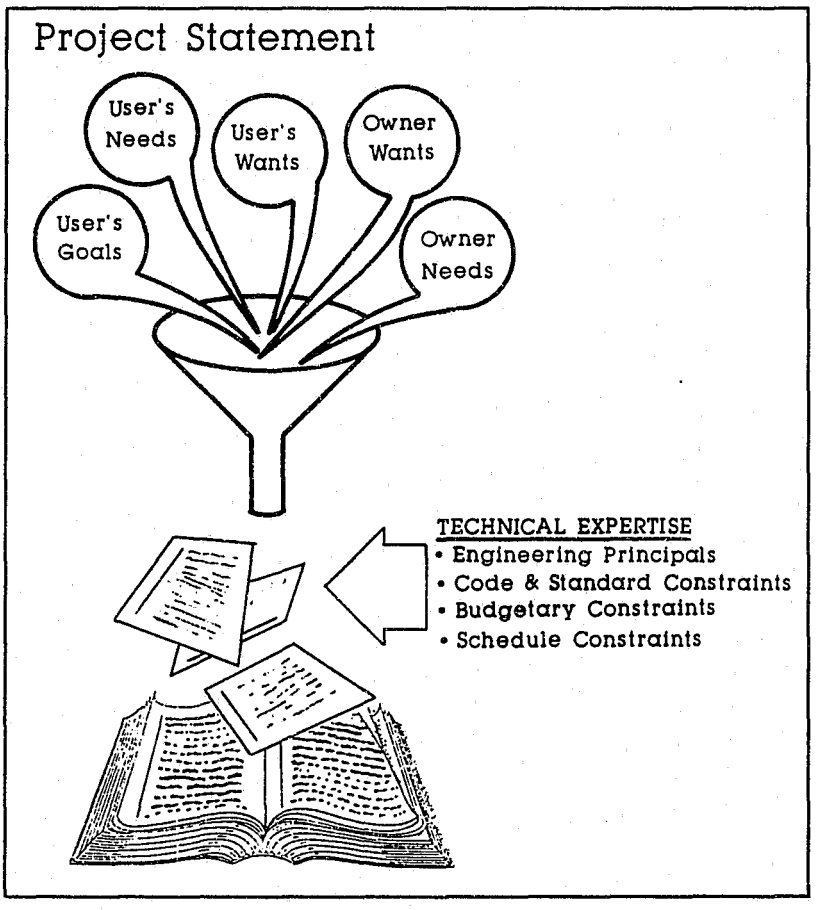
To help ensure that the jail you get meets your county's needs, wants and budget, you need a clear, concise, complete description of what it will be. In this Handbook, this description is called a Project Statement (PS), but it has other names. The State and some counties call such a document a Project Planning Guide. Los Angeles County calls it a Service and Facility Program. **Regardless of what you choose to call it, you need to develop a document that clarifies and defines your project in basic terms before you begin architectural programming or design.**

The Project Statement is a bridge from needs assessment and master planning to architectural programming. It spells out this one specific project, documenting the scope of work, the cost of the project and the schedule to be met.

Definition of the project scope is essential if the programmers are to plan and the architect is to design facilities that owners and users really want and need. The project statement must be accompanied by as accurate an estimate of project costs as possible. The estimate establishes a level of expectation for the quantity, quality and security aspects of the facility. The schedule is the plan that tells you when and how you're going to get where you're going. Later, the project statement will serve as a base point to ensure that the architectural program

and design taking shape follow what the team agreed to from the outset. The project statement represents the starting point from which decisions are made.

Get involved now. Don't let it be done for you and then pay to fix it later. When you walk into your new facility for the first time, you should know if you've achieved what you set out to by thinking back to this point.



Purposes

A Project Statement (PS) is compiled to ensure that a consensus on your project has been reached before the county spends time and money to flesh it out through programming and design. To produce this document, the scope of this project must prove to be something that your Jail Project Team, consultants, Board of Supervisors and the Board of Corrections feel is consistent with what the county can afford initially and over the long run. If it isn't, the scope can be modified or the project divided into phases. Finally, the PS can clarify strategies to get your project built on time and within budget. All of these are defined in the final document, but the exercise you must go through to draft it and have it approved is what makes the project statement particularly valuable as a planning tool.

CONTENTS

Project Scope

The project statement provides your first complete clear definition of project scope, addressing the needs and objectives to be met by this project. The wants to be met, should the budget allow, are easiest to handle later if they are prioritized at this stage.

The document explores how county philosophies will be incorporated in the physical structure. It defines the populations to be served, the numbers of each inmate category to be accommodated. The project statement also identifies the major operational approaches, such as direct or indirect surveillance, and delivery of services to inmates or transportation of inmates to services. It provides the first estimate of project square footage and cost requirements.

Site Criteria

No site yet? Then your project statement should contain site criteria. Based on input from the Jail Project Team and the decision-makers, site criteria should include location/proximity, size, accessibility, compatibility and expandibility. Include site acquisition and development costs since site costs can be the most variable cost component, amounting to more than 10 percent of the budget. When a budget problem is encountered, square footages, materials, hardware and building systems can be changed.

Site acquisition costs are generally fixed — they can run the gamut. Be aware that a sizable portion of funds designated for your facility could end up hidden in the ground. Be aware of costs — both for initial cost and staffing — associated with building configuration, unit/pod capacity, and low-rise versus high-rise design.

Evaluate several sites prior to establishing a budget. First determine the associated costs of the site most likely to be used. Generally, the site with the lowest cost will have the greatest chance of being selected (especially if it is the lowest for both short and long term).

The expense of making each site accessible and buildable should be figured in with its price tag. However, due to the political nature of siting jails, make sure that the budget provides for not less than the site with the second lowest cost.

If you already have a site, the project statement should include a description and assessment of the site. (Has an Environmental Impact Report been developed? See Section III.B, Master Planning, for more information.) Proximity to other jails, courts and justice departments; size; location; access; and known constraints should be included.

Remember to include indirect site costs too — those arising from transportation of inmates between jails and the courts. Assumptions about transportation should be closely examined; locating a jail in close proximity to courts (but not physically connected) does not necessarily reduce transportation costs.

Also, consider the cost in time of police, public defenders and others to work at the site. The report also should evaluate requirements and/or assumptions for site grading, site demolition, soil and sub-soil conditions, and drainage. Availability and cost of existing and future on and off-site (water, sewer, gas, electric, etc.) utilities must be addressed, as should fees and permits.

Outline Program

For the project statement develop a preliminary or outline program. The detail included will vary substantially depending on the size of the project, resources devoted to development of the project statement and available information on what kinds of spaces you plan to build.

The outline program should be consistent with decisions made during master planning. For example, for efficiency your county may have decided that the new jail will provide all laundry services to all county institutions and that intake/release will be centralized at the older main jail. Your brief description, therefore, would include a laundry sized for a much larger population than is to be housed at the new project. The estimate also would contain only minimal intake/release (holding) space. In your project statement, you should assign a space estimate for each component you intend to include in your new facility. Although not all jails have all of following components and some jails have additional components (such as courts), the following list represents spaces typically found in a jail:

Common Jail Components

1. Administrative and Staff Areas
2. Public Areas
3. Visiting
4. Central Control
5. Maintenance/Utility
6. Food Service
7. Laundry
8. Intake/Release
9. Medical
10. Inmate Programs
11. Housing/Dayroom
12. Indoor Exercise
13. Quasi Outdoor Exercise
14. Outdoor Exercise
15. Circulation
16. Future Space
17. Indoor Parking
18. Courtyard
19. Non-jail

The Board of Corrections will provide a range of sizes for the above areas based on other California jails.

Although briefly describing functional components, such as food services, and estimating areas may seem premature, if you have a budget you must stick to, this is a crucial exercise before beginning the programming process.

This definition will help tell you how your needs and wants line up against your budget before you go on to the more time-consuming task of developing an architectural program. If you skip this step, you may find yourself over budget and behind schedule at the end of programming because you cannot afford the building programmed. Reassessment means a giant step backward.

The outline program should contain such basic descriptions as: "The project will contain administrative space which will serve the new facility only. Based on statewide averages for jails of a similar size, administration will encompass approximately 900 net square feet (NSF)." If you've already decided on the exact number of staff and spaces for administration, these details can be listed as well.

In either case, the budget will be based on more information than a simple estimate of the size of the facility. Undoubtedly some of the assumptions in the project statement will change as the project unfolds. At least you will know what assumptions were used to come up with the original budget and what parameters are realistic during programming.

In addition to the above information which will help project construction costs, you also must identify any other costs which you plan to include in your project budget. Perhaps the most important part of preparing any budget is making sure everything is accounted for when you start (10 to 30 percent of your initial project costs will not be construction dollars). In addition to the base construction dollars, you should account for the following costs:

Consulting fees. You need to budget amounts now for all of the consultants you plan to use. If the money is not budgeted for a consultant upfront, it may become difficult to allocate dollar resources for that position later. Although the amount paid for consulting services can vary substantially, depending on the scope of services needed, research into what your county and others have paid should give you a range of values on which to base your budget. Consultants you may want to consider are discussed in more detail in Section II.C, Establishing Your Team.

Testing and inspection services. During construction, work needs to be tested (soils, concrete, welding, etc.) and inspected to ensure it is completed according to your contracts. Budget enough money to ensure you get what you pay for on bid day. A lax inspection program may result in many substitutions by the contractors of lower quality materials and methods.

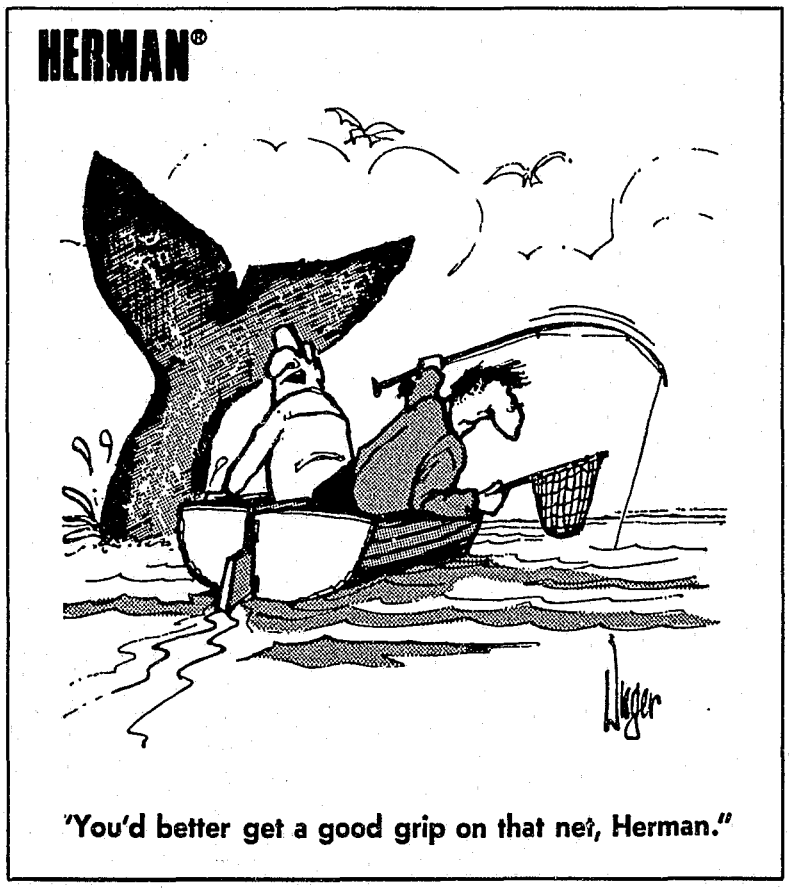
Utility connection fees. Your site analysis should have identified what utilities are available to the site and what costs, if any, will be necessary to tie into the utility system. Negotiating utility connection fees can be very time-consuming and should be done early in the planning process.

Off-site improvements. If you need any road improvements, such as turning lanes, determine whether these costs will be part of your construction budget.

Equipment. Budget for movable and fixed equipment. Clearly define what categories of equipment will be included in your construction costs and what will be procured elsewhere. Confusion about what equipment is being provided by what source is quite common, usually because the issue was not addressed early enough in the project.

Communication Systems. Plan and budget for telephones, intercoms, personal alarms, closed circuit television (CCTV), and other communication systems.

Site acquisition/easements. If your county requires a new site, acreage adjacent to an existing site or easements, these costs must be identified.



"You'd better get a good grip on that net, Herman."

Reproductions. Although not a significant percentage of your entire project budget, a substantial number of reproductions will be necessary for the construction project. Identify that cost now.

Management costs. If you plan to pay for any additional county staff time out of your project budget, you should identify this cost now.

Outline Specifications

Some counties may wish to describe the basic systems, materials and equipment selected in the design-to-cost model to improve the likelihood of a solid cost estimate. Included in the outline specification are the associated building materials for different levels of security. It describes the type of glazing, doors and hardware, furnishings, partitions, floor and ceiling types and finishes for non-security areas and the different levels of security areas.

Outline specifications also should contain all decisions regarding cells. For instance, is the furniture to be movable or floor or wall-mounted? Remember that a $100 change to a cell in a 500-cell jail will change the bottom line by $50,000.

Schedule

Your schedule impacts costs too. A schedule must be realistic and incorporate adequate design review time. A schedule that takes too long can cost money; a schedule which is accelerated can be equally expensive because it places greater demands and constraints on contractors and consultants. Consultants' fees, design errors and contractor overhead are directly related to schedule. Scheduling encompasses much more than the construction process. Your project schedule should detail what you must do to get to construction. Design time, approvals, funding, etc. can be much more difficult than the actual construction process, and time required for these activities is often underestimated. Again, don't shortchange planning and design time or you may regret it later.

It is a fact of life in construction that schedules frequently slip. If your schedule is an especially tight one, it would be smart to get a second opinion to verify that your schedule is feasible. This outside verification should come from an independent expert, not from your construction manager.

Missing a step in the process can add time or reduce time allotted for other activities, thereby increasing cost. These are costs which a cost analyst may not be able to estimate but which can affect your budget substantially.

Bidding strategies have a significant impact on cost and time, so these decisions need to be considered. A complete discussion of fast track, design-build, phased construction, trade contracting, prepurchase, and owner-furnish methods is covered in Section III.H, Construction. If you need your jail in a hurry, make sure you include the acceleration cost in your budget.

DESIGN-TO-COST MODEL

Based on the site, the outline program, the previously addressed objectives and philosophies, and the project schedule, a realistic project budget can now be established. Major life-cycle costs also can be projected. The benefits reaped by making this extra effort before programming include:

- **First and most important,** you now have a budget established on certain parameters. When it becomes necessary to deviate from these parameters, you can make informed decisions relative to the overall goals established in the project statement.
- **Second,** you will have a basis for the cost assumptions being made. If and when there are changes, you will be able to provide accountability for those changes.
- **Third,** you have a system for tracking your project from this point on and for making decisions which fit into your budget.

Preliminary Budgeting

With the information you have assembled on anticipated site costs, outline programming and schedule assumptions, you can now begin the process of establishing your original budget.

Construction costs can consist of cost of sitework, cost of the building and possibly costs of infrastructure off your site to service the new facility. A conceptual estimate should project costs for these items based upon similar projects recently constructed and whatever level of project detail you have at this point in time.

Your outline program should provide a basis for projecting the cost of your building. Values should be assigned for each square foot of space in each category of your outline program to arrive at the cost of the building. Depending on the complexity of your project and the sophistication of your cost projecting, you may simply have one value per square foot for the entire building, such as:

125,000 GSF x $150/GSF = $18.75 million
(construction cost)

Or, you may identify separate unit costs for each space, such as:

Administration	20,000 GSF x $ 95 =	$1,900,000
Public Areas	5,000 GSF x $125 =	625,000
Visiting	18,000 GSF x $140 =	2,520,000
Central Control	800 GSF x $350 =	280,000
	TOTAL	$5,325,000

(NOTE: The above construction costs are examples only. They reflect typical construction costs for a low-rise jail facility at the time this Handbook was prepared.)

How the dollar values for either level of detail are developed will once again be dependent on project complexity, resources expended and level of sophistication. At a sophisticated level, it is possible through computer modeling techniques (based on historical data from other projects) to project costs for a facility down to how many doorknobs will be in the facility. At a medium level of sophistication, the costs may be based on assumptions about what major building methods will be used for structural, security and mechanical systems and what level of quality expectation is desired. At the simplest level, the overall square foot cost of the project may be based on another similar project.

Whatever level of sophistication or detail is used at this point, the cost analysis should be performed by someone with experience in budgeting correctional facilities and at least some expectations for the finished product should be established (will it be a downtown showcase or a bare bones facility hidden away in a corner of the county).

Contingencies And Assumptions Of Cost Model

At some point during the project, it will be necessary to develop back-up figures depicting how the building or site will be constructed to meet the dollar per square foot figures projected in your early budget. This is the next step in continuing the design-to-cost model process. If the cost analysis developed for your project statement is an in-depth study and the parties responsible for developing the project statement budget have experience and the data bases for budgeting correctional facilities, it may be possible to project costs for the building systems which make up the total project at the project statement level. If the project statement budget is based on simple dollars per square foot for the entire building or for the various functional use areas, then determination of costs for building systems should be completed no later than the schematic design phase.

The Value Matrix section of this Handbook describes the project's systems. Developing the costs for each system as early as possible will enable tracking of the project for each system. It will provide budget parameters for designers in every discipline. Use of the building system cost model is absolutely essential for control of the design of each system. All parties involved — the architect, the civil engineer, the structural engineer, the mechanical engineer, the electrical engineer and the security/communications consultant — know what part of the dollar pie their work must come from. Without this control and the communication of budget parameters to these designers, it is impossible to have an end-cost which will meet the budget.

Breaking down a project early on into costs for each building system will not be 100 percent accurate for each system. There must be give and take between the systems to equal the bottom line. The original assumption for the mechanical system may be low. But when you discover that the allotted amount may not be enough, you can do something to compensate.

Either the mechanical system will have to offset the cost, or the estimating contingency may accommodate the increase. If no one knows the parameters of their responsibilities, no one can control the project budget.

Once this base cost is established for construction based on historical costs of other similar facilities, the construction budget should take into account the following:

Estimating contingencies. An early conceptual budget is going to be based on many assumptions; therefore, an estimating contingency ranging from 5 to 20 percent should be included depending on how much is known about the project at this time. This contingency may be built into the unit costs or listed as a line item. (It is usually more useful to list contingency as a separate line item so one knows where it is and what it is.)

Schedule impact. Make assumptions about how fast or slow you plan to build the project and document these assumptions. Suppose your original budget was based on a normal design and construction schedule with construction starting in the spring after the winter rains one year from now, but the project is delayed two years. You are making up for the delays with accelerated design and construction durations with construction starting at the beginning of the rainy season. Your original budget may be affected substantially. Document your original schedule assumptions and be aware when making schedule changes that schedule affects costs. If you use historical cost data from another project, make sure to include escalation cost in the data of your project. Record this assumption.

Construction contingencies. A construction contingency must be included in the budget to cover changes to the construction contract after the award of contracts. Typically, a 5 percent construction contingency is allocated for new construction projects, but a higher percentage is prudent for remodeling work and sometimes for fast-track contracting, depending on the complexity of the project.

Location factor. If you use cost data from another project, make sure to account for any cost differences between that project's and your location — primarily labor costs and availability of materials.

COST CONTROL REPORT

Once all of the pieces are pulled together, develop a cost control report which lists the components identified in the construction budget and other non-construction costs (see example on page 33). This information becomes the baseline against which the remainder of the project will be tracked. When designing the format of your cost control report, you might consider bidding strategies since the cost control report should reflect how you intend to "buy" your project. Pre-

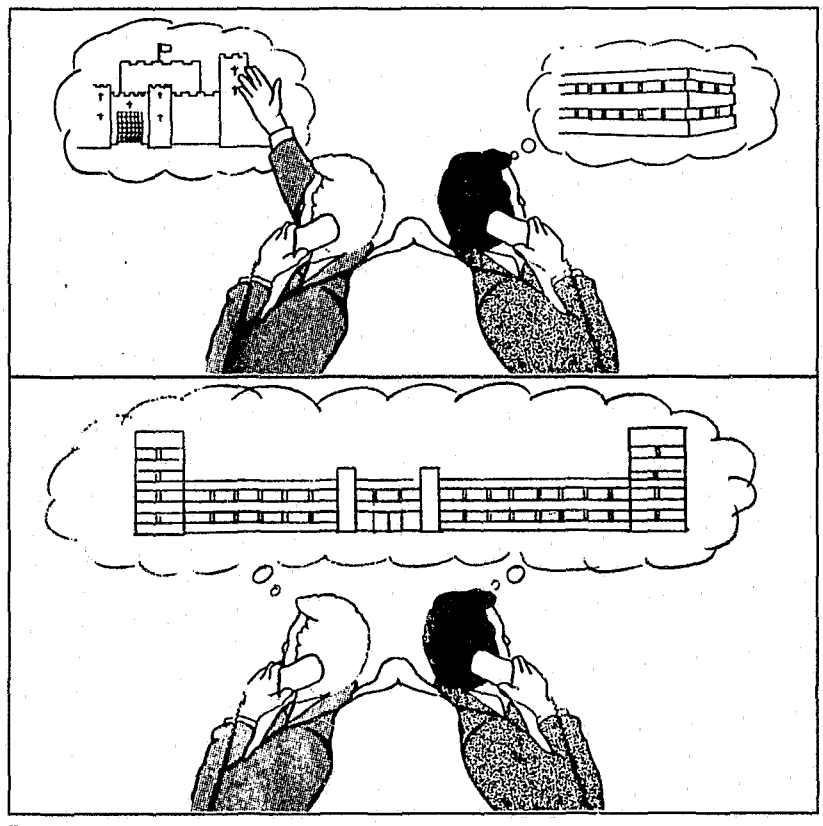
purchasing equipment and bid packages should be identifiable line items or subtotals within the report. (See Section III.H, Construction, for more details.)

