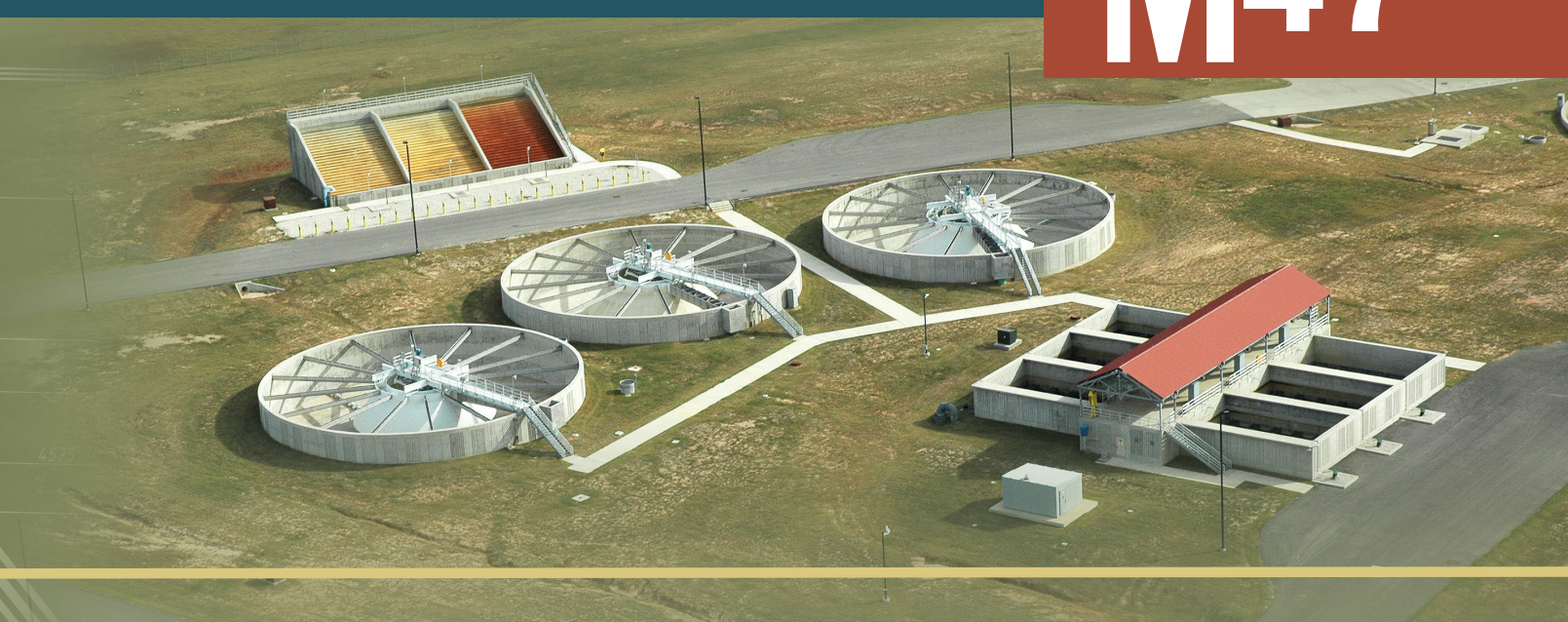


Capital Project Delivery

MANUAL OF WATER SUPPLY PRACTICES

M47



Second Edition



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Capital Project Delivery

AWWA MANUAL M47

Second Edition



**American Water Works
Association**

MANUAL OF WATER SUPPLY PRACTICES — M47, Second Edition

Capital Project Delivery

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Preface

This manual introduces the terms and procedures used in water utility construction project administration in the United States. The intended audience is anyone involved in such projects, including engineers, contractors, suppliers, administrators, and decision-makers. The main emphasis of the manual, however, is presented from the water utility's, or owner's, point of view.

Because construction projects vary so much from project to project and country to country and because state and local regulations vary nearly as much, this manual cannot address every specific issue. Because of the variance, the manual cannot be considered a standard of practice. It should be used, rather, as a resource in planning, designing, and managing construction projects.

Contract documents have important legal consequences, and consultation with qualified professional services firms, such as attorneys and consultants, is encouraged before entering into a contract for the performance of construction, engineering services, construction management, and other services.

This publication, titled *Capital Project Delivery*, is the second edition of AWWA Manual 47, formerly known as the *Construction Contract Administration Manual*, published in 1996. The American Water Works Association (AWWA) and the Capital Project Delivery Committee would appreciate any comments on the manual. Contact the AWWA Volunteer and Technical Support Group at VTS@awwa.org, or write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098.

