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National Institute of Justice

Construction Bulletin

Michael J. Russell, Acting Director

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Project Delivery Options: An Introduction to Corrections Construction

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With limited funding and often under time pressure from litigation or court orders, elected officials throughout the country face increasing demands to provide adequate detention and correction facilities. In response, some jurisdictions have adopted alternative methods of design and construction contracting ("delivery") to deal with cost constraints and schedule requirements. These methods offer variations on the "design/bid/build" approach traditionally used for publicly funded projects, as well as on the alternative "design/build" and "construction manager/general contractor" (CM/GC) approaches that have been successfully used in the construction of privately owned facilities.

The term "design/bid/build" refers to the traditional method of managing publicly funded construction projects in which the

owner hires the architect, construction work is competitively bid based upon completed architect documents, and the owner awards construction contracts to the lowest qualified bidders. Several variations of the design/bid/build approach have been developed in response to the unique demands of some corrections projects.

The term "design/build" refers to any one of several alternatives in which the owner hires, under a single contract, a team consisting of architects, construction managers, and construction contractors. The team is responsible for designing and constructing the proposed facility in compliance with criteria established by the owner for a lump sum price or a guaranteed maximum price (GMP). Some design/build alternatives include provi-

sions for the team to provide funding for the construction of the facility, which is then leased to the user. Sometimes the lease agreement includes provisions for the facility to be purchased for a lump sum payment at some point in the future (that is, lease-purchase facility).

Between the design/bid/build and the design/build approaches is the CM/GC alternative in which the owner hires an architect to design the facility and, early in the design process, hires a construction manager or general contractor to assume full responsibility for construction for a guaranteed maximum price.

This Construction Bulletin provides general introductory information about the several approaches (design/bid/build, design/build, and CM/GC), possible

As efforts to combat drugs and crime continue, a steady stream of offenders has more than doubled Federal and State prison populations during the past decade, to a current total of 883,593, according to the Bureau of Justice Statistics. Local jail populations have surpassed 426,479, and the probation and parole population now totals more than 3.2 million.

Inadequate prison and jail capacities continue in many States and localities, compromising efforts to punish offenders and deter crime. Federal, State, and local authorities need practical, proven information on more rapid and economical ways to ensure adequate corrections capacity.

To help meet these needs, the National Institute of Justice (NIJ) created the Construction Information Exchange. The Exchange provides easy access to the latest

concepts and techniques for planning, financing, and constructing new prisons and jails. State and local officials can tap this valuable network and obtain the information they need through the Construction Data Base, the Construction Information Exchange's Reference and Referral Service, the *National Directory of Corrections Construction*, and Construction Bulletins like this one.

In Construction Bulletins, NIJ highlights critical corrections issues and provides case studies of success stories from corrections specialists and construction experts who have saved time and money in corrections construction projects.

This Bulletin describes the principal contracting and management methods jurisdictions use to complete the process of designing and building correctional facilities. Written to help planners select or adapt a project delivery

method, this Bulletin outlines the methods, describes variations, and summarizes possible advantages and disadvantages of each in terms of time, cost, and quality. The Bulletin also outlines the facility development process, explains the roles and responsibilities of project participants, and suggests management processes.

Through NIJ's Construction Information Exchange, State and local officials can benefit from innovative approaches that incorporate techniques of proven effectiveness. By building on the experience of others, these officials are better able to develop well-designed, cost-effective jail and prison facilities that will serve the needs of their jurisdictions.

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variations on them, and advantages and disadvantages of each. This information should be useful for corrections officials in selecting and adapting a method suited to their individual needs as they plan new corrections construction projects.

In addition, this Construction Bulletin includes several side panels that summarize the overall facility development process, explain the roles and responsibilities of the key project participants, and provide suggestions for the management process.

There is no best method for every project. The selection of the project delivery method reflects a variety of factors: project size, availability of funds, resources and

talents of inhouse staff, scheduling requirements, and contracting regulations.