As the design progresses, current estimates will be reported in a similar fashion in order to identify variances from the baseline. Variances should then undergo value analysis.

DEVELOPING A PROJECT STATEMENT

Unless your county has staff trained in planning, estimating the cost of, scheduling and building correctional facilities, a consulting firm should produce the project statement. Of course, the Jail Project Team must be closely involved in determining the project scope, outline program, site, and budget and in reviewing all parts of the document as it develops, including alternative building systems and costs.

The Board of Supervisors must approve the entire document — thereby buying into the project — once it has been accepted by the Jail Project Team. Consensus is essential before moving to the next step, architectural programming. If your county cannot reach a consensus, the project statement should be revised. Changes made now are easier to implement and more cost efficient.



Reaching a consensus

In gathering material for the project statement, your staff and consultants should use the following methods:

- Extracting and expanding information from the needs assessment study and master plan.
- Listing assumptions that drive space requirements.
- Interviewing all decision-makers, including the Board of Supervisors.
- Interviewing and/or issuing questionnaires to those affected by the project, such as jail managers and staff.
- Visiting other jails to identify features you like and dislike.
- Tapping space and cost resources/historical data such as that compiled by the Board of Corrections.
- Brainstorming with the committee.

PROJECT STATEMENT

(All answers must be "Yes" before you move on.)

1. Has the project been defined clearly?

YES NO NOT SURE

2. Has a site been selected or site criteria been specified?

YES NO NOT SURE

3. Has an outline program been developed?

YES NO NOT SURE

4. Has a design-to-cost model been developed?

YES NO NOT SURE

5. Has an estimate of all first costs that is compatible with the budget been completed?

YES NO NOT SURE

6. Have you completed an estimate for life-cycle cost which indicates that your county can afford to operate the new facility?

YES NO NOT SURE

7. Have all items to be covered by your project budget been included in that budget?

YES NO NOT SURE

8. Has a project schedule been developed?

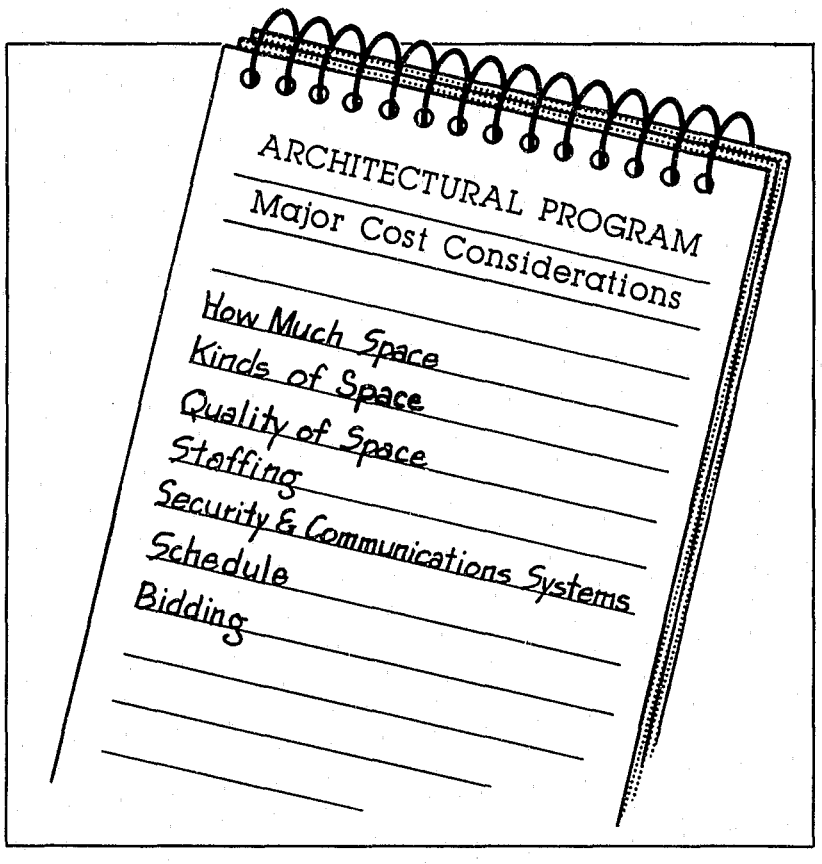
YES NO NOT SURE

9. Have items 1 through 8 been approved by the Jail Project Team?

YES NO NOT SURE

10. Have items 1 through 8 been approved by the Board of Supervisors?

YES NO NOT SURE



Your project statement provided an overview of who your jail is for, how it will be operated, and, as a result, roughly what types and quantities of space are required. Its space estimate was based on some rules of thumb, historical data, design standards for similar projects and "guesstimates."

The architectural program forms a bridge between the Project Statement and your design. In a clear, well-organized package, it provides the bulk of the information that the architect needs to design.

The program communicates to the county and the architect:

Activities and functions that need to be accommodated in your new facility.

How your jail will operate, both as a system and within its individual parts.

Who the users are, including all staff by shift and position, and categories of inmates by the number that can be accommodated.

Fire and life safety provisions.

Every space (functional use area) needed, with its size, quantity, proximity to other areas, special features, equipment, furnishings, and ambient conditions (acoustics, heating/ventilating/air conditioning, lighting). These spaces include circulation, mechanical systems and other non-usable areas.

The type of security and communications systems to be integrated throughout your facility.

In addition, the program document summarizes information and decisions from previous documents regarding your project's mission, objectives, and philosophies. (Also see Chapter 5.2 of the Corrections Planning Handbooks regarding Correctional Facility Programming.)

How To Make It Work

Because budget balancing must occur while developing your architectural program, it is important to use professionals. Money spent on professional programming will be some of the best spent money on your project.

Hire programmers that are well versed in calculating space needs and tightening and loosening the collective belt. Keep your cost analyst involved. Engineers, architects and corrections planners consulted must be familiar with the attributes and costs of alternative building systems, construction types and major pieces of equipment.

Get your county people involved. Jail administrators and staff at all levels will need to work closely with programmers to develop a program that truly supports their operational/functional requirements. Food service, maintenance, intake and medical staff should be involved in programming their areas. (Refer to the Board of Corrections guidelines for food service and medical services.) Set up a process that keeps your Jail Project Team on top of the programming and budget. To be incorporated in the program, recommendations to change space features or systems to balance the budget require a team consensus.

Data sheets from an Architectural Program

B.03 - INTAKE AND RELEASE
Temporary Holding

AREA REQUIREMENT

LOCATION: Zone 1 NUMBER OF SIMILAR UNITS: 1

CODE	POSITION OR ACTIVITY CTR	TYPE OF ENCL	UNIT AREA	QUAN-TITY	NET AREA	REMARKS
	Holding Cell	F	50	14	700	1
	Safety Cell	F	50	2	100	2
	Secure Waiting	F	120	2	240	3
	Secure Waiting	F	300	1	300	4
TEMPORARY HOLDING			Total NSF:		1,340	

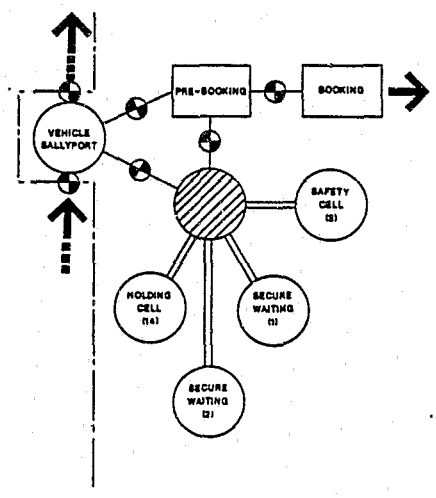
Remarks:

1. Individual cell with toilet/lav combination (stainless); modesty screen.
2. Individual cell; no furnishings; floor drain.
3. Transport waiting - short term; up to 5 inmates seated; 1 toilet/lav combination; modesty screen.
4. Transport waiting - short term; up to 30 inmates seated; 1-2 toilet/lav combinations, per code; modesty screen.

B.03 - INTAKE AND RELEASE
Temporary Holding

FUNCTIONAL RELATIONSHIP DIAGRAM

LOCATION: Zone 1

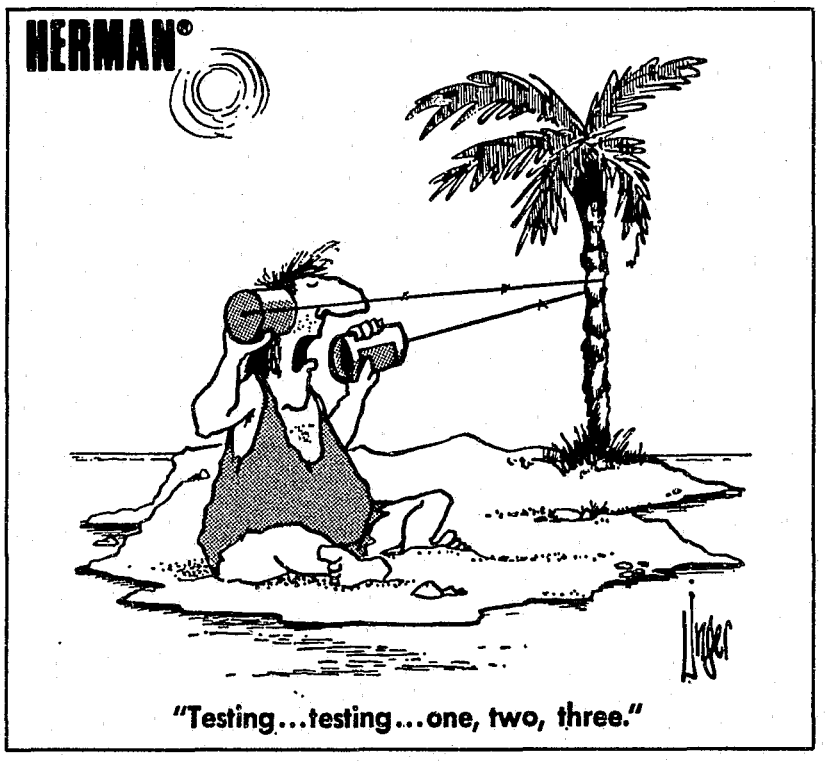


When members cannot agree, the controversial items should be referred to your Board of Supervisors for a decision. When the team does agree, recommendations should be sent to the Board for approval. The entire program will be reviewed and approved by both bodies.

Make sure that recommended changes do not violate Titles 15 or 24 or other regulations and codes. Consult with the Board of Corrections. Its staff can review your program to help ensure compliance.

When it comes to equipment and building systems — including communications systems, security hardware, alarms, food delivery systems, and glazing materials — **BE CAREFUL ABOUT BEING A GUINEA PIG!** Don't let your project be driven by new technology. Make sure that the technology you select is tried and true. If you do decide to experiment with new technology, be sure your vendor contracts provide you with a fallback.

Never assume everything that vendors say is true. Ask about and, if possible, visit jails that have used materials, hardware, etc. that you are not familiar with, particularly in high tech areas. Ask about problems, maintenance, reliability, safety and security, and how well these systems meet their functions. Remember, a less expensive system may be more expensive in the long run if its life-cycle is short or maintenance expensive.



For example, a perimeter security system was selected for a state prison, partially because it was relatively inexpensive. Later, the corrections department found out that its maintenance charges ran close to $1 million a year! This negated the savings in a hurry.

Cost Management And Programming

During programming, previous assumptions about the types and sizes of spaces to be renovated or constructed will be verified or found inaccurate. With thorough planning, previous budget projections will still be in line with current spaces as they are defined.

Remember, if an expensive space such as a medical area increases by 1,000 square feet and a less expensive space such as storage decreases by the same amount, you may wind up with the same size building, but the budget will still be affected. Because the medical area may cost 400 percent more per square foot than the storage area, you must reconcile your plans before moving on to the next step.

You should continuously compare previously projected areas with those being programmed. The programming process is not complete from a cost control perspective until the budget is verified or until the decision-makers acknowledge that including all desired program space will change the cost. This is a great point at which to make trade-offs in your priorities or to reassess what needs will be met at this point.

AREA DESCRIPTION	PROGRAM NSF	DESIGN NSF	%NET INC. OR DEC. PROGRAM:DESIGN	
INMATE TOILET	0.0	.0	0%	**
PARTS STORAGE	160.0	267.8	67%	>
STAFF LOCKERS	30.0	6.0	-80%	<
STAFF TOILET	0.0	.0	0%	**
SUPERVISOR, INMATE CLERK	135.0	134.0	-1%	

Changing the building size will have the most direct impact on the budget. Should it become necessary to reduce the building's cost per square foot later in the process, the quality of the building will diminish rapidly without having as great an impact on the overall budget. Hard decisions must be confronted as early as possible.

Update the cost report during programming to indicate the clearer definition of facility space requirements now taking shape. If you've received any additional information on other aspects of the project, incorporate it in the cost control report update.

PROGRAMMING

(All answers should be "Yes" before proceeding to the next step.)

1. Is the budget balanced?

YES NO NOT SURE

2. What are the functions, activities, users, equipment, etc., and will they be adequately provided for as addressed in the program?

YES NO NOT SURE

3. Does the program provide adequate beds for each inmate category?

YES NO NOT SURE

4. If compromises were made to balance the budget, did the Advisory Committee and the Board of Supervisors agree with the changes?

YES NO NOT SURE

5. Is the program consistent with the Master Plan and Project Statement?

YES NO NOT SURE

6. Do all building systems, construction types and major pieces of equipment meet your needs? Are they relatively cost efficient?

YES NO NOT SURE

7. Has the program been reviewed by the Board of Corrections for compliance with applicable codes and standards?

YES NO NOT SURE

8. Does the program effectively communicate building requirements to the architect?

YES NO NOT SURE

Schematic design involves taking the conceptual ideas developed to date and finally putting them in drawing form. Site plans, floor plans, elevations and major building sections are developed. Drawings can be confusing to the layperson; use of three-dimensional presentation models help participants other than architects understand the project. These models also allow you to explore visibility and other issues.

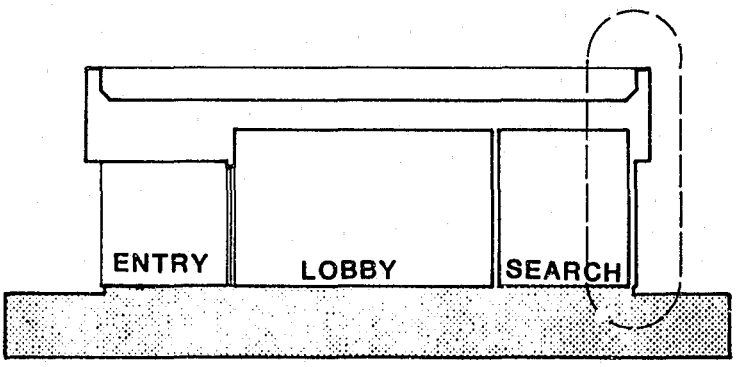
During schematic design, three major considerations arise which will affect the cost of your project:

The size of the building.

The shape of the building.

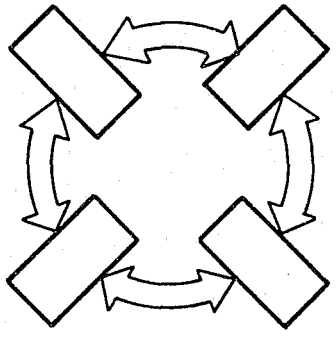
What the building is made of.

If the building design is larger than originally programmed, an irregular complex shape and constructed of expensive building systems, the cost of your project could double at this point. Once the size, shape and primary building systems are established, a 25 percent increase in budget would be substantial. Remember, the further into a project you get, the less impact you have on its cost!



BUILDING SECTION

Size



Your jail will equal the sum of its parts, right? Wrong. No matter how good your designer is, no matter what layout or building type is selected, a lot of space will be taken up with nonfunctional items such as corridors within components (e.g. within your infirmary); corridors connecting components (e.g. housing to recreation); staircases and elevators; mechanical, electrical, heating/ventilating/air conditioning systems; walls; and structural members, such as columns. (Note: Some programmers also include janitor closets, restrooms and lobbies as nonfunctional space.) This space has been estimated in the PS and the architectural program.

In a jail, nonfunctional space can consume 40 percent or more of the total area. If your jail contains 100,000 square feet of usable space (net square feet), its total area (gross square feet) could be 140,000. If your average cost per square foot is $100, your county is paying $4 million for nonfunctional space. Considering the total construction cost of $14 million, $4 million is quite a big chunk. What would you prefer to spend that money on?

Obviously you can't recoup all of that money because nonusable space is as unavoidable as death and taxes. But you can help limit the amount of that space. One proven method is using campus plans that put most inter-component circulation space outdoors. Another approach is to build two-tier housing modules, rather than one, where much circulation will take place in one central dayroom rather than in networks of corridors. ,

Refer to Corrections Planning Handbooks, "Handbook Four: Determining the Feasibility of Developing a Correctional Facility," Chapter 4.1, for more complete explanations of net and gross square feet and efficiency factors. (See Section VI, References.)

Shape

The most material-efficient means of enclosing space is a circle. But since constructing round buildings is a contractor's nightmare, a square or a fat rectangle is the most economical means of enclosing space. Very large squares and rectangles rarely allow natural light into all spaces where required. For

example, strategically placed skylights in dayrooms can offer sufficient light for cells too. So, moderately large squares, rectangles, or cross-shapes are often the most efficient and workable shapes for jails. Of course, the size and shape of your site and whether your jail will be connected to an existing building also will influence its shape.

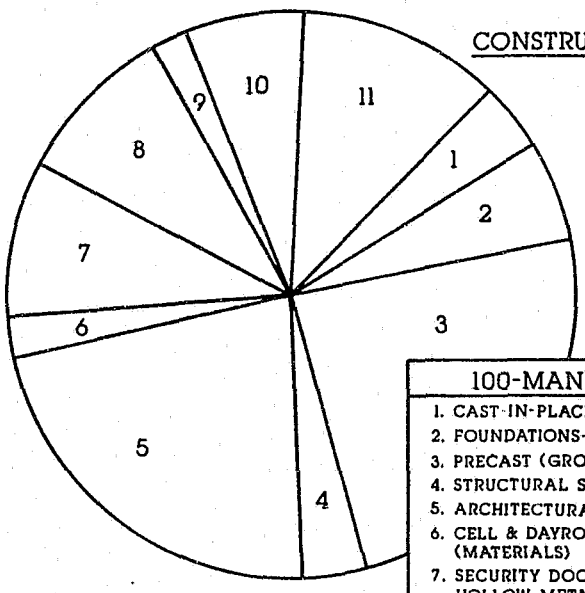
To economize, keep your configuration simple. Line of sight is extremely important in correctional facilities. Complicated shapes generally translate to more wall surface, and every corner and unusual form drive up cost. Also, consider your building height. Meet codes, but avoid unnecessary ceiling heights. You should recognize, though, that two-tiered housing modules are generally economical. They provide dayrooms that are one-and-one-half to two stories high.

Building Systems

Primary building systems should be finalized during schematic design. Because of the specialized nature of designing a secure environment, selecting these systems has a greater impact on cost than when selecting them for an office building. Items such as interior walls, windows, doors, plumbing fixtures and communication systems generally cost more in a facility with strict security needs.

(See the outline of building systems in the Major Cost Component Value Matrix at the end of this Handbook for a more thorough discussion of these systems.)

CONSTRUCTION COST BREAKDOWN



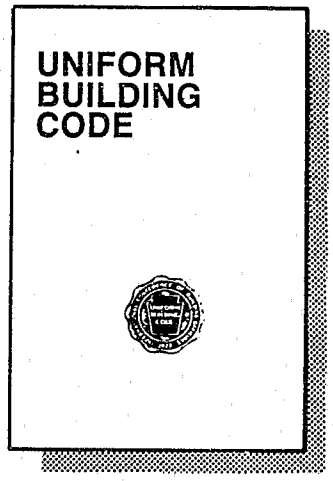
100-MAN HOUSING MODULE	
1. CAST-IN-PLACE CONCRETE	3.8%
2. FOUNDATIONS-CONCRETE	5.8%
3. PRECAST (GROUT & REBAR)	23.9%
4. STRUCTURAL STEEL	3.6%
5. ARCHITECTURAL FINISHES	22.3%
6. CELL & DAYROOM EQUIPMENT (MATERIALS)	2.2%
7. SECURITY DOORS, WINDOWS, HOLLOW METAL (MATERIAL)	8.9%
8. PLUMBING	9.1%
9. SECURITY TOILET UNITS-MATERIAL	2.2%
10. HVAC	6.8%
11. ELECTRICAL	11.4%

When selecting materials to meet your security needs, make sure that these materials are to be used in the secure areas only. The costs of items such as doors and toilet fixtures for high security areas versus those for non-secure areas can vary by as much as 500 percent. Selection of components appropriate to each particular use area is one of the best ways to save money during schematic design; failure to do so is one of the most common ways to drive up costs. But don't go overboard. Too many types of materials increase labor costs.