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Photographs in this manual are courtesy of Joe Reichenberger, Brian Steglitz (City of Ann Arbor, Mich.), Amy Kramer (Northern Kentucky Water District), and Kevin Linder (Aurora Water, Colo.).

Introduction

Capital projects are those construction projects that further the growth of a utility's infrastructure or upgrade or replace aging infrastructure. These capital projects involve a significant amount of monetary investment (capital) and, when completed, are expected to service the utility and its customers for decades. The term *capital project delivery* refers to the method of contracting for the construction of these projects. Depending on the delivery method, the term may also include the design or short-term or even long-term operation of the project. Figures I-1, I-2, I-3, and I-4 illustrate typical water utility construction projects.



Figure I-1 Large water transmission pipeline (courtesy of Beaumont Cherry Valley Water District, J. Reichenberger, P.E., District Engineer)



Figure I-2 Steel water tower (courtesy of B. Steglitz)



Figure I-3 Prestressed circular or cast-in-place rectangular reservoir (courtesy of Beaumont Cherry Valley Water District, J. Reichenberger, P.E., District Engineer)



Figure I-4 Headquarters/admin building (courtesy of A. Kramer)

In the past, the design-bid-build approach was the traditional project delivery method used by most large and small water utilities—particularly publicly owned utilities. However, within the last decade or so, other delivery methods such as design-build, design-build-operate, and others have evolved based on successful experiences in the private sector. As projects became more complex, owners sought the assistance of program managers (PM) and construction managers (CM) to assist them in project delivery.

Manufacturers are taking big strides in the development of technology for treating water. These are not subtle changes but major differences in construction and operation of these systems. Owners are faced with new problems on how to contract for this technology in such a rapidly changing world. The boards of directors, commissioners, and management of water utilities are quietly wondering what risks are being assumed. How do they protect themselves? What are utilities getting into?

The purpose of this manual is provide public and private water utilities with a menu of various project delivery methods, a roadmap to implementing the method, and analysis of applicability, the risks involved, the advantages and disadvantages. It provides utility staff and management with a foundation for discussion with other utilities, consultants, and construction contractors as to the applicability of a particular method to the utility's project.

This introductory chapter discusses the principal terms used in the manual, explains the major differences in project delivery methods for publicly owned versus privately owned utilities, and previews the chapters of this manual.

PRINCIPAL TERMS

The terminology used in contracts and construction varies from locale to locale. The terms used in this manual are not intended to be the only correct terms that can be used. For example, a project manager is sometimes called a resident manager, a project engineer, a construction manager, or a resident engineer. Depending on the project and locale, there may be differences in the meanings of the terms. The contract documents for a project should define the terms to be used on a specific project.

The term *owner* refers to the entity, usually a utility, that arranges the financing for the project, contracts with the other participants, and operates and maintains the project after it is completed.

The term *consultant* refers to a professional or a firm hired by the owner to perform planning, design, management, construction observation, and other services. In this manual, the consultant is also referred to as the *engineer* or *design engineer* (in reference to engineering-related services). Of course, a consultant may also perform services other than engineering, such as architectural design.

The term *contractor* refers to the firm or consortium that constructs the project. Other groups, such as the American Society of Civil Engineers (ASCE) and the American Water Works Association (in its standards), refer to the *contractor* as the *constructor*. This manual uses the terms interchangeably. The word *contractor* usually implies a general or prime contractor, i.e., the firm with prime responsibility for the construction of the project. Firms hired by the general contractor to provide construction services, usually in specialty areas, are *subcontractors*. The terms *vendor*, *equipment supplier*, or *equipment manufacturer* refer to the entity that designs, manufactures, delivers, and often provides installation assistance, startup, and training for equipment or materials furnished to the owner. These terms are normally used in the context of owner-procured or owner-prepurchased equipment. Sometimes the terms are also used to describe those entities that provide material and equipment to a general or subcontractor.

The term *contract administration* is used in this manual to refer to the owner's project management efforts thorough the entire project delivery process. Contract administration

occurs over the complete project from planning through postconstruction. The term *construction management* is more specific to the construction phase of the project.

Other terms are defined as needed in the following chapters.