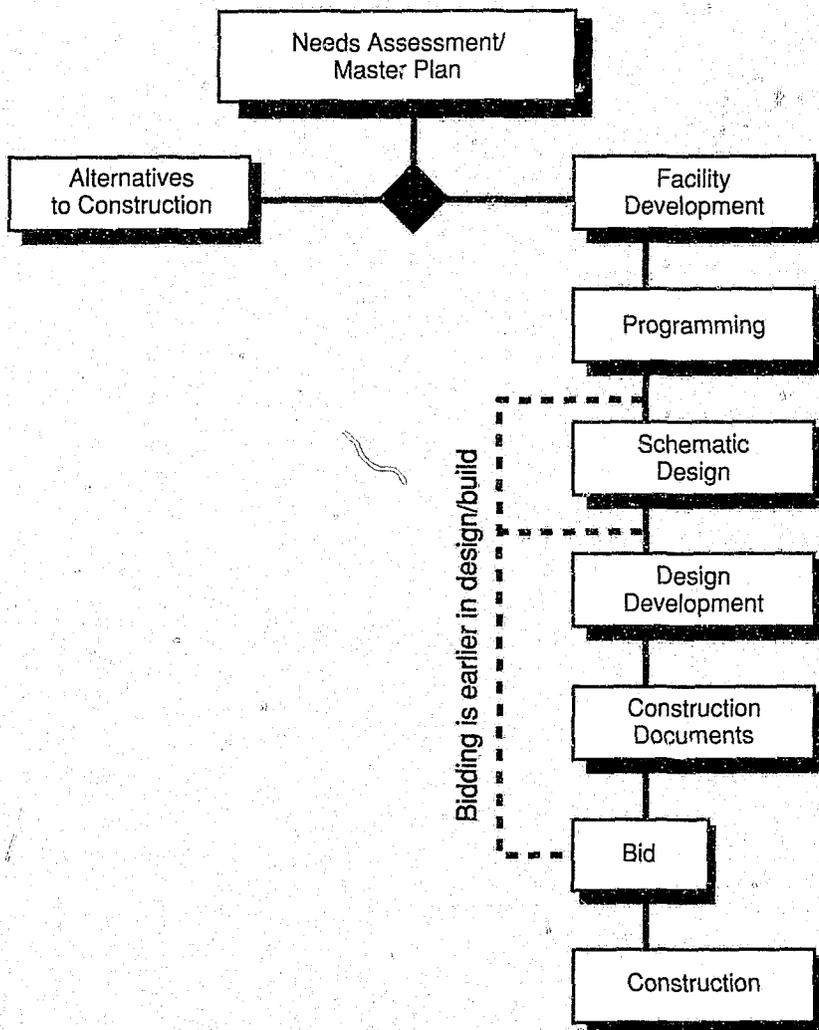
Basic project delivery methods

The steps in the overall facility development process are outlined in the panel on pages 2 and 3. The steps, while present in all projects, are organized differently under the various project delivery options used in the construction of correctional facilities. To meet the rigorous demands of a construction project schedule, for example, the construction of early phases of the project, such as foundations and utilities, can begin before the design documents for the entire

facility are completed. Substantial time required for design and construction can be saved because work on initial construction can overlap work to complete design documents. Schedules can be compressed under each of the methods by overlapping and accelerating the pace of each of the steps in the overall facility development process.

Very fast schedules, however, create complicated management problems and

Figure 1. Facility Design Process



Overall Facility Development Process

The term "facility development process" describes the entire process of planning, designing, constructing, and opening a new corrections facility or expanding an existing facility. The process for a traditional design/bid/build project is depicted in figure 1. The basic steps, described below, should be included in the process for every facility, even though the sequence and duration may be different under each of the project delivery options.

Needs assessment and master plan

The facility development process should begin with a needs assessment and a master plan that place the requirements for facilities in the broader context of the justice system. The needs assessment and master plan should be completed and approved before the planning and design of any new institution begins. The needs assessment identifies characteristics of the inmate population and develops population projections. It also reviews alternative programs to determine ways to reduce new construction. This information is then used to develop a master plan. All too often, this first step is missed or skipped, resulting in the loss of important opportunities to look at alternatives to construction.

The master plan should begin with a mission statement that clearly defines the goals and objectives of the jurisdiction. Once the mission is stated, the master plan identifies:

- Ways to reduce the need for new facilities.
- The kind of new facilities that are actually needed, including type of facility size, and security classification.

The master plan also includes cost, schedule, and phasing recommendations for both new facilities and alternatives to new

can therefore become the primary cause of failure to meet deadlines, complete construction within budget, or build a quality facility. The more the schedule is compressed, the more complicated and risky the management becomes, requiring closer coordination and quick, tough decisions.

To address these issues, owners now regularly hire program managers, project man-

agers, or construction managers to assist them in the delivery of completed facilities within budget and time constraints. Some owners are adapting their traditional design/bid/build approach to incorporate fast-track, construction systems, and other techniques to meet the compressed schedules. Other owners are electing to delegate much of the responsibility for coordination and control of cost and schedule to a con-

tractor by adopting design/build or CM/GC approaches for project delivery.

Advantages and disadvantages, which exist for each method, can be described in terms of the balance of TIME, COST, and QUALITY. All three factors are critical in every project, but owners must assign priority in terms of their own project requirements.

construction. In some cases, the master plan identifies the site for new facilities. In other cases, site requirements and potential locations are identified. At the conclusion of the master plan phase, the jurisdiction decides whether to proceed with alternatives to construction, planning and design of new facilities, or both.

Some owner agencies have staff with the experience and capability to produce the needs assessment and master plan. However, others hire consultants to prepare plans tailored to the special problems and requirements of corrections construction. (See box on page 8 for more information about hiring management consultants.)

Programming

Programming, the next step in the facility development process, defines the new facility's requirements. The program is a narrative document that describes the functions of the proposed facility and identifies space needs, circulation requirements, adjacent entities, and other environmental issues. When finished, the program describes the size, quality, and function of each of the physical areas to be included in the new facility. The program document often suggests staffing requirements for the proposed facility.

Experienced consultants are usually hired to work with staff to prepare program documents. These consultants may be independent contractors or part of the architect's team.

Schematic design

Once the owner approves the program, actual design of the facility begins with a schematic design. In this step, the architect produces conceptual drawings that are consistent with the program document and illustrate the general size and shape of and relationships among all of the spaces. Basic building systems—structural, mechanical, and electrical—are outlined, and

a schedule for remaining design and construction is established. A cost estimate is generated based on the gross square footage of the building multiplied by a cost-per-square-foot unit. The unit cost is derived from the cost for similar facilities and construction costs in the area. The estimate includes a "contingency," a dollar amount that takes into account cost increases from further development and refinement of the design, as well as an allowance for the change orders that normally occur during construction. An ample contingency is necessary at this point, because the architect has not yet defined many details of the building. The contingency can be reduced during later phases as the design proceeds and materials and systems for the new facility are more clearly defined.

The approval of the schematic design is an important milestone because it provides the first opportunity to examine the building plan and often provides the basis for funding approval. In many jurisdictions, the drawings and architectural information produced at this phase are widely—and often publicly—reviewed, and controversies are resolved. Indeed, in many cases, this is the only design that receives detailed public review. Officials should analyze the staffing and operational implications of the schematic design and make appropriate revisions before proceeding to the design development phase.

Design development

The design development phase specifically defines the design by producing more detailed drawings, calculations, and "outline specifications" in which the features and scope of the structural, electrical, and mechanical systems are described. The work in this phase identifies and resolves conflicts between the overall functional or operational plan and the proposed construction systems. The schedules and estimates are updated and carefully reviewed

to ensure they are still compatible with required budgets and completion dates. The revised construction cost estimate still includes a contingency amount to allow for further design detail, for variations in the bidding market, and for construction change orders. Staffing and operations should be further analyzed because the development of architectural details and building systems may result in changes to staffing requirements.

Construction documents

This step produces the working drawings and specifications that are necessary for bidding and construction to take place. The detailed requirements for all systems and construction emerge in a set of drawings and written specifications. The schedule for construction is made final and incorporated into the contract documents as a clear requirement.