Local Building Methods

If you hire an outside design firm, make sure the architects are aware of local building practices when they select the construction methods of the structure and wall systems. If you haven't seen any other buildings in your area constructed using the same methods as those chosen by your architect, chances are you will pay more for your building than necessary. You also may inadvertently be excluding local construction firms from your project.

Building Codes



Although provisions to meet applicable building codes should have been considered prior to schematic design, this is when code considerations prove most important. A thorough code analysis of your project is mandatory because many design features affecting cost will be determined by interpretation of building codes.

You may wish to go through the project with the local building inspector and fire marshal. This exercise is valuable in helping them become familiar with your project at an early stage. Consultation with the State Fire Marshal representative assigned to the Board of Corrections is required and will be very useful. Another set of trained eyes can look for code requirements not already addressed — preferable to being confronted later in the project with expensive redesign or finding solutions to a problem which could have been avoided.

The building inspector and/or fire marshal also can help spot overly conservative interpretations of the code. Because the building code is a complicated document subject to interpretation, the easiest solution for a designer, in terms of time and liability, is to choose the most conservative and simple approach to applying the code to your project. Oftentimes, an equally safe but much less expensive solution can be reached with more research and thoughtfulness in applying the codes to a project.

Fire and life safety requirements of the code affect jail design and cost considerably because correctional facilities involve limiting an inmate's ability to quickly exit from a building. Remember, however, consideration also should be given to all areas within the building that are not locked. Do not assume that stringent code requirements for locked portions of the building should apply to areas such as administration, maintenance, kitchens and laundries. In some cases,

particularly for very small jails, having separate areas of the building with different building systems can increase costs.

Schedule And Bidding Strategies

At schematic design, it is critical to revisit the scheduling assumptions made earlier. Also essential is refining or developing the contracting strategies you intend to use. Drawings and specifications will be developed based on your bidding strategy. For instance, a lump sum general contract requires one set of bid documents, whereas a phased or sub-contracted project requires more than one set. This strategy should be finalized before proceeding into design development. Changing strategies once the drawings and specifications are being prepared may require additional work by the architect. (See Section III.H, Construction, for a description of alternative bidding strategies.)

Cost Analysis/ Decision-Making

At this point, the building components as drawn need to be quantified and costs must be attached in order to verify the budget. Once again, check the sizes of the spaces within the building against previous projections. Also check to see if the actual quantities and types of materials match the cost of previous projections. (Depending on the level of detail and sophistication applied to cost projections in earlier phases, quantities of materials may or may not have been projected. Doing so now is a must.)

Any differences between previous cost estimates and those conducted during schematics should be easy to detect and trace if your cost control report has been kept up to date. Did your building get bigger? Did the quantities of materials required to enclose the building increase because of a complex configuration or additional stories? Were the assumptions about or qualities of materials different? Has additional equipment been included or was any other change of scope made?

After reviewing these questions, reasons for cost changes should become apparent. Once again, decisions about where to put the money must be made. Only by being involved in the project and knowing where the dollars are can the project be brought back in line without losing something you really want to include.

SCHEMATIC DESIGN

1. Do you understand how the building and site will function from the drawings and models presented?

YES NO NOT SURE

2. If this was your last chance to modify the plans, would you approve them? (As the owner, you can always change the plans, but after schematic design each change costs more time and probably more money.)

YES NO NOT SURE

3. Has the shape of the building been defined in terms of wall heights, room heights, exterior elevations?

YES NO NOT SURE

4. Does the size of the building match the program? (Remember, less of an inexpensive space does not balance with more of an expensive space.)

YES NO NOT SURE

5. Have the materials been selected for the structure, interior and exterior walls (at this point primarily based on security)?

YES NO NOT SURE

6. Has your construction manager, value engineer, cost analyst or all three reviewed your selected materials for consistency with the budget and local building methods?

YES NO NOT SURE

7. Have security door and toilet types been selected?

YES NO NOT SURE

8. Has the heating, ventilating and air conditioning system been defined in terms of concept? How about the water, sewage, power and telephone systems? (Which spaces have what requirements? For instance, is it a central boiler or numerous roof top units?)

YES NO NOT SURE

9. Has a building code review been completed?

YES NO NOT SURE

10. Have the variances between previous and current assumptions been noted and the cost impact documented?

YES NO NOT SURE

11. Is the project, as specified to date, within budget?

YES NO NOT SURE

12. Has the cost control report been updated and variances documented?

YES NO NOT SURE

13. Have you determined the cost of each building system and communicated these parameters to the designers of the respective systems?

YES NO NOT SURE

14. Has your project schedule been updated?

YES NO NOT SURE

15. Have you finalized your bidding strategies?

YES NO NOT SURE

One step closer to the final product, design development is just as it sounds: further development of the schematic designs. By now, project designs should be fully developed except for the details of how the pieces fit together. Loose schematic sketches are tightened up to clarify how all spaces work and, more definitively, how materials and systems will work room by room. This tightening is important from a cost control perspective because it prevents the project from advancing too far without letting you know what total cost impact your decisions are having on the big picture.

At the completion of design development you should know how each space within your facility responds to your anticipated use of that space. Take the time, at this point, to have your architect and construction manager (if onboard) explain the building to you.

During previous steps, you and your team should have been establishing criteria and making global assumptions about solutions. Design development is the time when specific decisions should be made.

If you are concerned about cost, be aware of the false assumption that the "best" solution is always the most expensive. When a Chevrolet will cost less up-front and over time,

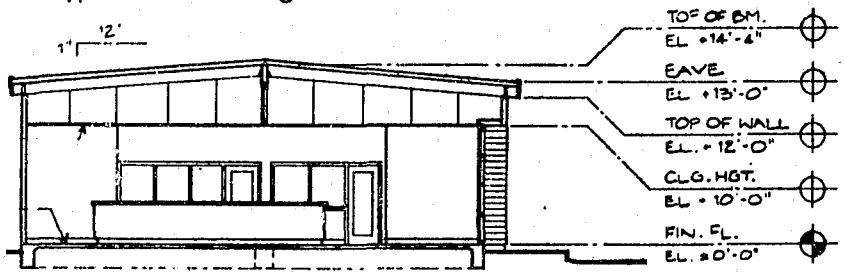
why choose a Rolls Royce which costs more up-front and over time both in interest and maintenance? You'll note that very few public employees drive county or state-owned Rolls.

Finalization Of Floor Plans, Elevations, Sections

Delineation of the project during design development should finalize floor plans, elevations and sections throughout the building. Typical wall construction should be identified.

From a layman's perspective, there is little difference between completed design development drawings and completed construction drawings. The design development plans indicate major dimensions and are drawn to scale for other smaller spaces. They show locations of structural elements and mechanical chases, those spaces that allow access to the systems. The completed construction drawings will display all dimensions and reference all details, finishes, doors and other information necessary to construct the project.

Completed design development drawings cover elevations of the building with wall heights, materials and locations and types of windows indicated. The building sections indicate how the interior parts of the building work in the vertical dimension, including delineation of how mechanical and electrical systems interface with structural elements and ceilings. More detailed sections show all of the components within each of the typical walls being used.



BUILDING SECTION

It is important for you to "walk through" each room, to see if it works operationally. Note the locations of doors and of any glazing for visibility into adjacent spaces. After this stage, the reconfiguration of rooms and walls will have a substantial impact on the A/E and consultants as each of the separate disciplines will be working out details so they all fit together. Last-minute changes oftentimes detract from proper coordination of the drawings. These changes translate to change orders during construction which are never cheap.

Finalization Of Security Decisions

Similar to your review of each space for function, a security review helps you verify that the design meets your security needs. You should be familiar with the materials being used for the floor, walls and ceiling of each room. You should know what kind of doors you're using for each room, what kind of window frames and glazing, what kind of light fixtures. Do you need a speaker in every room; if so, should each be two-way?

Have communication needs been met? Does it all work together as a well orchestrated and integrated security and communications system?

Finalization Of Finishes

Once again, go through each room to see if you have carpeting where you want it and simple concrete where it will do the job. The same applies to walls and ceilings — should they be ceramic tile, bare concrete or painted?

Finalization Of Plumbing, Mechanical And Electrical Systems

Oftentimes these building systems are ignored and left to the engineers because of their more technical nature. Because these items represent approximately one-third of the first cost of your facility and have the potential to strongly influence life-cycle costs, the job is only two-thirds complete if you and your architect do not understand the implications of the engineers' assumptions. At this point, the engineers have determined the needs for each space and developed a means of meeting these needs. For heating and air conditioning the mechanical engineer should know the size(s) of the heating and cooling equipment. (Air conditioning is measured in tons, heating in BTUs per hour.) Engineers base their designs on known information for each room, such as:

- How many people will use each space (people give off heat).
- What kinds of light fixtures or other heat-generating equipment will be in each room.
- How much exterior wall, window and roof area is included.

The architect is responsible for making sure each engineering discipline has and is using all of the needed information. Ask your architect how the mechanical system was sized. Express your expectation that it was done in an accurate manner — oftentimes engineers use "rule of thumb" design for sizing their systems. As with any rule of thumb design method, a conservative assumption is used to be "safe." This approach saves the engineer money in design time, but often you pay for a system that was oversized just to be safe. Your first and future operating costs can go up.

The same applies to electrical, lighting, and communications design. Your consultant should base lighting design on known needs for each room. "Rule of thumb" selection and spacing of lighting fixtures will cost more to install and operate.

Ask what diversity factor is being used in design of electrical equipment. Diversity is a calculation in which the engineer assumes 100 percent or less of all outlets, lights, etc. will be used simultaneously. This is a conservative approach, whether or not it is realistic. It is more costly and some believe this added expense is really an insurance policy for the electrical designer rather than a realistic benefit to you.

The Budget

By now you've made a lot of decisions. They could affect the cost of your new facility by as much as 50 percent if you chose all of the most expensive solutions. Do your selections reflect previous assumptions? Were you aware, during the process, what decisions the design team was making for you? When making decisions, were you thinking of your previous assumptions and were your architects and construction managers informing you of the cost impact of your decisions?

Ideally each decision and its impact should have been tracked throughout the process. If not, verify the budget now by completing an estimate before proceeding. Figure out where you stand. Make necessary decisions now to keep on track through the remainder of your project.

DESIGN DEVELOPMENT

1. Do you understand each room of your facility in terms of function, security, finishes and mechanical/electrical design?

YES NO NOT SURE

2. Do you know the cost impact of decisions made during this process?

YES NO NOT SURE

3. Have you updated the cost control report?

YES NO NOT SURE

4. Have you checked your budget for each building system against the schematic design budget and resolved any variances with the parties responsible for each system?

YES NO NOT SURE

5. Have the variances among previous and current outline specifications been noted and the cost impact documented?

YES NO NOT SURE

6. If you told your design team to complete the drawings while you went on vacation, based on the decisions confirmed, do you think you'd be satisfied with the final product upon your return?

YES NO NOT SURE

7. Does it meet needs identified in the project statement and requirements identified in the program?

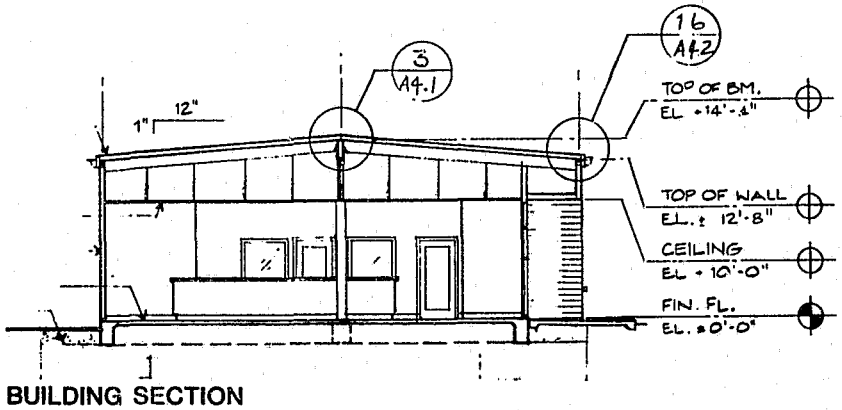
YES NO NOT SURE

8. Are designs and specifications being developed according to your bidding strategy?

YES NO NOT SURE

At last, the final phase is completing the drawings. If all has gone well, earlier decisions simply need to be executed and all of the details worked out to make the documents into something on which the contractor can bid and from which the project can be built. But wait! Don't shortchange this step. Most important in finalizing the drawings is making certain they are complete and understandable and that they make sense from a constructability perspective.

There shouldn't be any surprises or major cost changes during this last design effort, but careful review is warranted.



BUILDING SECTION

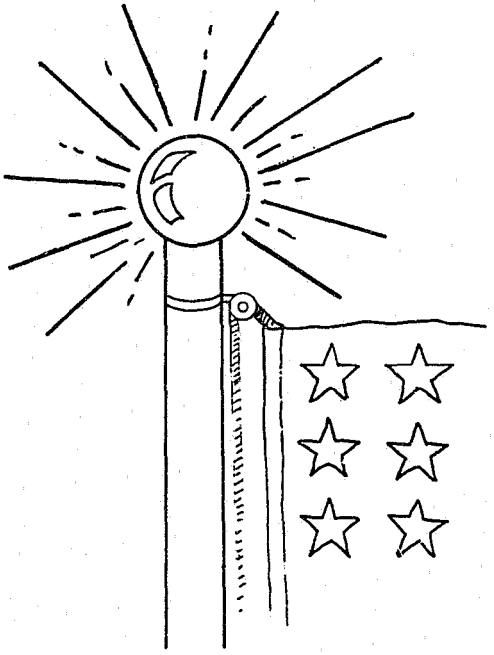
Track Earlier Decisions; Perform Constructability Review

Make sure earlier decisions are carried out during this final phase. Also, make sure that the drafting team preparing details and specifications does not make achieving your goals an overly complicated task. You should build time into the process to ensure the drawings do not go out to bid until they are correct.

The project architect should be overseeing his team. Your construction management team should be actively participating in the process. Also, user representatives should review the plans to make certain that the facility can be operated as intended.

The architect's final effort to complete the drawings is crucial in controlling costs. All too often the entire team is worn down by the numerous large problems which had to be solved to reach this point of crucial final review. But if all of the details and specifications contain difficult methods, if materials specified are the most expensive available, the project cost can easily be affected by 20 percent without any noticeable difference in the appearance or function of your building. Consider the cost impact if the drawing of one detail costs twice as much to implement as it should and that detail occurs in hundreds of places throughout the project.

Because those who will more than likely be producing the details on your drawings are your architect's junior staff under the supervision of one or two more experienced architects, it is essential that the drawings be thoroughly reviewed for constructability by both the architect's senior staff and at least one other party such as your construction manager.



This is especially important when the architect's firm is organized into design and production teams or when a joint venture firm is using different offices for design and technical production. Communication of design intent and budget considerations to all working on your project is essential.

Specifically, go through the details of the drawings and specifications as they are prepared and when they are finished to make sure products specified are not unnecessarily gold-plated.

If you think "gold plating" is just a figure of speech, check the specifications for the ball at the top of your flag pole. The ball may, in fact, be gold-plated. Do you think anyone will ever notice or compliment you on your gold-plated ball 70 feet in the air? This does happen. Hopefully, the press won't find it before you do.

On a more mundane level, be aware that most architectural firms have a standard set of specifications on their word processor. Your specifications must be checked to see if they are appropriate for your job. The following are a few examples of what may happen:

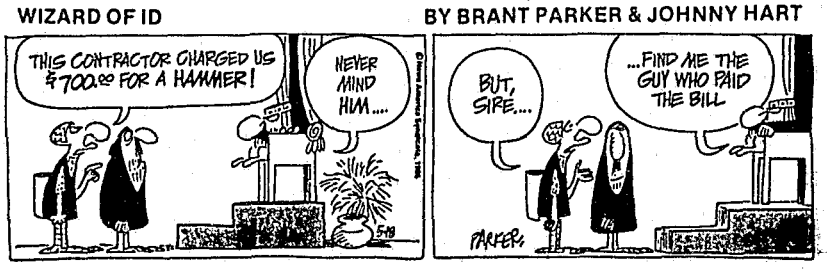
Avoid Learning The Hard Way

The last job your architect's mechanical consultant completed used high-pressure steam piping. Your job is low-pressure steam. The valves specified for your job should be cast iron, but the specifications, lifted from the last job, call for brass. Although this may seem like a minute detail, the brass valves each cost $400 more than the cast-iron. You need 100 of them. If unchanged, when the bids come in you will have spent $40,000 for nothing. After the contractor gets the job he may offer you a $20,000 credit for using the cast iron valves. Such a deal. If you are fortunate enough to have the contractor catch this, you may get a $20,000 credit, but the contractor will be paying for his new boat with the other $20,000.

Another frustrating example is a specification which requires one-half inch of fire coating when code calls for one inch. If the discrepancy isn't caught in review, it can delay your project by a month or more and cost tens of thousands of dollars to remedy.

Check how the specifications affect the qualifications required for each piece of work. Specifications often will require a minimum amount of contractor experience for installation of specialty items. This is especially true with security items. You want someone with experience installing your specialty work. But make sure an item like standard cyclone fencing is not included with the special security systems requiring 25 years of experience. Installing security systems is far more complicated than installing a fence. If the two are grouped — and it has happened — you may prevent all of the local fence contractors from bidding. In fact, you may eliminate nationwide all but one or two specialty contractors who know they are not competing with anyone and will therefore charge you twice what the fence is worth and still use the same local subcontractor at the real price.

Check the specifications for the appropriateness of each area. The cost can vary by 200 or 300 percent. Perhaps you want top-of-the-line material in the lobby. Is the same material being used in storage areas where appearance doesn't matter? These are things to look for.



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As a general rule, a change order that increases your cost is usually negotiated at retail value, while one that's bound to reduce your cost is offered at wholesale value. If forced to use change orders, make sure your negotiator is aware of this.

Review For Completeness And Coordination

It has been said that the number of change orders you experience is directly proportional to the amount of time spent in constructability review.

Construction industry horror stories abound about change orders and claims that arise during the construction phase of projects. Most of these problems and additional costs grow out of incomplete or uncoordinated drawings.

The best change order prevention plan is to make certain your experts take the time to complete and check the drawings.

The worst coordination problems arise when four or five different parties produce the drawings and specifications in different offices, possibly in different cities. Most architectural firms hire subconsultants to design civil, structural, mechanical and electrical systems. Additional consultants often are brought in for security, special equipment for kitchens, and communications. Even if your architect has some of these disciplines within his/her office, interdisciplinary communication still must, but often doesn't, take place.

Ensuring that all of the pieces fit together is the architect's ultimate responsibility. Because of the technical aspects involved and the volume of information which must come together in the last month of the drawing process, this is a very difficult challenge.

For example, imagine if the duct work for the heating system does not fit between the ceiling and the beams of the structure. Now what? It is advisable to have at least one party, such as your construction manager or county engineer, review the drawings in addition to the architect.

So, remember, when the drawings are due and your architect says he needs more time, you're taking a risk in cutting the process short even when it comes down to the final deadline decisions. Hopefully, your project schedule was realistic and everything was properly monitored to avoid a situation during which two months' work must be done in one month. When you cut the design process short one month to get construction started, you may be adding three months and thousands of dollars in cost to the project.

Check Your Contract

Contractual obligations define when the contractor will finish the job, what roles others will play in the process, and what water and electricity, if any, will be provided to the contractor during the process. This part of the contract must be clear and make sense. Wherever the contractor confronts ambiguities when preparing his bid, he will add expense as a safeguard or he will anticipate how he can turn the ambiguity into a change order after landing the job. Insurance and bond requirements should be stated in the contract.

Make sure the schedule is what you want and, at the same time, is realistic. To gain clout in convincing the contractor to meet your schedule, liquidated damages (a daily fee for being late) may be included in the contract.

Remember, when you have an accelerated schedule and liquidated damages to enforce the schedule, the project will cost more because the contractor will have to pay overtime to get the job done or he will include in his bid the amount of liquidated damages he figures he will have to pay because the schedule cannot be met. When establishing the schedule, the best approach, then, is to have realistic ideas about how long it will take to build the project under normal circumstances and what the contractor's costs will be. Is the additional cost worth the time saved? Was the cost of an accelerated schedule originally included in the budget?

If you plan to occupy part or all of the facility for training or equipment installation before the contractor is completed with his contract, this should be stated clearly in the contract. Without such notification, the contractor may have legal grounds to charge you for slowing his work or extending his schedule because you are in the way.

Also important to the building process is making certain the project is adequately advertised so contractors are aware that the project is out to bid. Give the bidders a reasonable amount of time to put together their estimates. Contractors need time to get documents to their subcontractors, for the subcontractors to prepare their prices, and to get the whole package put back together (unless the project is bid with subcontracts direct to the owner). Without enough time, the contractor is forced to guess for those parts of the work he can't completely estimate. When contractors guess, they guess high because it is their money on the line.