PUBLICLY OWNED VERSUS PRIVATELY OWNED UTILITIES

There can be differences between publicly owned utilities and privately owned utilities when constructing projects. For example, a private owner may not be bound to competitive bidding as strictly as a public entity. Public utilities may be precluded from using some project delivery types as a result of policy, charter, or state or local law. For the purposes of discussion in this manual, the utility is assumed to be either publicly or privately owned unless strong differences exist. In that case, the differences will be discussed. The utility should discuss any of the “nontraditional” project delivery methods with its legal counsel beforehand.

PROJECT DELIVERY METHODS AND OVERVIEW

Table I-1 presents a summary of some of the project delivery methods available and typical projects for which they might be considered.

RECENT TRENDS

Although it is difficult to quantify increases in actual expenditures, the following trends are occurring:

- Design-build projects are becoming more prevalent in water treatment. Agencies that have gone with design-build for water treatment facilities include the city of Seattle, Wash., the city of Orlando, Fla., and the city of Detroit, Mich., among others.
- Agencies with large capital improvement programs to replace aging infrastructure or to accommodate growth in their service areas have retained program managers to set criteria for design and construction, select design consultants, perform design review, conduct the bidding process, select the contractor, and manage the construction and startup phases. Agencies that have used program managers include the Southern Nevada Water Authority, city of San Francisco Public Utilities Commission, city of San Diego, and others.
- Seawater desalination and other water resource projects are areas where private entities are being formed to provide complete design-build-own-operate services. Two recent notable projects in California include the Cadiz Groundwater Storage and Dry Year Supply Program and Poseidon Resources’ Carlsbad Desalter.

CHAPTER PREVIEW

The manual is presented in three main sections intended to divide the topic of project delivery into distinct areas of discussion. However, some overlap is occasionally necessary to provide a complete discussion.

Section I contains three chapters and introduces conventional project delivery. Chapter 1 discusses the traditional (design-bid-build) construction project, including the project phases, participant responsibilities, and advantages and disadvantages. Chapter 2 introduces construction documents, which include bidding requirements, contracts, drawings, and specifications; the chapter also reviews standard contract documents developed by the Engineers Joint Contract Documents Committee (EJCDC) and others. Chapter 3 discusses the reasons for prequalifying contractors and the steps in selecting contractors.

Table 1-1 Summary of project delivery methods

Project Delivery Method	Brief Description	Types of Project
Design-bid-build	Traditional method wherein owner provides a complete design, openly invites bids, and issues a single construction contract to a constructor. Owner provides oversight of the constructor's workmanship and materials.	Applicable to any project, large or small.
Multiple prime contracts	Owner provides complete design, openly invites bids for more than one part of the project. Multiple construction contracts are on-going simultaneously—often on the same site. Owner provides oversight of each constructor's workmanship and materials.	Applicable to parts of projects that are easily separated (e.g., pipeline segments) or that require different skills and experience (e.g., pipelines versus treatment facilities, reservoirs, or buildings).
Design-build	Owner provides a partial design and design criteria, openly invites bids or proposals to complete the design and construct the facility, and issues a single contract to a design-construction entity. Owner frequently retains some control over the design to ensure conformance with the design criteria and provides some oversight of the constructor's workmanship and materials for conformance with established criteria.	Applicable to any type of project, but best suited for projects like reservoirs, water treatment facilities where the equipment is "packaged" and represents a major portion of the cost, or when there is need to complete a project in an abbreviated time frame. A membrane treatment plant is a good example.
Design-build-maintain	Essentially the same as design-build but requires the constructor to maintain the facility for a prescribed period of time.	Applicable to any type of project but particularly applicable to a complex project involving equipment and machinery such as a water treatment plant.
Turnkey	Essentially the same as design-build but with the design-build entity also providing additional services such as site selection and purchase, financing, or both.*	A water treatment facility—particularly a complex facility—involving new or innovative technology and where the owner does not have a site or the financial resources immediately available.
Design-build-own-operate-transfer	Essentially the same as a turnkey, except the constructor actually owns the facility and operates it for an extended period of time. At the end of the contract time period, the constructor transfers ownership to the utility. Usually payment is made based on the quantity of treated water, often with "take or pay" consequences.	A water treatment facility—particularly a complex facility—involving new or innovative technology. May be appropriate where owner does not have capital funds available.

* Design-Build Institute of America (DBIA) 2006. A variety of techniques may be used by owners in the process of delivering their capital projects. Some of the more common methods are presented in Table I-2 along with a brief description and typical applicable project types.