The revised cost estimate reflects the architect's best estimate of the likely cost of the project in the current bidding market. Often, this estimate is not publicly released until the construction bids are received from contractors.

Bidding

Under the traditional design/bid/build method, once the construction documents are complete, the project is ready to be offered for bid. The documents are usually distributed to interested contractors and subcontractors. General contractors develop sealed bids and submit them to the jurisdiction's bidding authority. The bids are opened in a public forum and the bid amounts are announced. The project is usually awarded to the lowest bidder, unless there are irregularities in submission or questions about qualifications.

Construction

Once the contractor has been given a notice to proceed, construction begins.

Very fast schedules affect the quality of the facility because the necessary time to coordinate the work and check documents for errors or omissions is reduced. Fast schedules sometimes require selecting materials and components for the facility that are easily available and can be installed quickly, rather than more durable or serviceable items that would be incompatible with the schedule. Likewise, an emphasis on minimizing cost can result in compromising the quality of materials and components selected and may require a longer schedule. A decision to build the highest quality facility possible will almost certainly require more time and money than faster or cheaper alternatives.

Variations on each of the basic methods have been developed and successfully applied to corrections projects in recent years. These variations address the complicated and often conflicting issues that drive corrections construction projects and balance the TIME-COST-QUALITY equation.

Design/bid/build method

The traditional project delivery method for corrections has been the design/bid/build approach in which the owner contracts directly with an architect for the design of the facility. The work proceeds sequentially from the needs assessment and master plan to programming and to design; only then does the project proceed to bidding and construction. The owner contracts separately with a general contractor or multiple contractors for the construction work, usually on the basis of public bidding with contracts awarded to the lowest bidders. Figure 2 depicts the traditional design/bid/build organization.

Roles and responsibilities

Figure 3 summarizes the roles and responsibilities of the key participants in the design/bid/build method. The owner executes separate contracts with the architect and one or more contractors. While design/bid/build maximizes the owner's control of the outcome, it also can require the most time and the highest level of owner involvement and responsibility. The owner, therefore, must take a strong leadership role throughout the process. This method ensures "checks and balances" in design and construction by providing for full public disclosure of all design and construction activities through formal

Figure 2. Traditional Organization: Design/Bid/Build

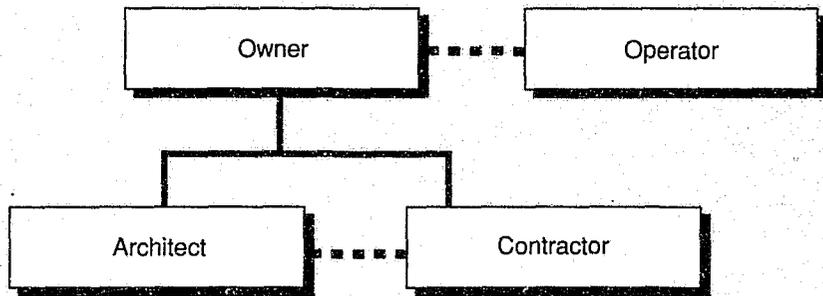


Figure 3. Design/Bid/Build: Roles and Responsibilities

Owner	<ul style="list-style-type: none"> • Controls all decisions • Assigns staff • Makes timely decisions 	<ul style="list-style-type: none"> • Actively participates throughout
Architect	<ul style="list-style-type: none"> • Is responsible for all design/specification 	<ul style="list-style-type: none"> • Reports directly to owner throughout
Contractor	<ul style="list-style-type: none"> • Is responsible for construction 	<ul style="list-style-type: none"> • Works for owner, but work is reviewed by architect
Operator	<ul style="list-style-type: none"> • Provides operational requirements during design 	<ul style="list-style-type: none"> • Participates in all steps

approvals at each phase and by requiring the architect and contractors to have separate contractual relationships with the owner.

TIME, COST, and QUALITY

The design/bid/build method normally requires more time because the steps in the process are consecutive. The schedule can be compressed to some extent without reducing the quality of the work. However, intensive owner participation and timely decisionmaking are required.

When total cost is the primary concern, the design/bid/build approach is usually preferred. The owner is able to evaluate the estimated cost at the completion of each step of the design and can adjust the scope and quality of the project as necessary.

The low-bid process ensures competitive pricing. The actual cost of the construction bids are not known, however, until the design and documentation are complete. If the construction market fluctuates during the design period, the actual low bid can vary significantly from the cost estimates prepared during the design phase. The contractual relationship with low-bid general contractors can be adversarial and can result in change orders and claims which add to the final cost of the project.

The quality of the completed project can be more readily controlled by the owner under this traditional method. Because the design work is done sequentially, the owner has the opportunity to fully review the design at each phase and make scope

continued on page 6

Roles and Responsibilities of Key Participants

Selecting the right project delivery method requires understanding that a team—consisting of the owner's staff, an architect, various other consultants, and construction contractors and subcontractors—must work together to make the project successful. The roles and responsibilities of the participants vary depending on the delivery option selected; however, all participants have responsibilities that cannot be delegated to other team members.

Owner

The owner is defined in this document as the official responsible for managing the contracts and the decision process that will produce the design and construction for the project. The owner usually works for a government agency responsible for justice projects. The owner:

- Defines the mission, goals, and limitations of the project.
- Ensures project budget, schedule, and requirements are defined and monitors progress as the project develops.
- Ensures the facility operator's views and needs are known and considered throughout the process.
- Leads in selecting an appropriate delivery option.
- Assigns adequate inhouse staff to manage all project activities or organizes a team of inhouse staff supported by consultants.
- Gives staff the authority to make decisions or ensures they have ready access to decisionmakers.
- Keeps the project team focused on goals and commitments.
- Is prepared to make tough, timely decisions.
- Ensures that decisions, once made, are reliable; overturned decisions are costly and time consuming.
- Obtains a realistic level of funding for the proposed facility or defines

a facility that is realistic for the funds available.