When bidding the project, consider using additive alternates. If the estimate indicates the project is close to or perhaps over budget, parts of the project which are desired but are not essential can be bid as separate items. If the bids come in lower than expected, then these things can be included. If the prices are higher than anticipated, then these things can be left out of the contract, but the project can proceed. You should be identifying possible alternates no later than the beginning of construction documents so that these alternates

can be clearly defined in the bid documents. As alternate bids can make the bidding forms and contracts complicated, take care to review them for accuracy in defining what is in each alternate.

The Budget

The ongoing estimating process should verify previous cost projections or identify variances. If the final estimate indicates that some components cost more than anticipated or that there was a change in scope which increased costs (with no offsetting drops in cost), then this is your last chance to decide what you can live without or what you should bid as an additive alternate (as described above). More positively, if the estimate reveals leftover money, you should now consider any items you wanted but left out initially.

The process should not wait until the drawings are complete. It must be an ongoing verification of previous assumptions with the cost control reports issued whenever a variance occurs. Then, when the drawings are complete, you will know where you stand with your budget. If you wait until the drawings are complete and then spend a month preparing a new detailed estimate, you may very well find that two months of drawing time were wasted because you are over budget and must redesign before bidding.

CONSTRUCTION DOCUMENTS

1. Are the drawings and specifications really complete or has the deadline arrived and is the architect just giving you what's been done to date?

YES NO NOT SURE

2. Are the documents well coordinated? How can you be sure?

YES NO NOT SURE

3. Have the documents been checked for constructability and gold-plated specifications?

YES NO NOT SURE

4. Does the contract lay out the schedule you want? Is it realistic? Are you aware of the cost impact of an accelerated schedule?

YES NO NOT SURE

5. Does the final estimate leave you on budget? Does the budget for each system reflect the design development budget? If not, why?

YES NO NOT SURE

6. Has someone put together a thorough bidders list, called the contractors in advance, and sufficiently advertised the project?

YES NO NOT SURE

7. Are the plans being developed according to your bidding strategy?

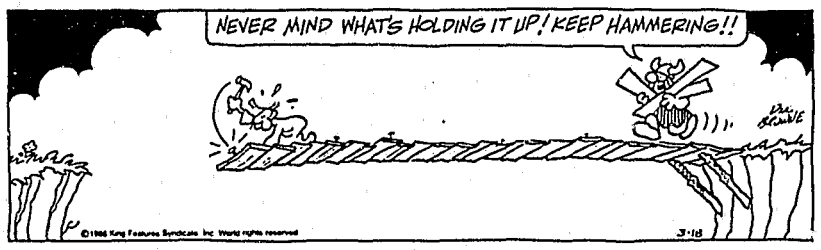
YES NO NOT SURE

The goals of a successful construction project are to build a quality facility on schedule while minimizing claims and change orders. The project is not over when design is complete. The same care and effort exercised during earlier stages is required during the construction phase and on into initial occupancy.

A well-managed design phase is the most direct route to a well-constructed building. However, even projects managed properly during design will encounter problems during construction. You've probably heard of claims and change orders. The mere mention of them is always accompanied by a shudder. This chapter looks at why claims arise and how to minimize them. It also walks you through change orders, how to analyze and negotiate them, as well as how to process and track them.

Keeping a construction project on schedule is as essential as attempting to stay on budget (and comply with court orders). This chapter also explores scheduling options and keys to good performance. Finally, high quality designs and drawings mean nothing if your project isn't built to the prescribed standards. Assuring this quality is carried into construction is another management function.

The following documentation provides insight into minimizing the problems and understanding and coping with the process.



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BIDDING STRATEGIES

The following strategies cannot be ranked from best to worst. They all have advantages and disadvantages. What's appropriate for you will depend on your project and your needs.

You should have selected your strategy during the PS phase and followed it throughout.

Lump Sum General Contract

The construction contract is awarded to one contractor based on a low bid fee.

Advantages:

Single point responsibility. Single contract.

No expenses are committed until the entire contract is awarded, assuring an affordable contract or re-design if necessary, prior to the award of a single dollar.

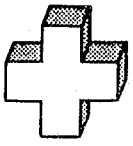
Caution — Improperly planned projects involving lump sum general contracting could produce the following results:

This is the slowest option. Construction does not begin until all of the drawings are complete.

Although no construction expenses are committed until the entire facility is designed, none of the actual costs are known until most of your time and money for design have been spent. If the bids come in high now, you may have to go back three steps.

Prepurchase

The owner contracts directly with material and equipment manufacturers for long lead items. These items generally include security equipment, security doors and hardware, security hollow metal, security control panels, large mechanical and electrical equipment, specialty items, etc. These materials and equipment can be purchased as fabricated and delivered with installation by the manufacturer or fabricated and delivered with installation by the general contractor.



Advantages:

Schedule efficiencies. Contractor does not have to wait for long lead items.

Contractor mark-up is saved on prepurchase items.

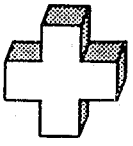
Direct working relationship with manufacturers of items that are critical to the facility's completion.

Caution — Improperly planned projects involving prepurchase could produce the following results:

Owner assumes responsibility for delivery of items which may require warehousing.

Owner-Furnished Equipment/Material

Owner-furnished equipment and material is often used interchangeably with prepurchase. However, it differs from prepurchase in that schedule is not the motivating factor. As a matter of fact, materials and/or equipment may be purchased after the general contract has been let. One reason for owner-furnished equipment is bulk purchase. An item may be required throughout a county's building program, such as toilet accessories, HVAC units, etc. Therefore, for cost considerations (savings on bulk purchasing) and standardization, the owner may opt to purchase as owner-furnished.



Advantages:

Contractor mark-up is saved.

Caution — Improperly planned projects involving owner-furnished equipment and material could produce the following results:

Owner assumes responsibility for delivery of items which may require warehousing if they arrive early or claims for delays if they arrive late.

Division of responsibility — when problems arise, who's responsible if it was installed by someone other than the manufacturer? Clarify who will install equipment; this will vary from job to job.

Coordination between owner and contractor responsibilities can be a problem if not clearly defined.

Phased Construction

Construction contracts are awarded at different times in order to accelerate the construction schedule. Contracts are based on completed design packages which are not related or are loosely related such as a site grading package, site utility package, or different buildings bid separately.

Advantages:

Design can be focused on individual pieces instead of the whole project.

If parts of the project have different critical end dates, phased construction will accommodate this. For example, if bed space is required as soon as possible, support spaces can be built afterward or later without slowing down the process.

Construction schedule is accelerated.

Caution — Improperly planned projects involving phased construction could produce the following results:

Minor increase in architect fees for producing additional bid packages.

Multiple building packages can result in unique building materials and systems in each building. This makes maintenance difficult and spare parts inventory excessive. However, this can be avoided by proper use of prepurchase and/or owner supply of items such as doors, hardware, toilets, etc., which you want to be consistent.

Coordination of multiple packages in the field is more difficult.

Fast Track

Fast Track is similar to phased construction in that multiple contracts are let at different times. However, fast track differs because bid packages are closely related. An example of fast track bid packages are foundations, precast, finishes, structural steel, interior partitions, interior finishes, etc. It's important to keep in mind that fast track bidding is not necessarily a means of saving money, but rather a means of saving time. Fast tracking is most likely to save money in times of high inflation. The reverse also can be true, and fast-tracking too fast can cost more.

Advantages:

The quickest approach to achieving a completed project, fast track starts construction earlier and mandates that design decisions for each subsequent phase be made in a timely fashion. Often when you don't have immediate pressure to make decisions during design, the issues hang on much longer than necessary. Once a fast track project starts, it demands a momentum which is difficult to stop.

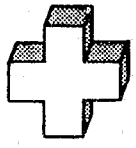
Caution — Improperly planned projects involving fast tracking could produce the following results:

Minimizing design flexibility. For example, relocating a wall becomes expensive once a foundation has been installed.

Increases chances of change orders and claims. Special attention and staffing in the field are a must if you are to maintain coordination and communications.

Trade Contracting

Multiple construction contracts are let to what would normally be considered subcontractors. Examples of contracts are concrete, masonry, steel, HVAC, electrical, etc.



Advantages:

General contractor mark-up is eliminated on subcontractor work since the individual subcontractors are contracting directly with the owner. If done properly, this is the least expensive way to build a facility.

Owner has direct link to contractor actually performing the work in lieu of working through a second-party contractor.

Increases the ability for a local contractor to compete in smaller towns.

Improved quality and pride of work has been observed when trade contracting is used. This may be attributed to a subcontractor being his own boss, working directly for the owner. Local pride is enhanced by local contractors.

Trade contracting may be used as an option to a general contract bid that resulted in a poor response.

One bad subcontractor is not as likely to hurt a project as compared to a bad general contractor.

Caution — Improperly planned projects involving trade contracting could produce the following results:

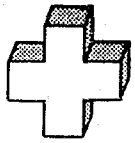
Most of the disadvantages associated with trade contracting can be eliminated/minimized if the job is well managed. Instead of one general contractor to manage, you must keep track of as many as 15 to 30 subcontractors. Documents need to be clearly defined; bid packages need to encompass the entire package without duplicating or letting items slip through the cracks. Packages need to be defined so that systems have single point responsibility. For example, if the roof leaks, there should be only one responsible party.

NOTE: Trade contracting may be phased, fast tracked and bid simultaneously.

Multiple Prime

More than one contract is awarded for the project. Phased construction, fast track, trade contracting and even prepurchase are considered multiple prime strategies.

Design/Build Guaranteed Max



This contract strategy awards one contract to an architect/contractor to design and build a project for a fixed fee.

Advantages:

Owner assured of a project at a fixed cost.

Caution — Improperly planned projects involving design/build could produce the following results:

This option offers the least owner participation and control.

Owner gets a project at a fixed cost but not necessarily the desired project. If the owner requests anything outside that listed in the contract document, it is added to the project. For example, if the owner wants a certain type of valve, this would be an add.

This approach may be difficult or impossible with a public project.

Negotiated Contract

Some counties in California can contract for jail construction work through negotiated contracts. This process involves issuing Requests For Proposals (RFPs), developing short lists, and negotiating prices with those contractors short-listed. This process allows contractors to offer alternative solutions to construction parameters in an attempt to make their proposals more appealing.

CLAIMS MANAGEMENT

Remember, if you pay for something through a change order, you have probably paid more than you would have through the bidding process — sometimes up to twice as much. All of the following tips require having an experienced staff representing your interests in the field.

Most counties have their own contractual language/terminology for handling change orders, but procedures generally followed to process them are as follows:

Claims may be made by either the owner or contractor based on changes that occur outside of the basic contract documents. Claims are based on cost, time or damages. A definition of claims may be found in the American Institute of Architects' General Conditions of the Contract (A201-1976-7.4). (See Section VI, References.)

"Should either party to the contract suffer injury or damage to person or property because of any act or omission of that other party or of any of his employees, agents or others for whose acts he is legally liable, claim shall be made in writ-

ing to such other party within a reasonable time after the first observance of such injury or damage."

Claims are generally resolved by clarification or change orders. In extreme cases arbitration or court litigation may be required.

Contractor claims, also referred to as "Request for Change Orders," result for four reasons: concealed condition/causes beyond the contractor's control; design deficiencies; user and owner request for additional/change of scope; or coordination of multiple contractors. Each of these reasons for claims are described below.

Concealed Conditions/ Causes Beyond Contactor's Control

These are the only types of claims that technically should occur on a well-managed project. They arise most frequently on renovation projects — those that have the most unknowns. Since these claims generally are unanticipated, they are difficult to control. However, there are ways to minimize them. AIA's General Conditions of the Contract (A201-1976-12.2.1) describes these claims as:

"... should concealed conditions encountered in the performance of the work below the surface of the ground or concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the contract documents, or should unknown physical conditions below the surface of the ground or should concealed or unknown conditions in an existing structure of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract..."

Concealed Conditions In The Site

The best way to minimize concealed conditions in the site is through comprehensive testing and accurate surveying.

If soil conditions are a potential problem, it is preferable to incorporate a linear foot price in the bid document for deep foundations. This cost would be used as a basis to pay the contractor for any additional piles that had to be drilled, instead of allowing him to quote a potentially higher price when submitting a change order. Unit pricing may be used in other applications as well, such as cost per cubic yard of rock, etc. This way the contractor bids on a known quantity and establishes a price at bid time for any additional work.

"....and we can save 700 lira by not taking soil tests"

Concealed Conditions In The Building

Concealed conditions in the building result from the unknowns of renovation work. These claims often arise as a result of poor "as-built" drawings, if any are available. If true for your project, make sure the architect performs a thorough walk-through and documents existing conditions in the bid documents.

You will pay more for the work if the contractor is uncertain of existing conditions when he bids the work. You also will pay more to finish the job if the existing documents are inaccurate. For example, when a wall designated to be removed turns out to be a supporting wall for other parts of the building, you're put in a situation where the design may be compromised by a workable solution. You will have an unforeseen cost in your budget, and you will probably pay more for that work as a change order than if it had been properly documented originally.

Other Conditions Beyond Contractor Control

Additional items which result in claims are described in AIA's General Conditions of the Contract (A201-1976- 8.3.1) as:

> "... labor disputes, fire, unusual delay in transportation, adverse weather conditions not reasonably anticipatable, unavoidable casualties, or any causes beyond the contractor's control..."

Weather and other time delays beyond the contractors' control are impossible to manage. However, the contract documents should contain a reference to the number on non-work days to be expected as normal. This may be a set number or a reference to the National Weather Service's typical amount of rain days exceeding so many inches per day in the project's location.

Design Deficiencies

Claims of this nature are merely a barometer gauging the quality of the construction documents. These claims generally arise from contractor misinterpretation, design conflict or omitted items. In all cases, the contractor will generate what is known as an "Information Request" (IR) or "Request for Information" (RFI). If the architect needs to implement a change, a "bulletin" (also referred to as a "Request for Change") will be generated.

Contractor Clarifications. RFIs do not necessarily mean that the scope of the contract will change. Many RFIs simply require clarification from the architect. Before agreeing to a claim, make sure the change is not covered in the plans, specifications or addendums.

If a request for clarification results in an answer to the contractor which does not increase the scope of work (it doesn't cost you any money), it is a "field order." Make sure your team is staying on top of answering requests for clarifications.

If a potential problem is clarified before other work is installed which would have to be corrected, the solution does not cost you any money. If questions go unanswered and work is installed which does have to be changed, the change will cost you money. Also, if your team does not answer the contractor in a timely manner and the project is delayed, the contractor has just cause for a claim because his time on the job is prolonged, increasing his overhead costs. You may end up paying for him to work overtime at the end of the project to finish on time.

The best way to keep what should be a clarification from growing into a scope increase is by maintaining the continuity of your team from design through construction. When new players are added during construction, they don't have the front-end team's working knowledge of the design.

Design Conflicts and Omissions. When a conflict or omission in the drawings or specifications results in additional work for the contractor, a "change order" must be issued which directs the contractor to a solution. This increases the cost of the contract. (See the following section on change order processing for further discussion.)

Consider building a cell mock-up prior to construction. A $100 mistake made in an isolated area is not as critical as a $100 mistake made on 500 cells. This $50,000 problem can be avoided by building an exact replica of a cell during the

early design phase. This $5,000 to $10,000 investment will help establish critical dimensions, generate lighting and heating data, build your confidence in the design and perhaps save you considerable money in change orders.

Additional/Change Of Scope

Construction is the worst time to make a change in scope. Generally, you will get roughly 50 to 75 cents value on every dollar for change order work. If the change requires moving walls or other major revisions, then the change will produce even worse returns. On average, change orders on new projects cost 2 to 3 percent of the total project budget. Remodeling and phased projects, however, experience change orders of up to 10 percent.

If change orders are becoming a problem early in the project, the use of an independent claims management consultant may be prudent to offset future lawsuits. The consultant can thoroughly document problems as the project progresses. Trying to sort out problems later only gives contractors the advantage.

If changes in scope or additional scope are crucial to the success of a project, they must be implemented. Because the facility may be operated for more than 40 years, making sure it is functional and safe is paramount.

Additional scope may be desired if you have funds left due to a good competitive bidding. A better way to handle this, however, is by using additive alternates. Additive alternates should be included in the bid documents, ensuring competitive bids on all work in lieu of a negotiated change.

Additive Alternates. Use of additive alternates is one of the steps involved in determining wants versus needs during the design phase. Since there is no certainty that funds for additive alternates will be available, these items must be considered "wants." Alternates may include an additional housing unit, square footage above and beyond the programmed space, landscaping, upgrade in materials, etc. Alternates should be clear in that minimal additional design is required and bid preparation for them by contractors is easily performed. The number of alternates should be limited to approximately six. These are generally identified during the schematic and design development phases.

If you have not followed the bidding and claims advice presented up to this point in this Handbook, you should plan to hire a claims consultant at the start of construction.

Coordination Of Multiple Contractors

Finally, claims also result from multiple contracts, owner-furnished items and owner labor. When damages are caused by destruction of completed work or schedule delays due to lack of coordination, the party who was damaged will receive compensation.

When the owner takes on the responsibility of multiple contracts, it is best that a CPM schedule be utilized. A CPM schedule, short for Critical Path Method, is a means of networking activities together to determine the impact one task (such as a delay in the delivery of doors) has on the remaining schedule. This tool is permissible evidence in a court of law. (See Schedule Control for further explanation.)

CHANGE ORDER PROCESSING

AIA's glossary of construction terms describes change orders as:

> "A written order to the contractor signed by the owner and the architect, issued after the execution of the contract, authorizing a change in the work or an adjustment in the contract sum or the contract time. The contract sum and the contract time may be changed only by change order. A change order signed by the contractor indicates the contractor's agreement therewith, including the adjustment in the contract sum or the contract time." (Refer to AIA's General Conditions of the Contract (A201-1976). See Section VI, References.)

Prior to a claim becoming a change order, it must first be analyzed and negotiated. It is important to analyze and negotiate a cost rebate as well as an expense. A cost control report should be issued prior to approval of a change order so you'll know its impact on the overall budget. Pending change orders should be carefully tracked in your cost control report so that all of the seemingly small ones don't all of a sudden add up to a big surprise when they come due.

Once a claim has been acknowledged as a change above and beyond the scope of the contract documents, a price needs to be negotiated. If there is a difference of opinion as to whether the claim is indeed additional scope or if a price cannot be agreed upon, then arbitration or court litigation may be required as a last resort. **Your contract should give you the capability to order the contractor to proceed with the work if a price cannot be agreed upon. The difference of opinion will be settled afterward. Remember, do not let the contractor pressure you with delays in negotiating change orders.**

Change Order Evaluation Steps

The following are helpful in evaluating change orders.

Make sure that the change is not covered in the plans, the specifications or the addenda.

Verify the contractor's estimate. The contractor is obligated by the contract documents to submit a proposed cost for

the change. This cost generally is submitted for materials and labor. The contract document should state a fixed percentage for mark-up for both subcontractor and contractor work.

Verify quantities and materials.

Use previous estimates and requests for payment to determine costs.

Contact suppliers or use other sources in order to determine cost.

Negotiate costs and time extensions (if applicable) with the contractor. The goal of negotiation is to be fair and equitable while maintaining a positive working relationship. You aren't striving to beat the contractor down to save a few dollars. You are entrusting the contractor with millions of dollars for a facility that will run for many years. It doesn't pay to irritate him for a few dollars.

Try to negotiate the change order prior to the work being completed. This leads to the best price. However, if a price cannot be reached and the change order impacts the schedule, it may be necessary to begin work prior to resolution.

Consider the option of correcting items after construction, using maintenance crews in order to avoid the up to 50 cents on the dollar change order price. Is the change a "must have" or a "like to have"?

Determine if the cost exceeds your individual change order limit or your total change order limit.

Finally, obtain proper approvals.

SCHEDULE CONTROL

Keeping in mind that schedules in contracts vary from those used as management tools, the best way to keep a project on schedule is through careful on-site monitoring. You need a baseline to monitor. The baseline may be milestone dates, bar-charts, or network diagrams. These reports are discussed below.

TYPES OF SCHEDULES

There are several ways of displaying a schedule, depending on the information and the level of detail to be communicated.

Once a scheduler has defined all the activities relevant to his project and the relationships of these activities to each other (i.e., the logic and sequence of activities), a critical path or critical activities are determined by a series of computations which can be done either manually or by computer. The calculations include determining the earliest and latest possible start and finish dates for each activity and the permissible lag (or float) between the completion of one activity and the start of a subsequent activity.

This output can be presented in one or more of the following reports: Activity Status Report, Milestone Report, Barchart and Network Plot.

Activity Status Report

The Activity Status Report is a listing of all activities with their start and finish dates. This report includes some or all of the following: original and actual start and finish dates, original and actual duration, and percent completion and accountability (i.e., which person or group has the primary responsibility for the task).