Increasingly, drinking water supply projects are constructed using nontraditional or alternative project delivery methods. Section II introduces the commonly used alternative approaches to construction projects and contract administration. These approaches range from construction management performed by the project owner (chapter 4) to design-build and turnkey projects (chapter 7) in which a private firm completes all the phases of the project. Other chapters in section II discuss hiring a construction management firm to provide contract administration (chapter 5), projects with multiple prime

Table 1-2 Project delivery variants and options

Option	Brief Description	Types of Project
Prequalifying and selecting contractors	Technical and financial qualification statements are requested from equipment suppliers, construction contractors, and design-build entities from which a short list of three or four entities are selected that may then bid for the project.	Very large complex projects requiring specialized expertise and experience, e.g., dams or projects involving new technology.
Equipment prepurchase	Owner prepurchases equipment and requires the constructor to take delivery of the equipment and install it or prenegotiates a price with a particular vendor or subcontractor and requires all bidders to use the equipment or subcontractor at the prenegotiated price. This alternative may result in significant cost savings to the owner because the contractor's markup on the purchase of the equipment is eliminated. But there is additional risk the owner must bear in terms of schedule and delivery.	For projects when an owner wants a particular brand of equipment to match existing equipment; or when particular manufacturer's equipment substantially impacts the detailed design; or when the owner needs to accelerate the project.
Construction management	Owner retains a firm to provide services during the design, construction, and commissioning to oversee and manage the design firm, oversee the bidding, and oversee the construction and startup. Usually limited to a single project.	Almost any project where owner does have the technical or staff resources available.
Program management	Similar to construction management except the consultant now manages the entire capital improvement program. Usually extends for many years. Program managers are typically precluded from doing any design or construction work on the projects.	Typical when owner is a large entity with a large number of capital projects in various stages of design and construction at a given time.
Construction management at risk	Similar to construction management except at some point in the design process, the construction management entity offers to construct the project for a guaranteed maximum cost. Construction manager then takes on the role of constructor.	Applicable to any project, but usually limited to a larger, more complex project.

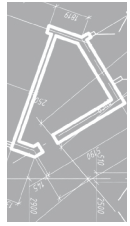
contractors (chapter 6), and projects with a guaranteed maximum price, i.e., construction management at risk (chapter 8).

Section III discusses general issues common to all project delivery methods, including budgeting and payment procedures (chapter 9), performance clauses that give the contractor incentives to complete the project on time (chapter 10), warranties that are guarantees of the contractor's and suppliers' materials and work (chapter 11), risk allocation (chapter 12), disputes and claims (chapter 13), communication (chapter 14), selecting consultants (chapter 15), and partnering (chapter 16). These general issues apply to all types of projects and contract administration.

At the end of this manual, the bibliography lists resources that can be consulted for more detail about the topics introduced in these chapters, and a substantive index is provided for the convenience of the reader.

REFERENCE

Design-Build Institute of America (DBIA).
2006. *Design-Build Definitions*. Washington, D.C.: DBIA.

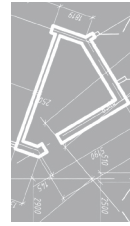


SECTION I

Conventional Project Delivery

- Conventional Project Delivery: Design-Bid-Build
- Construction Documents: Overview and Application
- Prequalifying and Selecting Contractors

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Chapter 1

Conventional Project Delivery: Design-Bid-Build Approach

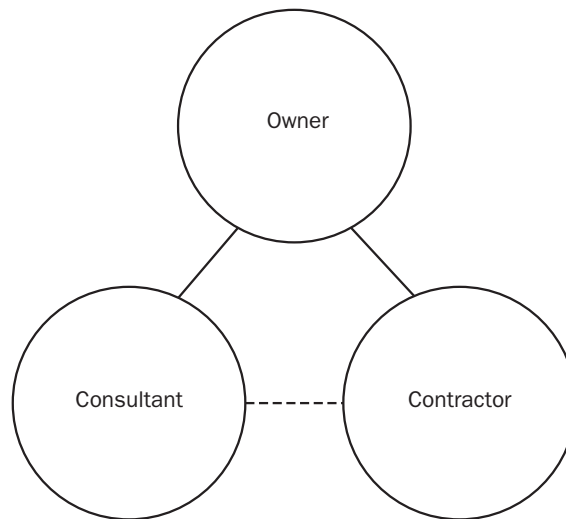
This chapter defines the traditional water utility construction project, project phases, participants and their responsibilities, selection of participants, forms of payment, and advantages and disadvantages of the traditional project.