- Commits to funding the operation of the planned facility (that is, plans a facility appropriate for realistic operating budget expectations).
- Remains an active participant throughout planning, design, and construction and provides leadership for the project team.
- Is responsible for project success.

Operator

The operator is the official responsible for operating the facility after construction is completed. In most jurisdictions, the operator is someone other than the owner, as defined above. The operator:

- Cooperates with the team and works to define facility plans that are realistic for the budget and schedule limits.
- Provides sufficient staff time to participate in the planning and design processes and is open to suggestions from staff.
- Is open to new ideas.
- Commits substantial staff time and other resources to planning a transition to the new facility and developing appropriate operational plans.

Planning consultants

Many owners retain planning consultants during early stages of the facility development process to assist with a variety of tasks when inhouse staff are not available or do not have the time or knowledge required. The kinds of consultants involved vary according to the type of project, the skills and experience of the owner's staff, and the delivery option to be used.

- Criminal justice planners help develop justice system needs assessments and master plans, population projections, and analyses of existing facilities, programs, or services.
- Urban or land planners assist in evaluating or selecting sites.
- Programming consultants prepare functional and architectural programs. They can be hired by the owner directly or by the architect as a component of the design process.

Architect

The architect develops a design that allows the program to be implemented and the facility to be constructed within budget limitations. The architect:

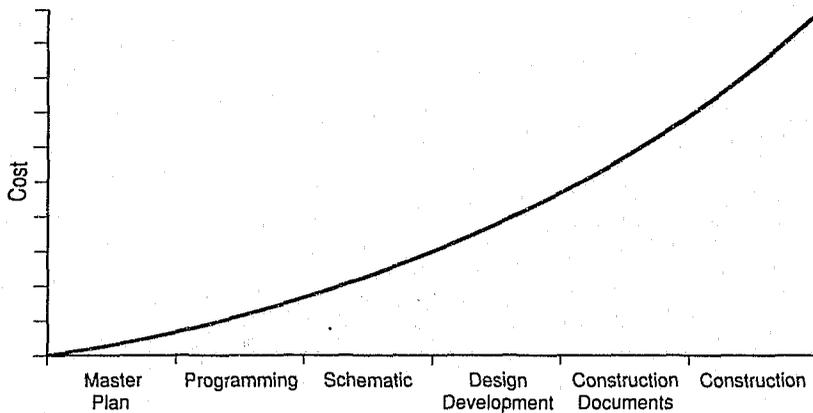
- Develops a design that is appropriate for the schedule and delivery option.
- Coordinates the work of architectural and engineering staff and consultants to ensure complete, accurate documents.
- Prepares a cost estimate at each approval milestone to demonstrate that the design is progressing within budget.
- Interprets the contract documents and provides clarifications and corrections during construction, as needed.
- Prepares change orders and periodically reviews the progress of the work to ensure compliance with the design.

Construction contractors

The role of the construction contractor varies significantly under the various delivery options.

- Under traditional design/bid/build systems in which the contract is awarded to the lowest competitive bidder, the contractor is obligated to do no more than required by the contract documents. The contractor's role can become adversarial when disputes arise.
- Under design/build or CM/GC, construction is performed by subcontractors to the primary design/build contractor or CM/GC. The primary contractor usually selects the subcontractors through a competitive bid process. Adversarial disputes can arise in this arrangement. However, the primary contractor is responsible for resolving problems within the overall contract budget and *usually* has more flexibility in problem solving than a government owner.

Figure 4. The Cost of Design Changes in the Facility Design Process



adjustments if necessary to maintain the budget. When there is time for a complete review of each phase of the work, the architect is more likely to avoid errors and the owner is less tempted to request changes later in the process. As figure 4 illustrates, design changes become more costly with every step in the facility development process.

One area of concern in many jurisdictions is financing the construction of a new facility. The traditional design/bid/build approach does not lend itself to many alternative financing options. The approach is most effective when construction funds are made available at the same time that the construction contract is ready for award. In this case, funds are most often provided through the traditional allocation of general funds or through other traditional financing methods.

Variations

Fast-track process. The "fast-track" process was developed to reduce the total time for design and construction under the design/bid/build approach. Under the fast-track process, the site work, building foundation, and other early construction work may be designed and bid before the design for later stages of construction is completed. This saves time by allowing early construction to proceed while the overall design of the building is still under way. Subsequent parts of the project can also be designed, bid, and started in stages.

Although some jurisdictions have used this variation successfully, it can be very difficult to manage. Cost and inefficiencies can increase because the design is not complete when the first phase of construction begins. Time and money can be lost if bids for subsequent stages of the project exceed the budget.

The primary drawback of this variation, however, is in the quality of the facility. Fast-tracking can complicate the design process because it can reduce the flexibility to make design adjustments in later stages if they affect construction already under way. For example, if the foundation is under construction, the architect has less opportunity to change the configuration of structural components such as walls and columns.

Construction systems. Another area of interest to many jurisdictions is the use of "construction systems." These are systems that provide premanufactured components—such as finished precast concrete cells or complete electronic security systems—which are incorporated into the building construction. The systems are advantageous because they can be delivered and installed very quickly and thus reduce the total construction time. Because they are manufactured under factory conditions, they can ensure a level of quality not available in field construction. Some systems are proprietary—that is, their designs are patented or they can only be produced by a single vendor or contractor.

The design/bid/build approach can accommodate proprietary systems when an architect can categorize them generally as a "performance specification." Since a usual requirement of the design/bid/build approach is to award the construction contract to the lowest bidder, procurement regulations may make it difficult for the owner to mandate use of a particular system that is not competitively manufactured. It may be possible, however, for the owner to contract separately for a proprietary system under certain conditions and require the general contractor to incorporate the system in construction. For example, an owner who decides to use a premanufactured concrete cell component may contract directly with the manufacturer to provide a specified number of components by a specified date. The owner's contract with the general contractor must then indicate that these components will be supplied by the owner. The general contractor's construction contract will include the specifications for the components so the contractor will understand installation obligations, and it will also identify the date and manner of delivery to the site.