I - J SEQUENCE REPORT

A/E SELECTION

DESCRIPTION	DURATION	EARLY START	LATE START	EARLY FINISH	LATE FINISH	FLOAT TOTAL	FLOAT FREE
DEVELOP A/E SELECTION CRITERIA	17	13-Mar-86	28-Apr-86	04-Apr-86	21-May-86	33	33
DEVELOP REQUEST FOR PROPOSAL	10	21-May-86	21-May-86	04-Jun-86	04-Jun-86	0	0
OBTAIN B O S APPROVAL OF RFP	5	04-Jun-86	04-Jun-86	11-Jun-86	11-Jun-86	0	0
PUBLISH REQUEST FOR PROPOSALS	2	11-Jun-86	11-Jun-86	13-Jun-86	13-Jun-86	0	0
PREPARE AND SUBMIT PROPOSALS	15	13-Jun-86	13-Jun-86	04-Jul-86	04-Jul-86	0	0
REVIEW A/E SUBMITTALS & SHORTLIST FIRMS	5	04-Jul-86	04-Jul-86	11-Jul-86	11-Jul-86	0	0
INTERVIEW A/E FIRMS	5	11-Jul-86	11-Jul-86	18-Jul-86	18-Jul-86	0	0
NEGOTIATE A/E FEES	5	18-Jul-86	18-Jul-86	25-Jul-86	25-Jul-86	0	0
OBTAIN B O S APPROVAL OF A/E FIRM	5	25-Jul-86	25-Jul-86	01-Aug-86	01-Aug-86	0	0
AWARD A/E CONTRACT	10	01-Aug-86	01-Aug-86	15-Aug-86	15-Aug-86	0	0

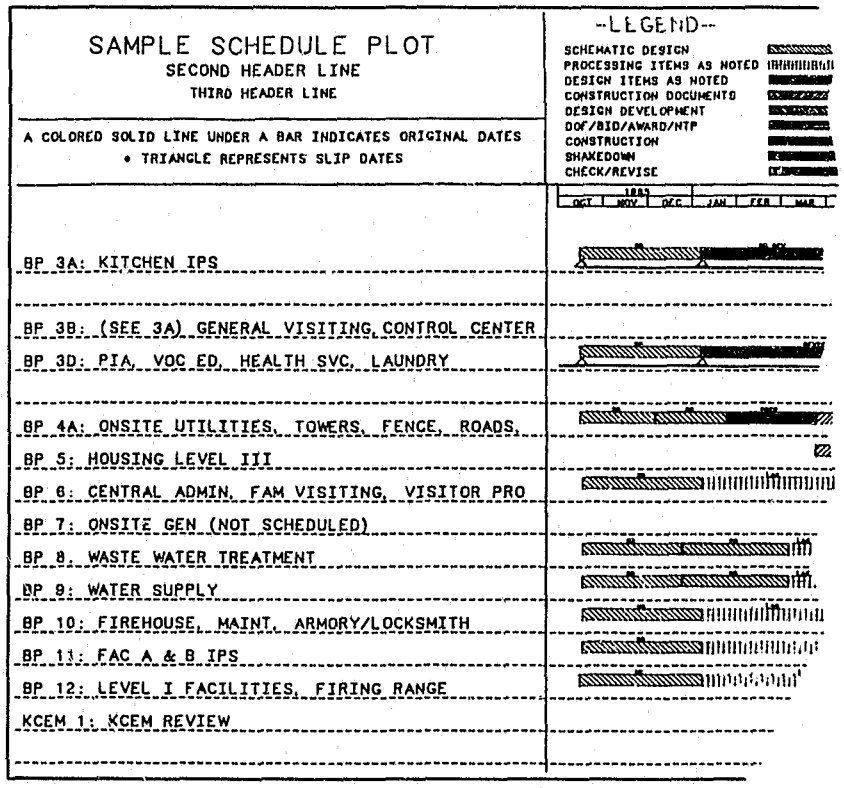
Milestone Report

The Milestone Report is a selection key of milestone activities. This is a summary level of the Activity Status Report and provides the end user with a concise report of key dates. For instance, a Milestone Report might summarize the start and end dates of each contract within a multiple contract project, such as sitework, foundations, structural steel, etc.

STATUS DATE: 11/15/1984	MILESTONE STATUS REPORT		
EVIR. DOCUMENT STATUS	DRAFT		FINAL
SITE ACQUISTION	SUIT. STUDY	SELECTION	LEG. NOTIF.
PRE-DESIGN	INITIATE PRO		DETERMINE
MASTER PLAN	FAC. LAYOUT	SITE UTIL.	SITE SECUR.

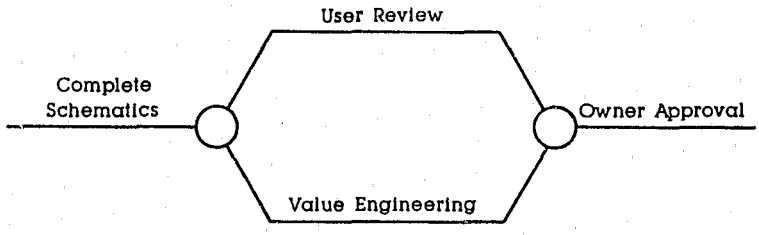
Barchart

The Barchart, generally referred to as a Gantt barchart, is a graphic depiction of the schedule. This chart may display two bars — one that depicts the original (target) schedule and the other the current (actual) schedule. The Barchart can consist of any number of activities, depending on the level of detail the user wishes to convey. The user can also group activities together on the chart. For example, he may want to divide the barchart up by contract.



Network Plots

Networks are another graphic method of displaying the schedule. The Network Plot actually shows the logical relationship between activities. The plot is time-scaled and activities are drawn as straight lines. Their start and finish points, referred to as nodes, are connected to other activities, as defined by the scheduler when the project schedule was initially developed. For instance, if the schedule was set up with the following sequence of events: completion of schematic drawings, followed by review by the user and value engineering by the project manager, followed by approval from the owner, the network would show two lines originating from the finish node of the activity "complete schematic drawings." One of these lines would be the activity "user review." The other would be "value engineering by PM." Both of these lines would then connect to the activity "obtain owner approval."



This form of displaying the schedule allows the user to see all of the constraints in his schedule and the impact of changing any activity. In the above example, it is evident that owner approval cannot take place until both user review and value engineering are complete. If value engineering is delayed two weeks, owner approval will be delayed as a consequence.

The importance of a Critical Path Method (CPM) schedule is that if an activity is delayed, the impact of that delay can be determined on the rest of the schedule, since activities have been networked together.

Schedules To Include In Contract Documents

Include either milestone dates or a simple barchart in the contract documents. To get any more definitive than that would be restrictive for the contractor since there are many approaches to constructing a building. The contract should require the contractor to submit a detailed schedule based on the milestone dates you have identified in the bid documents. Once the contract has been awarded, the contractor will submit his own schedule. Check this schedule for compliance with the dates established in the bid documents. **Carefully review your approved schedule for its cost and liability to the county.**

Schedules To Use During Construction

If the project is a single contract, the contractor's schedule may be sufficient. Depending upon the complexity of the job, you may want your staff to maintain a schedule against which they can check the contractor's. If the project involves multiple contracts, it then becomes essential to have one of your representatives maintain a schedule that combines and interrelates all schedules into one master.

From the moment a schedule update first reflects that your project is behind, take action. Your representative and the contractor should devise a plan of corrective action to bring the project back on schedule. Once behind schedule, projects have a tendency to drift. The longer it takes to develop a corrective plan, the larger the problem will become. If it becomes a problem, correcting it will more than likely cost you directly or indirectly.

If a corrective plan cannot be reached and the contractor is unwilling to exert an effort to bring the project within schedule, you have several options:

First, expedite the job daily. Document number and trades of workers and progress in daily reports. Work on a corrective plan with the contractor. Evaluate pay requests, making sure that the only work paid for is work completed. Pay requests should be tied to the schedule so that each working activity has a dollar value.

If this does not resolve the problem, use the written word, such as a telegram, to express the need to accelerate the schedule.

As a last resort, initiate a seven-day notice for "Failure to Perform." Generally County Counsel will prepare this document, and the Board of Supervisors will approve it. Different counties may have different processes. A copy of this letter will be sent to the contractor's bonding company, making it difficult for the contractor to get bonded on future jobs. This action, if pursued further, could result in the removal of the contractor. **Keep in mind that the object is to maintain a positive working relationship with the contractor. Removing the contractor is messy business. It should be noted that the contractor has no incentive to be on the job any longer than necessary. Overhead is costing him money every day.**

Use Of Liquidated Damages

Another tool you can use to encourage on-schedule performance is liquidated damages. These damages are an incentive to complete the project on time. They are assessed for each calendar day that the job comes in over budget. You include this in the bid documents.

There are, however, drawbacks to liquidated damages if they're not used properly. First, liquidated damages cost you money. The contractor is likely to increase his bid if liquidated damages are included. Second, if other jobs are being bid simultaneously, contractors may prefer to bid on jobs without

liquidated damages. Third, if a project has a tight schedule, the contractor may assume the project will take an extra 30 days and incorporate that cost into his bid. Therefore, if a $1,000-per-day assessment is implemented, the contractor may increase his bid by $30,000. Finally, in a court of law, liquidated damages will only be awarded if you can prove damages have been experienced equal to the value assessed to the contractor. For example, this would be satisfied if you are mandated by the courts to pay a daily fee for not having the new facility occupied.

Use Of Positive Incentives

Another incentive used in contract documents for on-schedule performance is a reduction in the contractor's retainage. Generally, a 10 percent retainage is withheld from the work completed in order to protect the owner. This retainage costs the contractor interest.

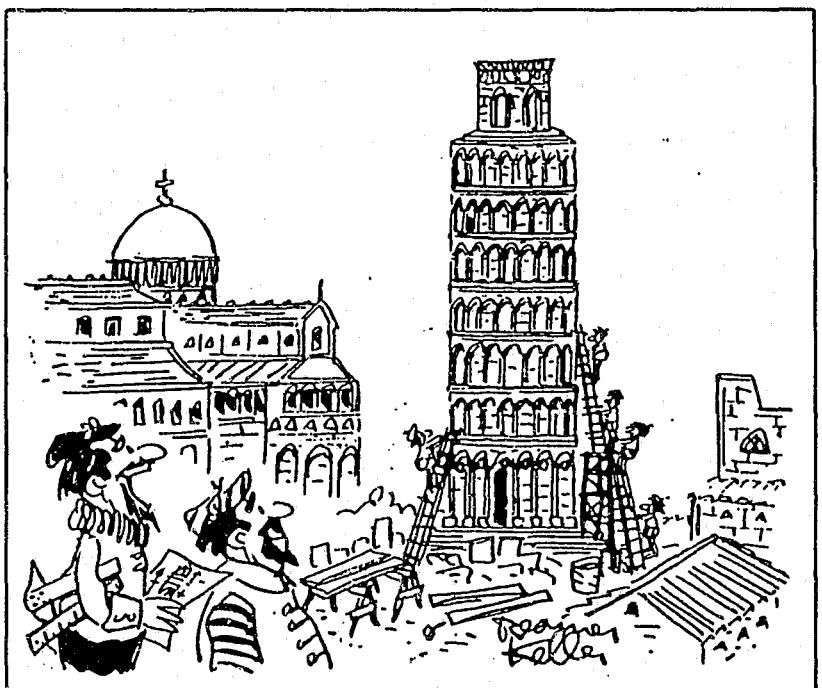
A positive incentive may be applied to withhold only 5 percent for each on-schedule month. Lower retainage also may be used in conjunction with liquidated damages. In other cases, bonuses for on-schedule performance have been used. Once again, each county will have different policies as to what can and cannot be done.

QUALITY ASSURANCE

Projects are built below standard because the plans and specifications are inferior or the construction fails to comply with them. Full-time field supervision is required at all times. Having an architect's representative on-site is not free, but you may want to pay for this service. Others who supervise for quality include construction managers and county inspectors. Additionally, user group representatives, including custody and maintenance staff, should walk through the building and focus on operational concerns.

Before starting construction, the construction managment team should establish a relationship with contractors that welcomes contractor proposals for alternative methods of construction that can result in negative change orders. Substitutions and alternate methods should be approved by the architect and the County to ensure modifications are compatible with the desired quality level and that delays will not adversely affect other parts of the design. Be aware that these types of changes can increase the architect's fee if not provided for when the architect's contract is negotiated. Contractor suggestions are most efficiently handled before construction documents are fully completed.

When work does not meet the requirements of the plans and specifications, all similar work should be halted immediately. The completed substandard work should be removed and replaced until it is installed properly. By demonstrating to the contractor that inferior work will not be tolerated and that it costs him more to do it that way, the quality of future work will improve.



"I saved some money on the footings. But don't worry—no one will ever notice."

Reprinted with grateful appreciation to the artist, Reamer Keller.

Money saved by not allocating resources for proper supervision and inspection during construction may cost you many times over in the future when poor workmanship becomes apparent and must be corrected. If the contractors know they're being watched, you have a far greater chance of having the work done properly.

When the last nail has been driven, the last wall painted, and all the construction debris cleared away, your construction project is not yet complete. A functioning correctional facility is a complex network of building systems and operating procedures. You must make sure that the new facility is operating satisfactorily for both staff and inmates — then and only then can you consider your construction project concluded.

A final facility development activity that you must be aware of from project initiation is the transition to the new facility. Although major cost decisions regarding construction and operation of the facility will be made in the early stages of the project, thorough transition planning is necessary to give you a final chance to double-check everything about the facility.

During the transition planning — which should begin in earnest as much as a year before the scheduled opening of the facility — you will make sure that all equipment and systems operate as intended and that the staffing budgeted for the new facility is adequate.

Sound transition planning will help control the costs that arise from last-minute corrections of oversights and errors in design or construction. Because this activity is so important to the successful completion of your project, the Board of Corrections has prepared a manual titled Transition Handbook: How to Open a New Institution. Consult this manual for a full discussion of transition planning.

This section provides a very basic understanding of the various construction systems which will be included in any building project. The Handbook divides a project into 14 separate systems. In reality, all of these systems are inter-related and will have different relationships and costs depending on the overall composition of the project.

The chapter covers the following information for each system.

- A brief description of what the system entails.
- A matrix of alternatives and attributes of those alternatives (when applicable).
- A checklist identifying when decisions on each system should be considered.
- A brief description of each alternative or pertinent information regarding alternatives.
- When applicable, a list of appropriate uses for each system.
- When applicable, a list of items to look for in and questions to raise about each system.

Keep in mind that this portion of the Handbook is not an encyclopedia of all possible alternatives for every part of your new facility. The intended purpose of this section is to acquaint laypersons with the many possibilities and different solutions to design problems they may encounter. The section is styled to prompt questions about why a particular solution was selected and to make the reader aware that numerous solutions exist for every problem.

When weighing the cost impact of various alternatives, consider that choosing standard items or ordering an extra supply of non-standard items can save you money over the long-term.

When testing sample equipment or materials, be sure to test random samples, not just samples provided by the vendor, to make sure the items will perform consistently as required.

This section is not intended to provide the solutions to problems, but rather to evoke an attitude that to achieve economical solutions in building a facility, one must always ask why the selected solution is the best one and how much that solution will cost in first and life-cycle costs. Keep in mind that the cost values presented in this section are only guidelines. The least expensive alternative may not always be the best choice for your project. Always select what is most appropriate for each space, and be sure cost decisions are based on your program's needs, not just on cost.

In this chapter, you'll find information on the following systems:

- Sitework
- Foundations
- Structural Systems
- Exterior Enclosures
- Interior Partitions and Ceilings
- Interior Finishes
- Windows
- Doors
- Specialties and Equipment
- Plumbing
- Mechanical Systems
- Electrical Systems
- Security and Communications Systems

SITEWORK

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	YES	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	YES	CONSTRUCTION	
ARCHITECTURAL		DOCUMENTS	DONE
PROGRAMMING	YES	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

Sitework consists of construction elements of your project which are not part of the building, but are necessary for the building to function. Four major categories of sitework typically encountered in a construction project include:

Earthwork, including site grading for placement of buildings, water drainage and landscaping. Demolition of existing structures or removal of natural growth also may be necessary.

Site utilities, which include piping and distribution of utilities above and below ground. Site utilities include:

- Domestic water supply.
- Sanitary sewer.
- Natural gas.
- Storm drains.
- Heating/cooling distribution between buildings.
- Electrical distribution and site lighting.
- Communications distribution (including alarms, radio and telephone).
- Data processing connection requirements.

Paving, including sidewalks, roads and recreational areas.

Fencing, including security and non-security fencing (see matrix).

RELATIONSHIP TO OTHER SYSTEMS

Sitework is what ties your building into the particular site, provides access to your building, and provides the utility hookups to operate your building. Pay special attention to the attributes of your site (soils and utilities) during site selection and preliminary budgeting — you may find many hidden or inconspicuous costs associated with site development.

ALTERNATIVES

Note: See value matrix for fencing alternatives. Because of the multitude of conditions and materials which are possible for other sitework, items affecting the cost of sitework other than fencing are only briefly discussed below.

Sitework

The key way to save money on site utilities is in the materials specified. Numerous kinds of piping materials are available. One material which can create a savings but may be overlooked is plastic piping for sewer, storm, gas and domestic water.

Paving

Paving and base are used in different thicknesses for different purposes. Make sure the paving selected for your project matches its use, similar to matching security building components to secure portions of your building. Concrete paving costs roughly twice as much as asphalt paving.

Fencing Matrix

○ SOMETIMES APPROPRIATE
● APPROPRIATE

CRITERIA		ALTERNATIVES								
		BARBED WIRE	CHAIN-LINK	CHAIN-LINK W/BARBED WIRE	CHAIN-LINK W/RAZOR RIBBON	CHAIN-LINK W/RAZOR RIBBON & GRADEBEAM	NON CLIMBABLE FABRIC			
	COST									
	LOW	●	●	●	●	●	●			
	MEDIUM									
	HIGH									
	SECURITY									
	LOW/NONE	●	●	●						
	MEDIUM				●	●	●			
	HIGH									
	DURABILITY									
	LOW									
	MEDIUM									
	HIGH	●	●	●	●	●	●			
	SCHEDULE									
	SLOW					●	●			
	MEDIUM				●					
	FAST	●	●	●						

FOUNDATIONS

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	MAYBE	DESIGN DEVELOPMENT	DONE
PROJECT STATEMENT	YES	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	NO	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

The foundation system of and the soils beneath the building prevent the complex from moving vertically. When a load is placed on soil, most soils settle. This creates a problem when the building settles but the utilities do not. Even more critical than settlement is differential settlement. This occurs when parts of your building settle at different rates, resulting in cracks, some of which may affect the structural integrity of the building. Conversely, in some rare instances soils may swell, pushing your building upwards and resulting in similar problems. Therefore, the foundation system must work in tandem with the soils to support the building.

RELATIONSHIP TO OTHER SYSTEMS

The type of foundation system selected depends on the soils, loads and the structural system. If you encounter unusual foundation problems, consider more than one option to ensure the least risk and the most cost effective solution to the problem.

ALTERNATIVES

Unfortunately, deciding what type foundation to use can't be based on how much money you have in your budget or how much you can afford. Often the soil conditions will dictate the type of foundation that has to be used. If you find your foundation design is costly because of soils conditions, you may want to get a second opinion to verify that the solution is appropriate, that there is not a less expensive alternative, or that the alternative selected is overly conservative.

Spread Footings

Spread footings generally are square reinforced concrete column supports 12 to 24 inches deep. Each spread footing supports a point load of the columns above. This is a simple and inexpensive approach to be used with good soils.

Strip Footings

Strip footings, wall footings and thickened slabs are used to support linear loads such as bearing walls. They provide a simple and inexpensive approach to be used with good soils.

Grade Beams

Grade beams are like strip footings supported by spread footings. They are used when both columns and bearing walls support the building's loads. They offer a simple and inexpensive approach to be used with good soils.

Imported Fill

Often soil close to the surface is unsuitable for building. This soil may be removed and replaced with good soil (fill). Afterward, one of the foundation systems can be used. The cost depends on the depth of the poor soils and the distance which good soils must be transported.

Mat Foundation

A mat foundation system acts like a raft floating on water. The slab on grade becomes thick enough so the entire building acts as a single load applied over the entire slab surface. This is used when you have poor soils. It is used less frequently than the previous systems mentioned.

Pile Foundations

Pile foundations are deep foundations consisting of concrete, precast concrete or steel. The pile is a slim member either injected or hammered into the ground. Generally multiple piles are inserted next to each other. They are joined by a pile cap acting much as a spread footing would in supporting a column load.

Pile foundations support a load primarily by depending on the friction created between the sides of the pile and the soils. The longer the sides and the more piles, the greater the system's load capacity.

Caissons

Caisson foundations are deep foundations which use holes drilled and filled with reinforced concrete. The caisson is a wider member than the pile; its radius is greater than the column it is supporting. Unlike the pile, which gets its support from the sides, the caisson also depends on its bearing capacity — the capacity of the soil or rock below the caisson which supports it. The greater the caisson diameter, the larger the area, the greater the bearing capacity. To use the bearing capacity, the depth of the caisson needs to reach either rock or load bearing soils.