In earlier times, more often than not, water utility staff themselves would plan, design, and construct the utility's projects. As projects became more complex, water utilities contracted with outside experts, particularly to design, finance, bid, and administer the construction contract. More recently, the consultant has been limited to planning, designing, bidding, and construction contract administration.

Traditional construction project organization can be illustrated by a triangle (Figure 1-1); the utility (owner) hires the design engineer, design consultant, or architect (consultant) along with the company that builds the project (contractor). In the triangle, the consultant and the contractor are connected with a dashed line, symbolizing that those two participants do not have contractual ties but may interact during construction if the consultant performs the contract administration. In this type of delivery system, the owner may retain an independent third-party construction manager to administer the construction contractor and provide on-site representation ("inspection") for the owner. In this case, the design engineer's responsibility during the construction is limited to shop drawing and submittal review, response to requests for information, and change-order preparation.

PROJECT PHASES

The following paragraphs introduce the main phases and activities of the traditional water utility construction project. The responsibilities of the participants during each phase are discussed in the following sections. Of course, water utility projects vary widely, from installing a valve (Figure 1-2) to constructing a treatment plant (Figure 1-3), and phases also vary according to the complexity of the project.



NOTE: Solid line indicates formal contract ties;
dashed line means no formal ties.

Figure 1-1 Traditional project participants

Planning

A preliminary study defines what the project needs to accomplish, determines possible alternatives to meet the need, estimates costs, and determines the technical feasibility and financial requirements. Based on the preliminary study, a final report more accurately defines the project scope, suggests a preferred alternative, presents a refined budget, and identifies the steps to implement. The owner uses the preliminary study and final report to decide whether to proceed with the project. The final report also serves as the basis of the design. The selection of the design consultant and other design professionals is described at length in chapter 15.

Environmental Documentation and Entitlement

Projects that involve federal financing or that potentially impact wetlands or waters of the United States will require some environmental clearance from the US Army Corps of Engineers, US Fish and Wildlife Service, or other regulatory and permitting agency. A number of states have requirements for environmental clearance that could involve environmental assessments or environmental impact reports. Environmental clearance must be obtained before proceeding too far into the design. In most cases, design is not initiated until completion of the environmental entitlement. Unless the particular project is exempt from environmental clearance, owners need to consider the time and cost to complete this phase of the project. The duration varies depending on the project's complexity and the public's concern. For projects that are deemed to have significant impact or to be subject to public scrutiny, the owner will be well served to implement an extensive public outreach program. Such an effort can be performed by the owner's staff or an independent consultant.

Design

The major products of the design phase include construction drawings, specifications (technical requirements), and the bidding and contract documents (legal requirements).

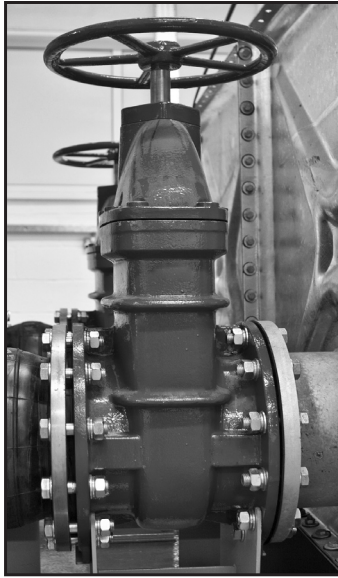


Figure 1-2 Water valve



Figure 1-3 Treatment plant

Other design-phase products typically include a final construction cost estimate and agency approvals of the design.

Based on the construction cost estimate and financing, the type of construction contract is usually determined in this phase. The main types of contracts in traditional projects are fixed price (unit bid or lump sum) and cost plus.

In a fixed-price, unit-bid contract, quantities for each element of the work are estimated by the design engineer and defined within the bid section of contract documents. During the bidding phase, bidders fill in the unit prices they will charge for each line item

(for example, 100 lin ft (30.5 m) of 6-in. (152-mm) pipe at \$35 per foot). Some projects or elements of projects do not easily lend themselves to a measurable quantity definition. In those cases, areas or limits of work are defined and the contractor is requested to submit a lump sum bid or a lump sum for particular items of work, e.g., pressure regulating vault, complete; and air release valve assembly, complete. During construction, payment is made based on an agreed-on percent completion of those elements appearing within an approved monthly cost estimate breakdown, also referred to as the schedule of values.