In this "owner-furnished, contractor-installed" scenario, the owner is responsible for ensuring coordination of the two contracts. Such arrangements can be very difficult to manage. Owners who determine that this variation is best for their projects should develop specific management procedures to deal with potential complications.

Multiple trade contractors. Another variation of design/bid/build is the use of "multiple trade contractors" who contract directly with the owner. The owner, in turn, may contract with a construction manager who is responsible for overall management of the various contracts. The owner, assisted by a construction manager, assumes responsibility for coordinating the work among the trade contractors. In some States, separate contracts are required for plumbing, mechanical, electrical, and other specific trades. There can be as many as 30 separate contractors, each responsible for specific trade work. Because there is no single general contractor responsible for the coordination of the work, the owner or owner's construction manager bears significant responsibility. However, costs

may be saved by reducing the profit and overhead of the general contractor.

Figure 5 displays the design/bid/build variations described here; the potential impact in terms of TIME, COST, and QUALITY; and the implications for design/bid/build or design/build.

Design/build method

The design/build approach differs from the design/bid/build approach in that the owner contracts with a single contractor who provides all design and construction services to complete a project. Figure 6 compares these two approaches. Usually, the design/build contractor is really a team, led by a general contractor or developer, that includes an architect, other consultants, and a series of construction trade contractors. Because the design/build contractor controls both the design and construction of the facility, the contractor has opportunities to closely coordinate the work of the architect and construction trade contractors, making it possible for the construction to proceed in phases before the construction documents for all phases of the work are completed. The owner provides basic design criteria for the project but gives up some control of the design process because the architect is not working directly for—or in the sole interest of—the owner. Figure 7 on page 8 depicts the organization of a typical design/build project.

Statutory changes or changes in the owner's policies and procedures for design and construction procurement may be required in some jurisdictions before a design/build process can be authorized.

The design/build contractor is selected early in the design process, often at the time the programming is completed. The contractor may be selected solely on professional qualifications, on a combination of qualifications and low estimated budget, or on the basis of guaranteed maximum price for the completed facility. Some jurisdictions "prequalify" the contractors: only those who pass screening are allowed to submit price proposals. In other jurisdictions, qualifications are the basis of the selection, and a guaranteed maximum price is negotiated after selection. In either case, the contractor works within a set budget but with limited information about project requirements, since the design has not yet been developed in detail.

Figure 5. Variations

Variation	Primary Impact	Implications for	
		D/B/B*	D/B**
Fast Track	• Time	• Limits options for changing scope or footprint to bring project within budget	• Many D/B projects use fast-track techniques
Construction Systems	• Time (construction) • Cost	• Limits design options	• Limits design options
Multiple Trade Contracts	• Cost	• Requires different organization of bid documents and multiple contracts • Requires owner to coordinate contractors	• Trade contracts controlled by D/B contractor or developer
Financing	• Cost (often more expensive to accommodate higher interest rates)	• May be more difficult to fit into D/B/B	• May be integrated into D/B proposal

* Design/Bid/Build

** Design/Build

Figure 6. Comparison of D/B/B* and D/B**

	D/B/B	D/B
TIME	May take longer than D/B	May be shorter than D/B/B
COST	Cost not "fixed" until start of construction	Cost may be "fixed" prior to design
QUALITY	Owner controls all decisions and can ensure quality	Owner may sacrifice control of many decisions in exchange for setting price before design

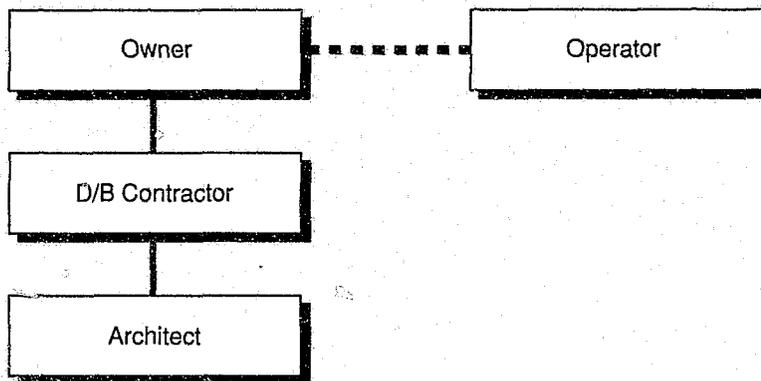
* Design/Bid/Build

** Design/Build

The owner may also negotiate a fixed fee with the design/build contractor rather than a fee that is open-ended and unspecified within the guaranteed maximum price or expressed as a percentage of the actual cost of construction. A fixed fee eliminates the incentives for the contractor to increase

the cost of construction unnecessarily. Allowances or lump sum amounts can be identified and negotiated for the design/build contractor's onsite general conditions costs and included as a component of the guaranteed maximum price. Normally, the process is structured to provide for the

Figure 7. Design/Build Organization



owner to review, negotiate, and approve the construction cost, as well as approve the contractor's design interpretation of the owner's criteria for the facility. The agreement may be revised before construction proceeds. To ensure that a facility meets the owner's needs, the contract must specifically set forth the owner's requirements for the facility, the approvals and decision process, and the owner's role during design and construction.

In a design/build contract, the owner does not retain full control of the project at each design step. It is possible to manage the control through contract provisions, such as design approval milestones or a contingency budget to cover owner-imposed changes. However, the more control the owner retains, the less flexibility the design/build contractor will have to control the fixed cost or time.

Managing the Process

Regardless of the delivery option chosen, the owner must ensure competent management of the complex facility development process. A broad range of management options is available, and selecting the appropriate mix of tools and human resources may be the most important decision an owner faces when organizing the team responsible for managing project delivery.

Inhouse staff

The first option available is the use of inhouse staff who are experienced in the corrections facility development process. This may be an appropriate choice if the owner determines that properly experienced staff and management tools are available to provide administration, coordination, control, and inspection services. The owner must recognize that a significant commitment of staff effort is required for a large, complex project, particularly when schedules and budgets are ambitious. Projects that are smaller also demand significant management resources, as there are as many issues to address, even though they are smaller in scale.