Foundations Matrix

○ SOMETIMES APPROPRIATE
● APPROPRIATE

CRITERIA	ALTERNATIVES: SPREAD FOOTINGS	STRIP FOOTINGS	GRADE BEAMS	IMPORTED * FILL	MAT FOUNDATION	PILE FOUNDATION	CAISSON FOUNDATION		
COST — LOW	●	●							
COST — MEDIUM			●	○	●				
COST — HIGH						●	●		
SECURITY — LOW/NONE									
SECURITY — MEDIUM			NOT	APPLICABLE					
SECURITY — HIGH									
DURABILITY — LOW									
DURABILITY — MEDIUM			NOT	APPLICABLE					
DURABILITY — HIGH									
SCHEDULE — SLOW									
SCHEDULE — MEDIUM	●	●	●	●	●	●	●		
SCHEDULE — FAST									

* Is an additional cost as the soils under the building are replaced before the foundations are placed.

STRUCTURAL SYSTEMS

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	MAYBE	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

The structural system of your new facility keeps the building standing. Most of the other building components are attached to it. Typically, it is composed of beams, load bearing walls, roofs, columns, and floors. (The foundation system, also an integral part of a building's structure, is addressed separately because of specific criteria which affect foundation design.) Determination of what criteria for wind, live loads, dead loads, and seismic safety factors will affect the design substantially. Find out what your engineer is basing his design calculations on and perhaps obtain a second opinion on the appropriateness of these assumptions.

RELATIONSHIP TO OTHER SYSTEMS

The exterior closure and interior partitions of the building may act as structural components in helping support floors and roofs or in providing lateral support.

Because many interior and exterior walls of a correctional facility are constructed of substantial materials for security purposes, they can and should be used for structural purposes also. A structural design which ignores the usefulness of walls in helping to support roofs and floors is redundant and, therefore, not cost effective. Although interior and exteriors walls will often be a part of your structural system, they are addressed separately because of other cost considerations particular to their use as walls.

ALTERNATIVES

Precast Concrete

Precast concrete consists of concrete members cast at an offsite precast plant and trucked to the site for installation or cast on site and put in place with a crane.

If used in the right places, precast concrete can be a good solution for a reasonable price. Because it is not inexpensive and is subject to wide price swings depending on how it is used, it can be a very expensive solution. Some of the advantages and disadvantages of precast concrete are:

- Prices can be very competitive with other systems when you use numerous pieces of the same size and shape. One of the most costly aspects of a precast system is the initial cost of making the forms. Once the forms are made, each additional piece becomes less expensive.

- Precast concrete can save time because it is fabricated in a plant where weather conditions do not affect production. Once trucked to the site, it can be erected extremely rapidly. To take advantage of this, make sure the building components are designed from a constructability perspective. Consider the sizes of pieces relative to trucking and erection with a crane and how the erectors in the field will be putting the building together.

- The inherent nature of concrete eliminates the need for fire proofing or additional finishes for durability.

- To achieve the maximum potential from precast concrete, keep the number of different pieces to a minimum and the shape of each piece as simple as possible. Every corner, reveal, embed, etc. adds to the cost of each piece.

- Consider the local market when specifying precast. The material must be trucked from the plant to the site, so trucking costs must be considered. Also, if the amount of precast is not significant, the interest from the precast industry may be minimal — a lack of competition can drive up costs.

- When considering floor or roof planks, a number of "off-the-shelf" panels are available. Usually these are less expensive than custom pieces.

Cast-In-Place Concrete

Cast-in-place concrete consists of concrete which is poured into forms, onto decking, or on the ground at its final location in the building.

Although cast-in-place concrete has many typical uses (such as slabs on grade or topping for roof and floor decks), this use of concrete is probably the most expensive and the slowest of structural systems available. But, because of correctional facility security concerns, cast-in-place concrete can sometimes be an economical solution for parts of the building. Most commonly, cast-in-place concrete structural components are used for parts of the building which are difficult to manufacture off the site or to construct with steel because of irregular shapes or fireproofing/durability needs of the finished product.

Cast-in-place concrete can be a competitive solution for high-rise buildings if the structural components also are used for floor, ceiling and wall components. The key to an economical design of a high-rise cast-in-place concrete structure is to consider how the building will be constructed, targeting a minimalization of the system's labor intensiveness. One common practice with high-rise concrete structures is to use "slip

forming" of floor slabs where the same forms are used for each floor and then moved to the floor above after the concrete cures. Design of interior walls and supporting columns and beams must be considered carefully in such an application.

Tilt-Up Concrete

(See exterior enclosures as this system is primarily a wall system which can double as a structural system.)

Steel

Steel, as used in a structural system, typically consists of steel beams, columns and floor and roof decks. Concrete topping typically is poured over steel floor decking as a structural part of the floor system and as the substrate for floor finishes. Roof decks may or may not have concrete topping, depending on fireproofing and spacing of beams which support the roof deck.

Some of the advantages and disadvantages of structural steel within a correctional facility include:

- Structural steel generally is more economical as a framing system than concrete.
- Structural steel typically takes less time than concrete to fabricate and erect.
- Steel is a more economical means of spanning open spaces such as dayrooms.
- Steel is a very durable material if detailed properly.
- One disadvantage is the need to fireproof structural members in many instances, although this cost alone doesn't make it more expensive than concrete. It becomes more expensive when the fireproofing also must be covered by expensive finish systems that are accessible to inmates. The cost can be more than concrete.

Pre-Engineered Metal Buildings

As implied by the name, this building system uses standardized metal components which are engineered to maximize use of the material's structural properties. This system typically is offered as a complete building package, including structure, metal roof and metal wall panels. (Tilt-up concrete walls can be used on a pre-engineered building also.) Because it's already been designed very close to its limit, the building system is meant to be used without modifying a manufacturer's standard design if you are to achieve the cost benefits of the system.

Pre-engineered metal buildings are not recommended for areas where the building itself provides the security enclosures because the metal wall and roof panels are light gauge. They are very durable, however, having a 20 to 30-year life span.

If used in areas where vehicle, forklift or materials are in motion, the metal siding should be protected with plywood wainscot, steel bumpers, etc. These buildings are not adaptable to areas which require fireproofing.

This is probably the least expensive quick way to enclose large areas, but the use must fit this system because it is very difficult to modify.

Wood

This structural system consists of wood columns, beams and framing for floors, roofs and walls, as commonly found in smaller commercial or residential buildings of up to three floors.

It is relatively inexpensive for non-fire resistive construction — buildings which do not have strict security requirements and which are similar to wood framing found in the private sector. Wood construction is more common with local, smaller commercial contractors who typically do not bid on concrete or steel buildings.

Good for non-secure areas as discussed below.

If a substantial part of your facility is strictly administrative or serves some function other than security, a wood structure may be more economical than steel or concrete alternatives.

Structural Matrix

○ SOMETIMES APPROPRIATE
● APPROPRIATE

CRITERIA		ALTERNATIVES								
		PRECAST CONCRETE	CAST-IN-PLACE CONCRETE	TILT-UP CONCRETE	STRUCTURAL STEEL	PRE-ENGINEERED METAL	WOOD			
	COST									
	LOW				○	●	●			
	MEDIUM	●	●	●						
	HIGH									
	SECURITY									
	LOW/NONE					●				
	MEDIUM				●		●			
	HIGH	●	●	●						
	DURABILITY									
	LOW					●				
	MEDIUM				○		●			
	HIGH	●	●	●						
	SCHEDULE									
	SLOW		●							
	MEDIUM	●		●	●		●			
	FAST					●				

EXTERIOR ENCLOSURES

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	MAYBE	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

The exterior enclosure of your facility serves two purposes: to keep inmates in the facility and to keep the weather out. The enclosure consists of walls, windows and roof membranes. (Windows are discussed in a separate section of the Value Matrix as they apply to interior and exterior walls.)

RELATIONSHIP TO OTHER SYSTEMS

As discussed in the structural and interior partitions sections of the Value Matrix, the exterior walls of a correctional facility often act as structural components. They may hold up the roof and intermediate floor structure of low-rise buildings. Typically, the exterior walls of a multi-story building (particularly buildings more than 40 to 50 feet high) will not act as structural elements but will be attached to the structure as an enclosure only.

ALTERNATIVES

Cast-In-Place Concrete

Because of the labor intensiveness and one-time use of forming, the use of cast-in-place concrete exterior walls is, in most cases, the most expensive and time consuming exterior wall system.

Precast Concrete

As discussed in the structural section of this Value Matrix, precast concrete can be an economically competitive exterior wall system for areas with high security and durability needs. The cost of precast members is affected greatly by the number of pieces of the same size and shape. Use of precast exterior walls for a limited number of pieces can be very expensive.

When using precast concrete, the design team should consider including in the specifications the options for the contractor to cast the panels on-site. Many general contractors do the concrete work with their own crews. This offers the contractor the option to use his own work forces and cast the panels on temporary on-site casting beds. When using this approach, take care to maintain quality control because the finish of a site-cast panel is more difficult to control than one that is plant cast.

Tilt-Up Concrete

In many respects, tilt-up concrete is similar to precast concrete, except it is less expensive. You save because it is cast at the

site on the building's floor slab and simply "tilted" into place with a crane. Tilt-up concrete is very common in low-rise commercial buildings throughout the country. When using a tilt-up concrete design, your building design and construction scheduling are important in obtaining the full benefit of this method. Because the exterior walls are cast on the building floor slabs, the schedule must ensure that the floor slab is in place and provides enough area to cast the walls. Also, construction of the interior of the building (such as columns for the structure) cannot commence until the walls are cast and tilted into place. The design should include simple wall panel shapes, generally 20 to 30 feet in length and not more than 40 to 50 feet in height.

Concrete Blocks

Concrete block in correctional facilities is very common. The price is usually equal to or less than other high security systems, such as cast-in-place concrete or precast concrete. This is especially true in buildings with many different wall shapes or configurations. This system is very flexible because concrete block walls are constructed of many small pieces.

Key economic factors to consider when using concrete block walls are:

- Keep the configuration of the building as simple as possible. Every corner (particularly those that aren't 90 degrees) slows down production and, therefore, drives up labor costs. Labor cost represents a high percentage of the total cost of a masonry wall.

- Keep the number of special shapes and custom blocks to a minimum. Blocks with special ballnose corners, special shapes, special finishes or colors all cost more. When your details include these special blocks and the details are repeated over and over, the cost of a masonry wall system can increase 100 percent from typical masonry construction.

- In a secure environment, the inside cores of masonry blocks typically are grouted solid. They include a lot of steel rebar reinforcing to tie the blocks together. A non-secure block wall only has rebar placed intermittently and only the areas in the wall which have rebar are grouted. It is extremely important to review the security wall plans to make sure only the areas which need to be further reinforced and grouted are so designated. If you are using masonry in areas which are not high security but need the durability of masonry, don't spend the money to fully grout the wall and add unnecessary reinforcing.

Light Gauge Metal And Wood Stud Sysems

Metal or wood stud framing systems are economical and look nice in non-secure areas of the facility. A variety of exterior finish systems can be used over this framing system, such as stucco, metal panels or wood siding. When using concrete or concrete block for walls in these areas, you usually will want them finished inside with insulation and gypsum board and outside with some more aesthetically appealing finish.

Roofing

Many products on the market can be competitive, depending on how they are specified. The two types of roofs most commonly used today are built-up roofing and single-ply membrane roofing. Consider the following cost implications when designing your roof:

- Because the market for these materials changes frequently (many are petroleum products), the roof system may be specified as more than one type of roof, allowing the contractors an option to bid on the most competitive roof material available at the time.
- If the roof is scheduled to be installed during the wet season (snow, rain or whatever applies to your area), try to limit the number of roof penetrations, complex flashings, or complex slopes. These conditions add cost and increase likelihood of roof leaks.
- Check the specifications for the thickness and type of insulation required.
- Check the specifications for the thickness of and types of materials used for flashings. Unpainted, galvanized steel is the least expensive material; painted sheet metal is the next least inexpensive. Materials like lead and copper are the most expensive.

Exterior Enclosures Matrix

○ SOMETIMES APPROPRIATE
● APPROPRIATE

CRITERIA		ALTERNATIVES								
		POURED-IN-PLACE CONCRETE	PRECAST CONCRETE	TILT-UP CONCRETE	CONCRETE BLOCK	LIGHT GUAGE METAL OR WOOD STUD SYSTEMS	METAL PANELS			
COST	LOW					●	●○			
	MEDIUM			●	●		○			
	HIGH	●	●				○			
SECURITY	LOW/NONE					●	●			
	MEDIUM									
	HIGH	●	●	●	●					
DURABILITY	LOW						○			
	MEDIUM					●	●			
	HIGH	●	●	●	●					
SCHEDULE	SLOW	●								
	MEDIUM		●	●	●					
	FAST					●	●			

INTERIOR ENCLOSURES

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	YES	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

What materials you use for the interior walls of your new facility will play an important part in determining the durability, security and first cost of your project. Many options, each with a range of costs, are available. In general, the more secure and durable the construction of the wall, the more it will cost. As emphasized throughout this Handbook, the key to controlling your spending for this system is to select the appropriate wall system for the appropriate use. Do not use the expensive wall system selected for your high security areas in low or non-secure areas.

Look at each wall. Consider its purpose, how long unsupervised inmates will be in that area, what types of inmates will be detained there, and where the inmates will go if they go through the wall. Remember, a typical masonry wall without the extra reinforcing and grout is still a substantial barrier in a location where unsupervised inmates are not detained for a long time. Also, always consider the total wall system the security wall is being used for. If you have glazed openings in a wall or some other material which is less secure, then additional money spent on part of the wall is not a prudent use of your resources.

RELATIONSHIP TO OTHER SYSTEMS

As stated in the structural systems of the Value Matrix, interior walls also can act as structural elements of your building. If your design includes masonry or concrete interior walls, these walls can and should be used for structural purposes. Although this may seem to be common sense, it is not unusual to find a structural framing system with beams passing directly over walls which could serve the same purpose as the beam or act as intermediate support points, thereby reducing the size of beam required.

ALTERNATIVES

Cast-In-Place Concrete

Because of the labor intensiveness and one-time use of forming, the use of cast-in-place concrete interior walls is, in most cases, the most expensive and time-consuming interior wall system.

Precast Concrete

As discussed in the structural section of this Value Matrix, precast concrete can be an economically competitive interior wall system for areas with high security and durability needs. (Refer to the earlier discussion of precast concrete in this section under Exterior Enclosures.)

Concrete Blocks

As discussed earlier in this section, concrete block in correctional facilities is very common. The price is usually equal to or less than other high security wall systems, such as cast-in-place concrete or precast concrete. (Refer to the full discussion of concrete blocks earlier in this section under Exterior Enclosures.)

Metal Framed Wall And Ceiling Systems

In areas of your facility where physical detainment or security are not necessary or the need for such systems is reduced, light gauge framing systems can offer a savings.

Key places to seek savings are non-secure areas such as administration, maintenance and support, such as kitchens and laundries. These areas can represent 10 to 30 percent of your facility and serve purposes similar to non-correctional commercial spaces. They should be designed accordingly.

Other areas in which to consider reduced levels of secure wall construction are those where inmates are supervised and contained within the overall security system of the building. These areas might include classrooms, medical clinics or inmate work areas.

Plaster

Plaster over metal studs or over a ceiling suspension system is often used in secure environments because its durability is greater than gypsum wall board. Plaster, however, is a very expensive, labor-intensive material which will cost as much (or more) as masony or concrete, yet does not provide the durability of a concrete or masonry wall. Use of plaster as a ceiling system does offer durability advantages over materials such as drywall, but it still does not offer a non-destructible solution. If you need a very durable secure ceiling, exposed structural roofing or floor decks above are the best ways to accomplish this. This consideration should be made during selection of structural systems and development of building sections during schematic design. The reason to consider this as early as possible is that the mechanical distribution systems are affected by the design of ceilings or plenum spaces above ceilings.

Gypsum Board Over Plywood, Wire Mesh Or Sheet Metal

Gypsum board or other inexpensive materials can be used in areas normally requiring more durability than gypsum board by using other common building materials over or behind the gypsum board. (The cost of gypsum board is one-fourth the cost of plaster.) Common materials to consider are: plywood (very impact resilient), wire mesh (increases time required to break through the wall) or light-gauge sheet metal (same quality as wire mesh).

The use of a material like plywood over or behind gypsum board can make the surface extremely durable without really increasing the cost. Take care in specifying materials such as plywood to ensure compliance with non-combustible requirements of most correctional facilities.

Suspended Acoustical Tile

Many suspended ceiling systems on the market can cost even more than a plaster ceiling. A standard 2-by-4 or 2-by-2 exposed grid suspended acoustical ceiling is the most economical ceiling system. (Of course, an exposed structure can be the least expensive solution.) Although suspended acoustical ceilings typically are not used in secure areas, they are an appropriate solution for non-secure areas. Once again, find out what is specified and how the cost of the selected system compares to other available ceilings. Concealed spline, special finishes, or special panels or grids all add to the cost; so select the proper solution for the appropriate use.

Interior Enclosures Matrix

		ALTERNATIVES								
○ SOMETIMES APPROPRIATE ● APPROPRIATE		POURED-IN-PLACE CONCRETE	PRECAST CONCRETE	SECURITY CONCRETE BLOCK WITH GROUT & REBAR	NON-SECURITY CONCRETE BLOCK	PLASTER OVER METAL STUDS	GYPSUM BOARD W/LATH OR PLYWOOD OVER METAL STUDS	GYPSUM BOARD OVER METAL STUDS	HOLLOW METAL W/GLAZING	
CRITERIA	COST LOW							●		
	MEDIUM				●		●			
	HIGH	●	●	●		●			● ●	
	SECURITY LOW/NONE									
	MEDIUM				●	●	●	●	●	
	HIGH	●	●	●					○	
	DURABILITY LOW									
	MEDIUM					●	●	●		
	HIGH	●	●	●	●				●	
	SCHEDULE SLOW	●							○	
	MEDIUM		●	●	●	●	●		●	
	FAST							●		

INTERIOR FINISHES

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION	
ARCHITECTURAL		DOCUMENTS	YES
PROGRAMMING	YES	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

Interior finishes serve three purposes:

- Allow for maintenance and clearing of surfaces.
- Protect materials from weather and physical abuse.
- Improve aesthetics of the final product.

Amounts spent on finishes can vary greatly, depending on how much money you have in your first-cost budget, how much you can afford to invest to offset future maintenance and repair costs, and how much you can spend to make the environment more appealing to the inhabitants.

Finishes usually are the last thing "designed" or specified and often are not essential to the operation of a facility. Consequently, they are often subject to drastic cuts to bring a project back within budget during later phases (construction documents or redesign if bids come in over budget). This happens when too much of the budget has already been committed to other building systems which are more difficult to cut during the eleventh hour.

The goal of any well-managed project should be to complete the project with the desired finishes which create the sought-after operating environment. The only way to achieve this when you have a limited budget is to control the costs of all systems which precede the finishes.

RELATIONSHIP TO OTHER SYSTEMS

Finishes protect other project components and make them aesthetically appealing. Metals must be painted to prevent rusting; gypsum board needs to be painted to be cleaned; the kitchen floor may require tile or another surface to be cleaned and protected from organic acids in foods. Types of finishes required to complete floor, wall or ceiling systems should be considered when the substrate material is selected. Finishes applied to a substrate will determine the true final cost of the complete system.

ALTERNATIVES

The attached matrices for floor, wall and ceiling finishes represent the most common choices. The volume of information required to even begin discussions of each of these alternatives precludes its inclusion in this Handbook. Ranking of each material by cost and properties depicts those materials as commonly used in commercial applications. Any materials could be specified to increase the cost from a typical commercial application by as much as 100 percent. It is important to have someone who is familiar with market costs review the materials specifications.

For example, sealing masonry or concrete can be done for less than $.20 per square foot, whereas thick-set quarry tile will cost close to $10 per square foot — a 5,000 percent difference in cost. If all of the floor of your $125,000 building was finished with sealed concrete, the cost would be $25,000. If done in all quarry tile, it would cost $1.25 million! Although this may be an extreme example, just imagine the cost impact if your floor, wall and ceiling finishes were all specified as top-of-the-line products.

Floor Finishes Matrix

○ SOMETIMES APPROPRIATE ● APPROPRIATE		ALTERNATIVES									
		QUARRY TILE THICK SET	QUARY TILE THIN SET	CERAMIC TILE TERRAZO	FLUID APPLIED GRANULAR FLOORING	CARPETING	SHEET VINYL	VINYL COMPOSITION TILE	EPOXY PAINT	SEALED CONCRETE
CRITERIA	COST									
	LOW									●
	MEDIUM			●	●	●	●	●	●	
	HIGH	●	●	●						
	CLEANABILITY									
	LOW									●
	MEDIUM					●		◐	●	
	HIGH	●	●	●●	●		●			
	DURABILITY									
	LOW								●	●
	MEDIUM					●	●	◐		
	HIGH	●	●	●●	●					
	SCHEDULE									
	SLOW	●	●	●●						
	MEDIUM				●			●	●	●
	FAST					●	●			

Wall Finishes Matrix

CRITERIA	○ SOMETIMES APPROPRIATE ● APPROPRIATE	ALTERNATIVES: CERAMIC TILE	WALL FABRIC	EPOXY PAINT	ENAMEL PAINT	LATEX PAINT	SEALER FOR CONCRETE & MASONRY			
COST	LOW						●			
	MEDIUM			●	●	●				
	HIGH	●	●							
CLEANABILITY	LOW		●			●	●			
	MEDIUM				●					
	HIGH	●		●						
DURABILITY	LOW		●		●	●				
	MEDIUM			●						
	HIGH	●					●			
SCHEDULE	SLOW	●								
	MEDIUM		●	●		●				
	FAST				●		●			

Ceiling Finishes Matrix

CRITERIA	○ SOMETIMES APPROPRIATE ● APPROPRIATE	ALTERNATIVES: PAINT	EPOXY PAINT	ENAMEL PAINT	2X4 EXPOSED GRID ACCOUSTICAL TILE	2X2 EXPOSED GRID ACCOUSTICAL CEILING	CONCEALED SPLINE ACCOUSTICAL CEILING	SUSPENDED METAL PANELS		
COST	LOW	●								
	MEDIUM		●	●	●	●	●	●		
	HIGH									
CLEANABILITY	LOW	●			●	●	●			
	MEDIUM		●	●				●		
	HIGH									
DURABILITY	LOW	●								
	MEDIUM		●	●	●	●	●	●		
	HIGH									
SCHEDULE	SLOW									
	MEDIUM				●	●	●	●		
	FAST	●	●	●						

WINDOWS AND WINDOW FRAMES

WINDOWS

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION	
ARCHITECTURAL		DOCUMENTS	DONE
PROGRAMMING	YES	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

Windows in the facility let light in and allow visibility to adjacent areas in and out of the building. Windows in this discussion consist of the frame and glazing.

RELATIONSHIP TO OTHER SYSTEMS

Window frames, like door frames, may be an integral part of the interior and exterior partitions. Some combinations of partitions and frames may not require the frame prior to installing the wall; check with your architect. However, generally the frame should be available when the wall is being installed.

Delivery of window frames is almost always a problem. Due to the limited competition and the ambitious correctional construction program ongoing across the nation, the manufacturers are overextended. Deliveries of the hollow metal can take 12 to 24 weeks from the approval of shop drawings.

ALTERNATIVES

Glazing Products

Note: Glazing information was excerpted from the Security Testing Glazing Program and Recommendations, July 10, 1985, prepared by Kitchell CEM for the State of California Department of Corrections. Security glazing products are evaluated in four basic categories which are inclusive of all of the security glazing types generally available in the market today. These are:

- Laminated glass
- Laminated polycarbonate
- Laminated glass and polycarbonate
- Air-separated products using the above

Glass Products

Glass products are comparatively low in strength but high in heat and scratch resistance. Annealed glass, strengthened glass and special glass will be discussed.

Annealed Glass. This is the basic glass product used by the industry for general purposes. Annealed glass is often further processed by strengthening, tinting, coating, etc. to produce special qualities. In security applications, annealed glass is usually strengthened and laminated with similar or other materials.

In bullet resistant products, it is often laminated in its pure form due to its ability to flatten bullets and its breakage pattern which reduces vision the least of all products when shattered.

Strengthened Glass. This glass may be strengthened either by heat or chemical treatment, increasing its tensile strength.

Fully tempered glass will fracture into small cubes or pebble-like fragments when broken. If the glass is laminated, it will stay in place, completely obscuring vision. For this reason it is most often used as a single piece and not as a laminate. Semi-tempered glass approaches the strength of fully tempered glass but has the breakage characteristics of annealed glass, making it more appropriate for laminates.

Heat treatment tends to produce minor distortions of vision through glass. Generally, this may not be objectionable; however, under conditions of constant surveillance through glass this could become highly objectionable. Heat-treated glass products must be cut to size, including cut-outs, prior to treatment, as any cut through the compression layer after treatment will fracture the product. Annealed glass and polycarbonate may be cut at any time, but this is not recommended due to loss of the compression layer at cut edge and resulting reduction of strength.

Special Purpose Glass. Most special purpose glass, such as tinted and reflective glasses, can be laminated with other materials and used in security glazing; however, those of most immediate concern to us are wire glass, tinted glass and mirror (one-way) glass.

Wire Glass. Wire glass is used where fire ratings are required. Wire glass is annealed glass, usually 1/4-inch thick, containing a layer of wire in the event of breakage by impact or heat. Wire glass can be laminated with other products.

Tinted Glass. Tinted glass for reducing solar heat gain and glare is available. It enhances the comfort level and decreases the light transmittance. The principal use for this product is in control stations exposed to the building exterior.

Mirror Glass. Mirror glass permits one-way visibility. The room from which you do the viewing must be darker than the room being viewed. This glass is available in float, heat-strengthened and tempered forms.

Polycarbonates

Polycarbonate is a highly impact-resistant material used extensively in security glazing. Compared to glass of any type, it has high degrees of strength and flexibility with light weight and good insulating qualities. Its other features, when compared to glass, tend to be negative — low resistance to heat, scratching, marring, discoloration and expansion.

Surface treatments significantly increase resistance to various forms of abrasions and discoloration; however, the performance of the product in these areas will not equal that of glass.

Interlayers

Laminations of glazing materials are adhered by interlayers of various chemical compositions and thicknesses. Interlayers not only adhere one lamination to another but actually impart significant additional strength to the product by way of shock absorption. The interlayer also serves to retard further breakage after an adjacent lamination has shattered. In the event of breakage, the interlayer holds the pieces in place, making it very difficult to separate a broken piece from the whole.

In general, the composite strength of a given thickness of a glass-laminated product will increase as the number of interlayers increase. This is not true, however, in bullet-resistant products because the interlayer has little resistance to bullets.

Special problems arise in laminated glass and polycarbonate products. Because polycarbonate has a coefficient of expansion eight times that of glass, the interlayer must be highly flexible, yet stable, to maintain bond throughout temperature extremes.

In conventional glass-laminated security products, except those with very high glass-to-interlayer ratios, the difference in the composite strength between the weakest and the strongest glass available (annealed vs. tempered) will represent a difference of only 3 to 7 percent of the composite strength of the product. Therefore, the type of glass selected will most often be determined by breakage characteristics, qualities previously cited or trade and manufacturing considerations.

Laminated Glass. This glass has a wide variety of applications, from the thinner laminates for light security (burglar-resistant) to medium thickness for higher security needs to thicknesses of 1-1/4 inch and more which have excellent bullet-resistance qualities. These products may use annealed glass, strengthened glasses or various combinations. Although the outer face of this product can be "broken" with little difficulty, resistance to total penetration is relatively high.

Laminated Polycarbonate. Polycarbonates are produced in a variety of thicknesses. While the product is sometimes used monolithically, it is often laminated for its high strength. Planes of weakness sometimes appear as shear cracks. Laminating will minimize structural failures due to this phenomena. Comparatively thin products provide excellent resistance to impact. Heat resistance requires greater thicknesses and/or more laminations.

Laminated Glass and Polycarbonates. This product combines the best qualities of both materials — the impact resistance of polycarbonate and the heat and mar resistance of glass.

Due to the large difference in thermal expansion characteristics of glass and polycarbonate and the relative inelasticity of interlayers, delamination problems have occurred in this product in past years; however, recent improvements in interlayers have greatly reduced this problem.

Air Separated Glass and Polycarbonate. This product is produced in a wide variety of unit and component thicknesses and glazing types. It is most often used in high strength installations with polycarbonate separated from glass laminations by air. One advantage of this product is the elimination of potential delamination. Another advantage is that some of these windows can have, if specified, an outer layer of glass replaced without replacing the entire unit, thereby reducing life-cycle costs.

WINDOW FRAMES

DESCRIPTION

Hollow metal frames generally are the only options available for a secure setting. The gauge of the frame may vary depending on the level of security; 18, 16, 14 and 12-gauge hollow metal frames are available, although 18-gauge is a medium commercial gauge of door. Sixteen-gauge frames are considerably less expensive than the heavier gauges and will do the same job in many cases. (Glazing actually determines the security of a window.) If you are unsure of the differences among gauges, get samples of each. It should be noted that hollow metal wall systems with security glazing will cost 5 to 10 times more than concrete or block security walls. Also, costs can be kept to a minimum with simple shapes. More angles, mullions, etc. drive cost.

For cell windows, however, metal angles have been used on some California jails and prisons in lieu of hollow metal frames. Bars may be used on cell windows in order to divide a larger window into sections equal to 5 inches thick. (Five inches currently is the accepted width.) An alternate approach to bars are the 5-inch slit windows. The window may be 5 inches horizontally or 5 inches vertically with the length as desired. The 5-inch slit window is less expensive than the window with bars. The window with bars does allow for more light. Both windows meet standards.

The metal angle window consisting of one metal angle installed to the wall below the glazing and another metal angle outside the glazing is less expensive than the hollow metal frame. The hollow metal frame, however, is more conventional and provides a more finished appearance. Another advantage to the metal angle slit window is that because the window is constructed of simple angle pieces, it is no longer a long lead item.

This new concept has been used on a few facilities outside of California. Glass brick is a solid piece of glass installed in a row or grouped in a masonry wall just as any other block would be installed. Glass brick doesn't require a frame and offers a level of security that rivals a bulletproof rating. The block, if scratched or marred, can be polished to reach its original translucency. On the other hand, the block distorts visibility and, if damaged, is difficult to replace.

SKYLIGHTS

Although this concept in jails may seem out of place, it has been used in correctional facilities. Based on an initial cost, it is not very likely that you would be putting skylights in your facility. However, skylights do offer long-term operational savings in lighting. Before agreeing to skylights though, make sure this long-term savings can be justified within a reasonable time period by your consultant.

Glazing Matrix

		ALTERNATIVES								
○ SOMETIMES APPROPRIATE ● APPROPRIATE		SINGLE LAYER FLOAT GLASS	SINGLE LAYER TEMPERED	SINGLE LAYER POLYCARBONATE	MEDIUM SECURITY POLY/GLASS LAMINATE	MEDIUM/HIGH SECURITY POLY/GLASS LAMINATE	HIGH SECURITY POLY/GLASS LAMINATE			
CRITERIA	COST LOW MEDIUM HIGH	5	10	20	50	70	100			
	SECURITY LOW/NONE MEDIUM HIGH	●	●	●	●	●	●			
	DURABILITY LOW MEDIUM HIGH	●	●	●	●	●	●			
	LEAD TIME SLOW MEDIUM FAST	●	●	●	●	●	●			

NOTE: The numbers presented in the cost row represent general relationships of cost to indicate the extremely wide range of costs for glazing. Because there are numerous combinations of security laminates possible specific products are not listed.

SECURITY DOORS

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	YES	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

Security doors control entry, as well as acting as fire, smoke and acoustical partitions. Security doors in this discussion consist of a frame, door blank, locking system, hardware, door glazing and accessories.

RELATIONSHIPS TO OTHER SYSTEMS

The security door is an integral part of the entire security system. The selection of security doors should be done simultaneously with identifying video, audio and direct or indirect surveillance; emergency evacuation; and flow of operations. For example, if you have a four-foot-wide food cart, make sure you don't have to pass through a three-foot-wide door.

The security door frames also may be an integral part of the interior and exterior partitions. Some combinations of partitions and frames may not require the frame prior to installing the wall; check with your architect. However, generally the frame should be available when the wall is being installed. Delivery of frames and doors is almost always a problem. Due to the limited competition and the ambitious correctional construction program ongoing across the nation, manufacturers are overextended. Deliveries of the hollow metal can take 12 to 24 weeks from the approval of shop drawings.

ALTERNATIVES

Swinging Doors Versus Sliding Doors

Swinging doors are hinged and open in or out. Sliding doors are on a track with a housing above. The cost of swinging doors is approximately the same as sliding doors, depending on the options selected. Where the costs differ is in installation. A swinging door takes approximately six man hours to install while a sliding door requires 12 hours to install. Swinging doors also require less maintenance than the sliding door because they have fewer parts.

Swinging doors are used in minimum and medium security cells, control rooms, secure closets, mechanical and electrical rooms, low traffic sallyports, emergency exits, and exterior doors. They provide a much better seal for weather protection than sliding doors.

Sliding doors are used in medium and maximum security cells, high traffic sallyports and holding cells. When selecting a sliding door, remember that the width of the door plus an additional six inches is required for operation. Therefore, a three-foot-wide door will require a six-foot-six-inch corridor opening.

When placing a door, pay attention to tolerances and dimensions such as the height of the housing above the door and the distance from adjoining doors.

Locking Systems

Manual Propelled Manual Lock. Door movement is controlled manually. The dead bolt is opened by a key and locked by a key. This may be keyed on one or both sides. It is generally used for mechanical and electrical rooms and is the least expensive system.

Manual Propelled Manual Slam Lock. Door movement is controlled manually. The lock is opened by a key and automatically locks when closed. This may be keyed on one or both sides. It is generally used with a door closer to provide automatic locking. This price is comparable to the manual propelled manual lock.

Manual Propelled Electric Lock. Door movement is controlled manually except for being pushed ajar when unlocked. Locks are controlled individually or as a group from a remote control panel. The system is generally used for sallyports, cells and control rooms. The cost is approximately 60 percent greater than a manual lock (not including wiring and controls).

Electrical Propelled Electric Lock. The door movement and lock are controlled electrically from a remote control panel. This system is used on sliding doors only. It is generally used for holding cells, maximum cells and sallyports. The cost is approximately 80 percent greater than the manually propelled, electric locking system.

Manual Tool Override (Sliding Door Only). The door lock may be overridden by a wrench type device. It is located in the housing of the sliding door and is accessible in emergency situations. This is standard equipment with most manufacturers.

Mechanical Group Release. Doors may be unlocked mechanically in groups or individually from a control cabinet. It is generally used for emergency situations when power is out. Three position levers provide open/closed/maintenance (access to locking mechanism) positions. The cost is approximately $200 per door (the length of run and location of cabinet affect price).

Electric Keyswitch. The door can be electrically unlocked by a (mogul type) key mounted on the door frame outside of the cell. These switches may be enabled/disabled from the control panel. The cost for a sliding system is approximately an additional $450 per lock, $150 per lock for a swinging door. This option generally is too expensive for cells. It is used most often in sallyports.

Inmate Pushbutton. The door can be unlocked inside the cell by a pushbutton mounted on the door frame. These switches may be enabled/disabled from the control panel. This option may be purchased with the electric keyswitch. It is generally used in minimum cells.

Door Blanks

The selection of a door type usually is determined by the type of inmate being incarcerated. In addition to the type of door, the size of the door also must be selected. Adjusting the door height or width two inches does not significantly affect the cost of the door system. Changing the door size by more than four inches increases the price significantly. The thickness of a security door normally is 2 inches. For minimum security inmates, a 1-3/4-inch door may be used.

Hollow Metal. The hollow metal door is the most commonly used security door. It is recommended for minimum and medium security inmates. It is constructed with two 14-gauge, cold-rolled steel face sheets, with 16-gauge vertical reinforcing members spaced every four to six inches. The perimeter of the door is continuously reinforced with 12-gauge steel channel welded to the face. This door, without openings, is classified with a three-hour fire rating; with openings it is classified with a 1-1/2 hour rating.

Hollow Steel. The hollow steel door is similar to the hollow metal door except the face sheets are 12-gauge and vertical reinforcing occurs more frequently. This door is recommended for maximum security inmates. The cost is approximately 10 to 15 percent higher than the hollow metal.

Steel Plate. The 3/16-inch steel plate door was a common security door but has since been replaced by the hollow metal door because the steel plate is heavier and less durable. Its current application is for chase doors. The cost is less expensive; however, additional and heavier hinges may be required which offset the savings.

Solid Wood. A solid wood door may be adequate for minimum or medium security inmates only. Wood doors are one of the least expensive options available.

Grate/Jail Steel. This door comes in many shapes and materials. These include several different types of meshes, tubular steel bars and solid steel bars. These doors provide good surveillance, voice communications and air circulation while still maintaining security. What makes this type of door desirable in some instances also makes it undesirable in other instances. It is most expensive option.

Door Frame And Hardware Comparison

The door frame and hardware are generally determined given the door type, locking system, and whether the door swings or slides. Frames may be manufactured locally when faced with a time constraint, but are generally purchased with the entire door system allowing for single point responsibility.

Hollow Metal Frame. The hollow metal frame is a 12-gauge, cold rolled steel frame, continuously welded at the corners with integral stops. Each frame receives a minimum of three anchors per jamb. During installation the frames are fully grouted. The hollow metal frame is generally used with hollow metal doors. This frame also is used when the lock is housed in the frame instead of the door.

Steel Channel Frame. The steel channel frame is a 12-gauge, cold cooled steel anchored similarly to the hollow metal. The steel channel frame is used for heavy doors such as steel plate and jail steel. The steel channel frame also may be used for sliding doors where the lock is housed in the door. The steel channel frame is considered more secure than the hollow metal.

Institutional Hinge (Swinging Doors Only). The institutional hinge is made of cast brass with stainless steel non-removable pins. This hinge is 4-1/2 inches square with two sets of hardened ball bearings. This type of hinge is recommended for hollow metal and other light doors. Three hinges are required for each door.

Heavy Duty Hinge (Swinging Doors Only). Hinges are drop forged of mild steel and have heavier bearing thrust for heavier doors. This hinge may be used on lighter doors requiring two hinges or heavier doors requiring three hinges. The 5-inch hinge is welded on one side.

Recessed Door Handle. This handle is most often used on the inmate side. It is cast bronze and fastened with safety screws.

Door Knob or Door Pull (Swinging Doors Only). The knob is a non-operable pull used on both sides of the door. It is solid brass fastened with safety screws.

Door Closers. Recessed door closers are generally used. This type of closer is recessed into the door frame head so that no hardware is exposed. Exposed closers constitute a real hazard because the closers can be torn off and made into weapons. Surface-mounted closers generally are used only in minimum-security areas.

Vision/Observation Panels. This is used to allow light and visibility through the door. Sizes and shapes may vary depending on user preferences. The cost of the opening is approximately the square foot price of the glazing being installed. For example, a 5 x 12-inch observation panel that costs $100 will cost an additional $100 for the opening. The size of these panels may be dictated by fire code.

Speaking Device. Speaking devices vary in size depending on the manufacturer but are approximately six inches by eight inches. They are inserted below the observation panel and covered with a steel baffle to prevent the passing of contraband. The approximate cost is $130.

Shutter. The shutter is a hinged steel plate applied over the observation panel or over both the observation panel and speaking device. Its approximate cost is $130.

Food Pass. The food pass is a 3-1/4 inches by 5 inches clear opening with a heavy duty snap lock. It allows you to present food to maximum security inmates. The approximate cost is $150.

Door Frames Matrix

○ SOMETIMES APPROPRIATE ● APPROPRIATE		ALTERNATIVES								
		18 GUAGE COMMERCIAL	16 GUAGE COMMERCIAL	14 GUAGE SECURITY	12 GUAGE SECURITY	STEEL PLATE, ANGLES, BARS				
CRITERIA	COST									
	LOW	●				●				
	MEDIUM		●							
	HIGH			●	●	○				
	SECURITY									
	LOW/NONE	●				○				
	MEDIUM		●	●						
	HIGH				●	●				
	DURABILITY									
	LOW	●								
	MEDIUM		●	●						
	HIGH				●	●				
	SCHEDULE									
	SLOW			●	●	○				
	MEDIUM					●				
	FAST	●	●			○				

NOTE: Doors & Frames are typically of same gauge or the door may be one gauge less. Grouting of frames is optional and may or may not add to security integrity of frame but adds cost. A security door w/security hardware will be 3 times as expensive or more than a commercial set.

SPECIALTIES AND EQUIPMENT

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	MAYBE	DESIGN DEVELOPMENT	DONE
PROJECT STATEMENT	YES	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	YES	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

The specialties within your building include items which make the building operative such as toilet partitions, cabinetry, pass throughs, etc. Although these usually represent a small percentage of the cost of the project, they should be reviewed to ensure that only those items which are needed are included in the project and those materials specified are economically appropriate.

The equipment part of your project budget can be quite a high percentage of the total cost (as much as 10 or 15 percent) depending on what is included in your equipment budget. **The most important part of budgeting for equipment is determining what is included in the scope of work for equipment.** Typically the equipment in a construction budget is the "fixed" equipment or those items which are permanently attached to the building. This might include cell and dayroom furniture (bunks, desks, tables, etc.), kitchen or laundry equipment, which is fastened to the building, or a computer system, which is an integral part of the building's security or environmental control systems. (These may or may not be included with the actual systems they serve as the computer may serve more than one system.)

When you establish your budget, be very specific about what you include in your construction budget and what will be bought from furnishings or operating budgets. It is very easy to let some items fall through the cracks.

RELATIONSHIP TO OTHER SYSTEMS

When planning and designing for equipment and specialties, make sure these items fit the design of the rest of the building, particularly if you are purchasing the equipment direct for the contractor to install. If the contractor measures for the equipment and it does not fit, it is the contractor's problem. If you buy the equipment and have it delivered to the site and it does not fit, it becomes your change order problem. This applies not only to dimensions, but also to fitting electrical, plumbing and mechanical hookups.

ALTERNATIVES

The scope of this Handbook is not broad enough to cover a "typical" list of options for specialty and equipment items. However, a few cost-related tips may prove helpful.

- When specifying specialties such as toilet partitions or fire-hose cabinets, you can purchase painted metal products or stainless steel. Although the stainless steel products may be less prone to vandalism because the paint finish cannot be scratched off, these products cost more than painted metal products. Consider the location of the item and the finish of other materials in the same place. Consider staff toilet rooms separate from inmate toilet rooms. Placing stainless steel fire-hose cabinets in inmate areas where all of the other metal products (such as doors and window frames) are painted is similar to installing a heavy duty security wall with a non-secure glass window.