Management consultants

When sufficient inhouse resources are not available, the owner can hire a

management consultant and select specific services to supplement the owner's team.

The owner may choose a consultant firm with staff, management experience, and expertise in providing and using specific management tools developed for corrections projects. Individuals and firms who provide this type of management assistance are referred to as construction managers, project managers, or program managers: the distinctions in types of service relate to the time when the manager joins the project and the kinds of services provided. Figure 8 on page 10 depicts the organization associated with each type of manager.

Construction managers are usually brought into the project during the construction documentation phase or just before beginning construction. They are responsible for the administration and management of the construction process. Because the design process is nearly complete, the construction manager's activities are usually limited to final review of the plans and specifications and to estimating costs and reviewing construction materials. Evaluation of the architect's documents for value engineering or constructability can be provided, but recommendations for substantial changes this late in the design process can add time to the schedule and need to be carefully coordinated with the architect. Construction managers often

assist in the contract bid and award process and take a leading role at the construction site once construction begins.

Project managers are hired when the owner is planning a single facility project and needs assistance during the preconstruction (planning and design) and construction phases. To be most effective, project managers should be brought into the project early. They can provide a broad range of services to assist the owner in the planning and design process as well as other preconstruction activities. During the construction phase, they provide the same services as the construction manager.

Program managers provide the same services as construction and project managers and, additionally, can assist the owner in coordinating and managing a building program that includes multiple projects and components.

Management consultants cannot completely fill the owner's role on the project team. An owner's representative, with authority to make timely decisions, must lead the team if the project is to be successfully completed. The management consultant provides the expertise, the staff, and the services to perform the management tasks needed to control the delivery of the project and recommends action to the owner. The owner's representative sets project policy and makes decisions on the consultant's recommendations, then authorizes

One design/build variation that improves owner control is to have the owner develop the concept through to the schematic design phase to ensure that the project layout and design respond to the owner's operational needs before turning the project over to the design/build contractor. The increased level of detail provided by a schematic design provides the design/build contractor with a clearer understanding of the owner's needs but still allows room for flexibility in the selection of materials and systems and in construction scheduling.

Roles and responsibilities

The design/build approach fixes the maximum cost for the facility early in the process, simplifies the owner's role, and minimizes the amount of inhouse staff time needed for the project. The design/build contractor is responsible for managing and coordinating all aspects of design

and construction to complete the project within the specified time and cost limits. If the design/build contract is structured to limit the owner's role, the tradeoff in terms of quality control of the finished facility can be significant. The ability to influence design decisions is reduced. Therefore, the owner should select a design/build contractor who will be responsive to the owner's facility needs and will establish review procedures and a problem-solving process that will allow the owner to provide input without disrupting work.

TIME, COST, and QUALITY

The design/build method is most effective when either time or cost is the most critical factor. The required completion date can be specified before design begins, creating clear incentives for the contractor to move the project along to meet this deadline. Because the design/build contractor con-

trols both design and construction, and because owner approval milestones are minimized, the contractor has opportunities to overlap phases and take other steps to increase the pace of the work which might not be possible under the traditional design/bid/build method.

Because the architect in this method works for the design/build contractor rather than directly for the owner, contract provisions for owner input and the opportunity to review the design may become very important. The architect is obligated to design a facility that complies with the criteria provided by the owner and can reasonably be expected to select the best alternatives available; however, as a subordinate to the contractor, the architect may be inclined to be primarily faithful to the time and cost interests of the contractor's team.

the consultant, architect, and contractors to proceed to the next decision point. Timely decisions by the owner are essential.

The cost of the management consultant's services is directly proportionate to the level of service required. Usually, the services are priced by calculating the hourly rates of the assigned staff multiplied by a factor for overhead and profit, the length of time their services will be required, and the actual costs of the equipment and supplies they use.

Management consultants can provide a variety of services, as required. These are outlined below.

Preconstruction services

- **Program or project administration.**
 - Project management plans, procedures, and strategy.
 - Site acquisition assistance.
 - Funding appropriation assistance.
 - Coordination and problem solving.
 - Meeting and decision management.
 - Public relations and presentations.
 - Consultant/architect selection assistance.
 - Communication, documentation, files, and records.
 - Contract negotiations, administration, and payment processing.
 - Progress and status reporting.
 - Permits and approvals.

- **Planning and design management.**

- Document review and approvals management.
- Constructability reviews.

- **Budget and cost management.**

- Budget development and management.
- Cost status reporting.
- Estimating.
- Value engineering.

- **Schedule management.**

- Project or program schedule development.
- Schedule monitoring and reporting.

- **Bidding and contract awards.**

- Early purchase of long-lead items.
- Advertising for bids and document distribution.
- Bidder prequalification.
- Bidder questions/addenda distribution.
- Bid openings, evaluation, negotiation, and award recommendations.

Construction services

- **Construction administration.**

- Meetings and decision management.
- Coordination.
- Progress monitoring and reporting.
- Problem solving and dispute and claims resolution.

- **Shop drawing submittal management.**

- Submittal scheduling, monitoring, and status reporting.
- Approvals processing.

- **Document clarification and coordination of changes.**

- **Change order management.**

- Estimates and negotiations.
- Approvals processing.

- **Cost reporting.**

- **Contractor payment processing.**

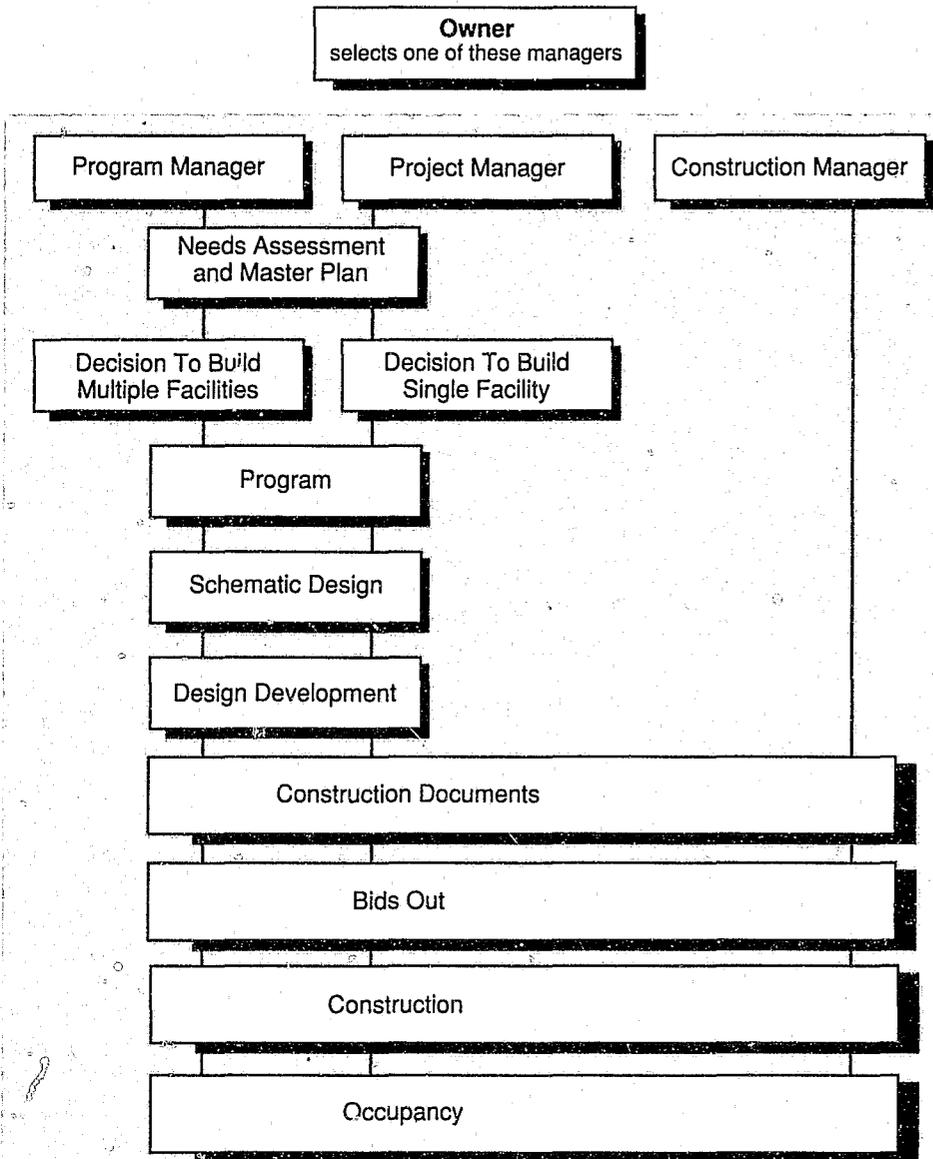
- **Construction schedule management and status reporting.**

- **Inspection and testing.**

- **Completion, acceptance, and contract closeout.**

- Punch-lists and final inspections.
- Operation and maintenance manuals.
- Staff training coordination.
- Record documents and as-built drawings.
- Warranty work during guarantee periods.

Figure 8. Construction Organization Chart



Where cost is the primary issue, the owner may find the design/build approach advantageous; however, quality may be compromised.

Because project cost is set in the very beginning by the agreement between the owner and contractor, the owner can anticipate that the project will meet requirements without cost overruns. However, because the detailed design of the facility has not been developed, the contractor and architect will have considerable flexibility

in selecting materials and components. Successful results are possible when the contractor and architect are experienced in jail or prison construction and clearly understand the owner's requirements from the start of the project. When the corrections experiences of the individuals responsible for the work are limited, when the owner's requirements are not clear, or when the budget is unrealistic, costly and time-consuming disputes may arise between the owner and the contractor.

Despite the potential for disadvantages, the design/build method allows more flexibility on other issues. By delegating responsibility for the completed facility to a design/build contractor, the number of controversial public or political encounters can be reduced.

Variations

Financing the construction of a facility is often one of the most controversial and time-consuming issues a jurisdiction must face. A variety of financing options may be available with a design/build approach. A jurisdiction might enter into a contract with a contractor, who would pay for the construction and lease the facility back to the jurisdiction once it is completed, or have the design/build team include resources to operate the completed facility. In addition, some jurisdictions have successfully required the design/build contractor to provide the site for the facility, thus delegating the controversial site acquisition and environmental approval process.

Construction systems

Because public bid requirements can be met through the process for selecting the design/build contractor, the use of proprietary systems may be allowed. The design/build approach can therefore facilitate the use of such proprietary systems as pre-manufactured cells, precast building components, security and electronics systems, and management information systems. Using these systems can improve the quality of the facility and reduce the time required for construction. The owner might even require use of a particular proprietary system, when justified by time, cost, or quality motives.

Construction manager or general contractor method (CM/GC)

Under the CM/GC approach, the owner contracts directly with the architect for design services and, under a separate contract, selects a professional construction manager to provide both construction management and general construction services for a guaranteed maximum price. Rather than complete the design and then award the construction to one or more low-bid general contractors, the owner hires a CM/GC to provide professional management services and to assume re-

sponsibility for bidding and awarding construction trade contracts and managing and coordinating the activities of the trade contractors. The CM/GC is usually selected on the basis of qualifications and experience or a combination of qualifications and fixed fee. The guaranteed maximum price is set before construction begins, generally protecting the owner from cost overruns as a result of change orders and claims. Because there is considerable freedom in packaging and fast-tracking construction trade contracts, a CM/GC can often coordinate very fast construction schedules. Statutory changes or changes in the owner's policies and procedures for construction procurement may be required before the CM/GC process can be authorized.