- When selecting cell and dayroom furnishings, consider your alternatives carefully. Because these items are repeated many times in your facility, seemingly small differences in cost per cell can multiply substantially.

- Cell, dayroom and dining room furnishings are manufactured by state prison systems throughout the country, including the California Department of Corrections Prison Industry Authority. You may want to compare the prices of these products to costs for similar items manufactured by the private sector.

- Making a mistake in the purchase of specialty equipment can be very expensive. Consider tapping the expertise of kitchen or laundry specialists. If your architect will be selecting this equipment, find out before finalizing the contract if the firm has in-house expertise or who it will be consulting. Tapping expertise in this area ensures the equipment specified is available in your market.

- Make sure you communicate your desires and budget goals clearly to whomever is specifying the equipment. Without this input, the designer may assume you want something you do not want or cannot afford. Involve the person who will be responsible for the operation of the equipment in the process.

- If you plan to use inmate labor for any of these operations, you should make this clear to the individual specifying the equipment. The equipment can be specified to use more labor-intensive or simplified controls or processes.

PLUMBING AND FIRE PROTECTION

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	YES	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

Your building's plumbing system consists of the plumbing fixtures, such as sinks and toilets, the piping connecting these fixtures and the building fire protection system (sprinklers or fire-hose cabinets). Two primary areas in which you can control plumbing costs are the selection of appropriate fixtures and fire protection systems.

RELATIONSHIP TO OTHER SYSTEMS

Fire protection systems are determined by the design of the facility and consideration of variables such as areas between fire-rated walls, location of access doors and location of the building on the site. Plumbing fixtures affect the surfaces they are fastened to and the means by which the piping to these fixtures will be accomplished.

ALTERNATIVES

The type of people who will be using the fixtures is a key consideration in their selection. Many types of institutional and correctional fixtures are available. Three categories are most commonly used: stainless steel, security porcelain, and standard commercial-grade porcelain.

Most correctional facilities have numerous toilet fixtures. Consequently, the selection of these fixtures will affect the cost of your facility substantially. Your design team should establish which areas will need individual fixtures for each cell as early as possible. Consider your high security areas and whether your low security areas will have gang toilets.

Once you've determined this, you can make your selections. Explore different scenarios to see what the cost range could be.

When choosing fixtures be sure to consider all of the costs involved, including the valves and piping necessary to operate plumbing fixtures. Although a wall-mounted toilet fixture may cost the same as a floor-mounted toilet, installation of the floor-mounted fixture will be less expensive. Wall-mounted fixtures require added valves and supports. Wall-mounted fixtures often are specified because they are easier to clean, but they also are subject to breakage by abusive inmates.

In addition to toilet and sink fixtures for inmate housing areas, you will need numerous other plumbing fixtures for showers, drinking fountains, and staff and public toilets. Once again, appropriate use will determine cost, but consider that buying one product in volume is usually less expensive than buying numerous different kinds of fixtures. One way to get a good price is to pre-purchase them directly from the manufacturer. You would supply them and the contractor would install them. If you do this far enough in advance, you may be able to receive bids on the fixtures desired and on an alternate that may be less expensive or more secure. The benefit is having actual costs to consider before making a decision. Because security fixtures can be long-lead items, an extended delivery schedule also may reduce the cost.

Alternatives in urinals are similar to toilet fixtures. Stainless steel security fixtures cost the most, security porcelain fall next in line, and commercial-grade fixtures are the least expensive. The primary difference between security and commercial porcelain fixtures is the security fixtures have push-button valves while commercial fixtures have lever valves. Automatic flushing units may be used for gang fixtures but add considerably to the cost of individual urinals.

Shower area construction alternatives include:

- Prefabricated stainless steel units are very durable, vandal-proof and easily maintained, but they are expensive.
- Ceramic tile over conventionally constructed walls and floors is cleaned easily and visually appealing for moderate cost, but can be subject to tile breakage and requires some maintenance of grout joints.
- Epoxy paints over masonry or concrete surfaces are probably the most economical solution. Epoxy paints are very durable but require special care to ensure proper installation. The substrate must be properly prepared to achieve an adequate bonding of the epoxy paint.

The cost of a fire protection system and its affect on the design of the entire facility varies substantially depending on the designer's creativity and willingness to thoroughly explore the possibilities allowed within applicable codes. Fire and life safety in an environment where inmate movements are restricted must be considered carefully, but an overly conservative and uncreative approach to meeting building code requirements can add 1 to 3 percent to the cost of the building. It is essential to know how the exiting, occupancy requirements and construction type will affect this system before moving beyond schematic design, because once the floor plan and sections are established, it becomes very difficult to modify a design to meet code requirements in an economical way.

Determine at your earliest opportunity whether the building requires a fire sprinkler system. Factors which determine this are:

- The occupancy classification of all spaces (one building will often have different occupancy classifications for different areas) and the construction type (type refers to type I, II, III, etc. with combustibility ratings, such as fire-resistive, non-combustible, combustible, etc.).
- The open areas around the building and proximity to other buildings.
- The area of the building or of separated spaces within the building. Because correctional facilities are constructed of substantial materials for security purposes, many of the walls, roof and floor assemblies will already have ratings and can be used to separate the building into smaller components.
- The number of access points into the building from the outside can determine whether sprinklers are required. Often a few additional doors can be added to eliminate the need for sprinklers. Once the floor plan is established, it may be too late to add doors.

Sprinkling of correctional buildings requires special care to keep the piping and heads as inaccessible as possible (to avoid inmates setting off the sprinkler system). Routing of pipes and location of heads is a design decision which should be considered during schematic design and finalized during design development. The cost of concealed heads and piping increases substantially the cost of a conventional sprinkler system.

Plumbing Fixtures Matrix

		ALTERNATIVES								
○ SOMETIMES APPROPRIATE ● APPROPRIATE		STAINLESS STEEL COMBINATION UNITS	PORCELAIN SECURITY FIXTURES	HANDICAPPED	WALL-MOUNTED STANDARD	FLOOR-MOUNTED STANDARD				
CRITERIA	COST LOW MEDIUM HIGH	●	●	●	●	●				
	SECURITY LOW/NONE MEDIUM HIGH	●	●	●	●	●				
	DURABILITY LOW MEDIUM HIGH	●	●	●	●	●				
	SCHEDULE SLOW MEDIUM FAST	●	●	●	●	●				

MECHANICAL SYSTEMS

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	YES	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

The building's mechanical system provides the environmental control, including heating, cooling, fresh air supply and humidity. This system typically costs 10 to 15 percent of the cost of the building, depending on the climate, design of the building envelope, and the type of systems selected to provide the desired environmental conditions in the building.

The most important thing you can do to get the mechanical system you need, want and can afford is communicate these goals to your designer. The designer needs to know:

- How you will use each space and how many people will be located there.
- Your environmental needs for each space. Do you want to heat the space only or heat and cool the space? If the space is cooled, what temperature do you want to maintain? Just because a space will be cooled doesn't mean the space must be cooled to what most people think of as air-conditioned.
- Your budget for the mechanical system. As discussed in the introduction of Section III, the design-to-cost model breakout of the project should allocate dollar resources to each building system so the design can be developed according to a budget amount for each system. When designers are unaware of budget parameters, they will strive to "give" the client the "best" system possible. As with most things, the "best" system is the most expensive solution. Therefore, it is essential the architect, as coordinator of all the consultants, communicates the budget parameters for the mechanical system.
- The amount of control you wish to maintain from space to space in the building. Controlling the environment in each room differs in price substantially from controlling a number of adjacent spaces together.
- The type of equipment and lighting fixtures you want in each space. Because equipment and lighting emit heat,

the cooling portion of the system must be able to accommodate these loads. This heat gain will offset the heating needs of a space.

Because your architect is responsible for the overall coordination of the systems within the building, the mechanical consultant will be working for the architect. It is the architect's job to make sure all of this information is collected and communicated to the mechanical consultant. If these questions are not being asked, the mechanical designer may be basing the design on assumptions from previous similar projects. Generally, such assumptions lead to an over-designed system.

Life-cycle cost is important when selecting your mechanical system. The energy cost to run the system, the equipment replacement time, and the amount of control should be compared to the first-cost. In general, the more expensive first-cost systems typically provide more control and have greater longevity than low first-cost systems. Analyze your options. As with any life-cycle analysis, the figures are derived from many subjective assumptions. Scrutinize these assumptions more so than the bottom line cost to make a prudent decision, whether the pay-back on a more expensive system is worth the first-cost and if you have enough first-cost dollars to pay for the "best" system.

When your design team is presenting options on first-cost versus life-cycle cost, be aware that a complicated "energy efficient" design will only be energy efficient and provide a better environment if properly maintained. Therefore, a simpler, less expensive and perhaps less comfortable system (in terms of controls) may, in fact, prove to be a more economical choice in life-cycle terms because it will be easier to maintain. To avoid buying a complicated mechanical system which looks good on paper, involve a staff maintenance person when you make your selection. If that person doesn't understand how it works and what it will take to maintain it, the "best" choice may be wasted.

RELATIONSHIP TO OTHER SYSTEMS

The mechanical system must fit among the other building components, such as roofs, ceilings, columns and beams, piping and ductwork. The equipment must be accommodated inside the building, on the roof or on the ground. The electrical system will affect sizing of heating and cooling loads because of the heat it generates. In a secure environment, inmate access to the system's components becomes an important consideration

ALTERNATIVES

Because of the volume of information required to describe all of the systems available (the most common are listed in the matrix), a discussion of each in this Handbook is not practical. The matrix should be used as a general reference. Discussion of some general differences follows.

Centralized Systems Versus Decentralized Systems

A centralized system uses heating or heating and cooling devices located throughout the facility, piping or ducting a heated or cooled medium (steam, hot water or air) to various locations throughout the system. This system can service one or a number of buildings. You have greater control with a central plant; its primary equipment is designed for long-term use. First-costs and energy costs usually are higher.

Decentralized systems use a number of heating or heating and cooling devices located throughout the facility. The energy source, typically gas, for heating and electricity for the cooling are delivered directly to the units. First-costs are usually lower and energy costs also may be. Control, however, is not as good, and some of the equipment is not designed for long-term use.

Gas-fired unit heaters (typically found in industrial and warehouse/maintenance facilities) are found at the low end of the cost scale. Central heating and cooling plants define the high end. It is very common to use a variety of equipment for one facility to serve different purposes. For instance, you can use unit heaters in the storage and maintenance areas, evaporative coolers in the housing areas, and a variable air volume system for the administrative areas. The cost per square foot for these alternatives will range from under $5 per square foot to $20 per square foot. Mechanical needs for each space should be considered separately.

Mechanical Systems Matrix

○ SOMETIMES APPROPRIATE
● APPROPRIATE

CRITERIA	ALTERNATIVES									
	VARIABLE AIR VOLUME W/CENTRAL CHILLER & BOILER	VARIABLE AIR VOLUME W/CENTRAL BOILER & DIRECT EXPANSION COOLING	VARIABLE AIR VOLUME PACKAGE W/DIRECT EXPANSION COOLING	SPLIT SYSTEM HEAT PUMP	CONSTANT VOLUME HEAT PUMP	PACKAGE UNIT GAS-FIRED ELECTRIC COOLING	DRY EVAPORATIVE COOLER	EVAPORATIVE COOLER (SWAMP COOLER)	GAS FURNACE HEATING ONLY W/DUCTING	UNIT HEATERS (NO DUCTING) NO HEATING-COOLING
COST LOW				●	●	●	●	●	●	●
COST MEDIUM		●	●							
COST HIGH	●									
LIFE CYCLE-EQUIPMENT LOW							●	●		
LIFE CYCLE-EQUIPMENT MEDIUM	●	●	●	●	●	●			●	●
LIFE CYCLE-EQUIPMENT HIGH										
LIFE CYCLE-ENERGY LOW COST								●	●	●
LIFE CYCLE-ENERGY MEDIUM		●	●	●	●	●	●			
LIFE CYCLE-ENERGY HIGH COST	●									
CONTROL-LOW								●	●	●
CONTROL-MEDIUM		●	●	●	●	●	●			
CONTROL-HIGH	●									

ELECTRICAL SYSTEMS

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	YES	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

Your facility's electrical system will have the following components:

- Site distribution.
- Site lighting.
- Major electrical equipment such as switchgear, transformers and emergency generators (may be located outside the building).
- Building distribution elements including raceways, wire, circuit panels and smaller transformers.
- Lighting, outlet and switch devices.

Similar to a mechanical system, the best way to get a functional, cost-effective electrical design is to establish user needs and budget parameters before the design work begins. If you lack the technical expertise, you must rely on your architect to ask the right questions about user needs and on your architect and cost analyst to determine budget parameters.

Establishing user needs (lighting levels and power requirements for equipment) before beginning design is important because when designers are left with uncertainties, they tend to over design lighting and power systems. If the footcandle levels (the measurement of light in a space) are specified 20 percent higher than need be and every light and outlet is assumed to be used at all times, the design of the entire system will cost more due to larger service, switchgear and emergency equipment. (The calculation of amount of power is determined by a "diversity factor," that is how much of the electrical load will be used at once.)

When hiring your architect, find out who the electrical consultant will be. Question the firm's design methodology and clarify that you expect the system to be designed avoiding the "rule of thumb" conservative and "safe" approach to design. The designer should use computerized programs for calculating necessary lighting levels and power loads.

RELATIONSHIP TO OTHER SYSTEMS

The electrical system must respond to the other systems it services. The finishes, ceiling heights and number of windows play a large part in how the lighting works. Providing power to the mechanical, kitchen, laundry and other equipment determines power load and switchgear needs. Once again, the architect must make sure all of the systems work together.

ALTERNATIVES

Electrical systems are composed of too many components to be displayed in a matrix. However, a number of cost-related concepts are briefly discussed below.

Site Distribution And Lighting

Depending on the size and complexity of your facility (one building or numerous buildings), the amount of electrical distribution may range from simple service to the building and parking lot lighting to a complex distribution system between different buildings on the site. If you have a great deal of site distribution, consider overhead wiring as it can be less expensive than underground distribution if economically designed. Security and appearance aspects also must be considered in this decision. The least expensive underground distribution uses PVC conduits for raceways. A more expensive solution is rigid steel conduit. Still more expensive (roughly 10 times the expense of PVC) is the option of encasing them in concrete.

High voltage distribution generally is less expensive than low voltage because the size of cable increases dramatically for long runs of low voltage cable.

Wood poles for overhead power or lighting are the least expensive. "Roadway design" poles and fixtures are the next most economical; "architectural" are the most expensive. Roadway design are standard economical fixtures used for roadways. Architectural design uses more customized poles and fixtures with more expensive finishes and shapes.

Building Distribution And Power

PVC conduit under slabs is more economical than rigid steel conduit.

Aluminum feeders are less expensive than copper feeders but must be installed properly at connection points. Inspection of connectors is critical. Aluminum buss panels are less expensive than those made of copper. Drawout breakers cost approximately twice that of molded case breakers. (Drawout breakers can be removed without de-energizing the panel.)

Listing a number of manufacturers for any specified product improves competitive material prices.

Use of stub-in breakers is less expensive than bolt-on breakers.

The diversity factor used to size power loads dramatically affects sizing of equipment. A factor of 1 assumes all outlets and power loads will be used simultaneously. This results in the most conservative design.

Electric Metallic Tubing (EMT) conduit (also known as thin-wall conduit) costs a fraction of rigid steel conduit.

Light Fixtures

Selecting fixtures should be conducted room-by-room because security fixtures can cost many times more than standard fixtures. Zone where security fixtures are needed. Heavy duty, off-the-shelf industrial or commercial fixtures often will suffice where security is an issue. Consider access to the fixture. If it is inaccessible, a security fixture may not be necessary.

Specify as many competitive brand names as possible to increase competition.

SECURITY AND COMMUNICATIONS SYSTEMS

WHEN TO CONSIDER

NEEDS ASSESSMENT	NO	SCHEMATIC DESIGN	YES
MASTER PLANNING	NO	DESIGN DEVELOPMENT	YES
PROJECT STATEMENT	MAYBE	CONSTRUCTION DOCUMENTS	DONE
ARCHITECTURAL PROGRAMMING	MAYBE	CONSTRUCTION	DONE

NO-Need not consider.
MAYBE-This system may be considered.
YES-This system should be considered.
DONE-This system should have already been considered.

DESCRIPTION

Your security and communications systems must work in concert throughout your facility. Many facets of these systems must be explored to properly tie them together while still meeting all of your needs. This section provides an introductory look at telephone systems, security and administrative intercom systems, closed circuit television systems, public address systems and master antenna TV systems.

ALTERNATIVES

Telephone Systems

Since the divestiture of Bell Telephone, each correctional institution must investigate its requirements quite closely. Public utilities no longer offer this service.

Many options are available. If you don't have the necessary expertise on your staff, consider hiring an outside communications consultant. Modern technology dictates use of a digital system in lieu of an analog system. Digital transmission opens up an entirely new communications dimension that employs not only voice, but data, video, text, graphics and the new world of Integrated Services Digital Network (ISDN). Determine the most cost-efficient system that not only will serve immediate needs, but also will meet the new technological requirements just over the horizon.

Your selection should answer the following questions:

- What type of system do you want?
- Do you need a totally independent on-premises system?
- Should it be part of an overall city, county or state PABX or a centrex system?
- Does it integrate 911 Emergency Services?
- Does it combine your voice and data requirements?
- Do you need to prepare a Request for Proposals to get competitive bidding?
- What does the local utility central office offer?
- Are the methods of data and voice transmission to off-site facilities microwave, fibre optics or hard wired?
- Will you use local or wide area network planning?

This difficult task requires careful planning, implementation and follow-up on an on-going basis.

Security And Administrative Intercom Systems

All correctional institutions use extensive intercom systems not only for inmate control, but also as a staff communications system. A well-thought-out and integrated system can reduce staffing and maintain the utmost in security and life safety. Specialized systems also exist for door control, inmate visiting and line-up, nurse call systems and overall monitoring systems. Systems also may be used for emergency or all calls to locate personnel in areas not normally equipped with public address systems.

Closed Circuit Television Systems

Closed circuit system design is critical. It should be designed in conjunction with intercom for maximum function. Obviously closed circuit TV is used for surveillance, door control, security and generally controlling key areas that require visual coverage. Unless this is closely investigated and planned properly, it can become an expensive system that in many cases is ignored or misused. Proper system design will greatly reduce maintenance costs which can get quite expensive.

Public Address Systems

Correctional facilities use a variety of public address systems primarily to locate personnel within a facility, as well as for emergency announcements and possibly background music. In certain cases, an intercom system used in inmate areas can also be used for public address. There is a tendency to overdesign PA systems with many zones of paging that are found non-functional for the intended purpose. Considering your desired end result, investigate clearly the basic functionality of any system considered.

Master Antenna TV Systems

An MATV system distributes TV signals throughout an institution as required for TV reception. Normally you provide this in inmate dayrooms and cells. Usually MATV systems are designed to receive all available local "off air" stations plus one or more channels from a VCR (Video Cassette Recorder/Player) for special or educational purposes. Normally, before design, on-site tests by qualified technicians are necessary to determine design parameters. Distribution methods vary. Methods considered for correctional facilities should reduce installation costs and help keep maintenance and vandalism at a minimum.

Other Systems And Issues

Other security and communication systems related to correctional facilities that you may want to explore include:

- Pneumatic (vacuum) tubes.
- Radio systems.
- Security detection microwave systems.
- Duress alarms.
- High-frequency radio antenna systems.
- Computer systems. (A related issue to consider is whether conduit should be run throughout the facility during construction in anticipation of future computer needs.)

The following agencies and associations are excellent sources of information related to criminal justice issues and correctional facilities planning:

American Correctional Association (ACA)
4321 Hartwick Road, Suite L-208
College Park, MD 20740
(301) 699-7600

American Institute of Architects (AIA)
Committee on Architecture for Justice
1735 New York Avenue
Washington, DC 20006
(202) 626-7300

California Board of Corrections
600 Bercut Drive
Sacramento, CA 95814
(916) 445-5073

California Criminal Justice Planning Directors Association
3640 13th Street
Riverside, CA 92501
(714) 787-2224

National Association of Counties
Criminal Justice Program
440 First Street NW
Washington, DC 20001
(202) 393-6226

National Criminal Justice Reference Service (NCJRS)
User Services
Box 6000
Rockville, MD 20850
(301) 251-5500

National Institute of Corrections/National Information Center
1790 - 30th Street, Suite 130
Boulder, CO 80301
(303) 444-1101

National Institute of Justice
Construction Information Exchange
Box 6000
Rockville, MD 20850
(800) 851-3420 or (302) 251-5500

NOTE: Refer particularly to the following NIJ publication: DeWitt, Charles, B. National Directory of Corrections Construction (First Edition), Washington, DC: U.S. Department of Justice, National Institute of Justice, 1986.

We gratefully acknowledge the following publications:

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State of California, Youth and Adult Correctional Agency, Board of Corrections (prepared by Farbstein/Williams and Associates). Corrections Planning Handbooks, Sacramento, CA: Board of Corrections, 1981.