In addition to the fixed fee, the contract usually provides an allowance or fixed price for overhead expenses for the services of the CM/GC as a part of the guaranteed maximum price, as well as an appropriate contingency for changes and problems that normally occur. The CM/GC controls the contingency fund but is subject to owner review and reasonable limitations on the purposes for which it can be used. Liquidated damages for late

completion are normally included. When an early completion date is needed, an incentive clause can be included.

Roles and responsibilities

Because the architect works directly for the owner, the design can be more responsive to the owner's needs for the facility but the architect should also be obligated to cooperate with the CM/GC in designing a facility that can be built within the owner's time constraints and budget limitations.

The CM/GC divides the construction work into a series of subcontracts or "trade contracts," managing and coordinating the work of the trade contractors as necessary to meet the completion date and guaranteed maximum price. The CM/GC is usually required to advertise and competitively bid the trade contracts and award the contract to the lowest qualified bidder for each bid package. The CM/GC may have the authority to prequalify trade bidders, reject those considered to be unqualified, enter into contracts with the second lowest bidder, and reject and rebid trade bid packages if the low bid is considered unqualified or nonresponsive. The CM/GC signs the trade contracts and assumes responsibility for coordinating the work done under

them, as well as for delivering the completed facility within the guaranteed maximum price by the required completion date. Under some contracts, the CM/GC's team is allowed to perform some limited portion of the work for a negotiated amount.

Usually, the CM/GC is hired early in the design process and participates in a professional construction manager capacity during the preconstruction phase by providing estimating, scheduling, and value engineering assistance. Since the architect works directly for the owner, the CM/GC may provide suggestions for the design process but does not control it. Estimates for the guaranteed maximum price are developed during early stages of the design and updated regularly. The guaranteed maximum price is negotiated before construction proceeds.

The owner plays a critical role in facilitating coordination between the architect and CM/GC. Timely decisions and approvals are essential to avoid delaying the work. Once documents are approved, it is important to minimize or avoid disruptive changes requested by the owner.

Roundtable Process

The information contained in this Construction Bulletin is the result of the efforts of the American Institute of Architects' Committee on Architecture for Justice. The committee invited construction professionals, criminal justice architects, and owners' representatives to participate in a roundtable discussion regarding the project delivery approaches that are currently available for corrections projects. The roundtable participants had a lively debate over a period of 2-1/2 days to discuss topics addressed in this Construction Bulletin. The group included the following people:

Carole Sanchez Knapel is a research fellow at the National Institute of Justice. She convened the seminar and organized the information for this Bulletin. Formerly, Ms. Knapel was the director of the Justice Projects Division in Santa Clara County, California, where she was responsible for the

planning and construction of criminal justice facilities.

William J. Patrick is senior deputy assistant director, Administration Division, for the Federal Bureau of Prisons (BOP) in Washington, D.C. Formerly, he was chief for Facilities Development and Operations for BOP.

Wantland J. Smith is vice president of West Coast operations for Rosser Fabrap International. Over the past 16 years, Mr. Smith has been responsible for more than 5,000 beds of correctional facility design.

William Proctor has provided construction, project, and program management services nationally for corrections and courthouse projects for more than 22 years. He recently joined CRSS Constructors, Inc., on the West Coast.

Russell E. Drobney Jr. is a civil engineer with 25 years of experience in both the design and construction phases of the industry. He has devoted the past 10 years of his career almost exclusively to the

corrections field. He now provides consulting services through his own firm located in Northern Virginia.

Marvin B. Jacobson is a principal of CUH2A, Inc., a multidiscipline architectural/engineering firm based in Princeton, New Jersey. Mr. Jacobson, principal-in-charge of his firm's criminal justice practice, is a frequent speaker and has published on subjects related to the design and construction of correctional facilities.

Rod Miller founded CRS, Inc., in 1972 as a nonprofit research and consulting firm. He has published many books and articles on standards, facility planning and design, staffing, and case law.

Allen L. Patrick is an architect and principal for NBBJ-Patrick. He has been involved in the programming, planning, and/or design of more than 200 detention and correctional facility projects throughout the United States and abroad.

TIME, COST, and QUALITY

The CM/GC method is most effective when time and cost are critical but the owner's inhouse resources for managing the construction contracts are limited. Competitively bid construction contracts can be adversarial, particularly when the project is publicly funded and controversial. The responsibility for delivery of the completed facility is delegated to the CM/GC, and the role of the owner is reduced to managing the CM/GC's and architect's contracts. The CM/GC is able to phase and overlap trade contract schedules to meet the completion date. Since the CM/GC has the contractual relationship with the trade contractors, he or she is able to more closely coordinate work and resolve problems to minimize delays and extra costs.

Because the CM/GC has guaranteed the final cost of construction, the owner knows the maximum cost of the project before construction starts. However, the CM/GC is allowed considerable flexibility to draw on the construction contingency fund to cover changes and extra costs. Unused contingency money is usually returned to the owner at completion of construction.

The CM/GC's fixed fee and an allowance for overhead expenses are included in the guaranteed maximum price. The architect's fee is funded separately and controlled by the owner.

Because the architect works directly for the owner and the CM/GC must construct the project in accordance with the architect's documents, the owner can evaluate the estimated cost at the completion of each step of the design and can adjust the scope and quality of the project as necessary. Because this process can allow time for a complete review of each phase of the work, the architect is more likely to avoid errors and the owner is less tempted to request changes later in the process.

Conclusion

At the start of planning, designing, and constructing new corrections facilities, basic decisions must be made regarding choice of the project delivery method. Each of the above methods offers certain advantages and disadvantages. Variations on each of the basic methods may also offer a particular advantage. The owner

must clearly understand all of the options and review resources available for the project. There is no best answer that applies to every project. Whichever project delivery method is selected, however, the owner must understand that active involvement is essential for success. Ultimately, it is the owner who benefits from the facility and, therefore, must accept primary responsibility for its design and construction.

Carole Sanchez Knapel, currently a fellow at the National Institute of Justice, is developing evaluation instruments that can be used to measure the effectiveness of jail and prison facilities.

Opinions or points of view expressed in this document are those of the author and do not necessarily reflect the official position or policies of the U.S. Department of Justice.

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