In a cost-plus contract, payment is made for the actual cost of the work based on labor and equipment rates, material invoices, and profit and overhead markup percentages. The effort is tracked during performance of the work. Most prevalently, the cost-plus approach is used as part of a change-order process or on a project for which the limits of effort required cannot be reasonably defined and the contracting parties cannot agree on a lump sum value. In some cases, owners may want to select contractors for small projects or emergency work on the basis of a prequalified list, where the owner has already prenegotiated rates for labor, materials, overhead, small tools, and profit. This process reduces the time to “get a contractor on board” and assures the owner of competitive pricing.

Bidding

The bidding phase essentially involves the selection of the contractor. Chapter 3 discusses this topic at length. Generally, the availability of bid documents (plans and specifications) to prospective bidders is advertised in local newspapers as well as within known construction publications, such as the *Dodge Reports*. Copies of the plans and specifications are maintained in “plan rooms.” A prebid conference may be held at which time questions from prospective bidders are answered. Bids are received and evaluated for compliance with funding capability, conformance with bidding requirements, and qualifications of the bidders. This phase also entails awarding a contract and entering into an agreement.

Construction

During the construction phase, the project is built according to the drawings, specifications, and contract provisions. Of course, projects rarely go completely according to the plans because of unforeseen conditions, and changes may be required. All three participants—owner, design consultant, and contractor—are usually involved in changes. Owners should budget for some changes, e.g., up to 5 percent of the bid price is reasonable, as plans and specifications are not expected to be error free and unknown subsurface conditions frequently require a change of plan.

During construction, there are many points of communication, written and spoken, and much documentation is prepared. The types of documentation used includes shop drawings, requests for information, responses to requests for information, payment requests, change orders, inspection reports, and material and operational test results. The components of the project are observed and either accepted or rejected. All components must be working correctly (as defined by the specification) before the project can be considered finished.

During the construction phase of the project, the owner, the design consultant, or an independent construction manager provides the contract administration services. Depending on the complexity of the project, the oversight can be full time or part time.

Postconstruction

In the postconstruction phase, utility staff may need instruction in the operations and maintenance (O&M) of the project components. A warranty period (refer to chapter 3) is usually in effect. Also, an important part of this phase of the project is the preparation of

the project record drawings (“as-builts”) based on the construction manager’s or resident engineer’s and construction contractor’s records.

PARTICIPANT RESPONSIBILITIES

The three project participants have relatively distinct responsibilities during each phase of the traditional construction project. Again, projects vary in complexity and the responsibilities vary accordingly. Each party’s responsibilities should be clearly described in the contract documents.

Owner

The owner has responsibilities in all phases of the project, the most important of which are defining the need for the project, selecting the consultant and contractor, providing direction to the consultant, and paying the consultant and contractor in a timely manner according to the contracts. The contractor is usually selected through the bidding process as described above. Guidelines for selecting the consultant are presented in chapter 15. The owner is responsible for clearly defining and communicating the expected roles of all the participants.

Preliminary phase. Based on the utility’s needs, the owner defines the scope of the project. The owner, sometimes together with the consultant, performs the preliminary study and prepares the final report. The owner acquires project approval and funding from the necessary authority, such as a water utility governing board.

Design phase. The owner enters into an agreement with the consultant to generate drawings, specifications, and bidding and contract documents. During the design phase, the owner and consultant meet periodically to review progress and resolve any questions that arise. The owner must make sure the project stays within its scope and budget and that the design meets expectations. The owner should provide necessary design approvals.

Bidding phase. The owner may submit the bid request to a list of prequalified contractors, advertise for bids, or both. Often the owner is bound by certain legal bidding requirements or bidding policies. Local newspapers, as well as construction bulletins such as *Dodge Reports*, can be used to advertise. The length of the advertisement period may be based on local, state, or federal regulations; project complexity may also determine the length. The typical bidding period is four weeks; but the period for simple, small projects could be less. Complex water treatment plants may require a six-week or more bid period.

The owner, often together with the consultant, conducts the bid opening, where those bidding are present and their bids are opened and read. The owner, usually with the consultant, evaluates the bids; if the low bidder meets the criteria established in the bidding documents, the low bidder is typically selected to construct the project.

Construction phase. The owner issues a notice of award to the approved bidder and sends the construction contract to the contractor to be signed. The owner also signs the agreement and issues a notice to proceed, which defines the start date and completion period. During construction, the owner documents progress and inspections either in person or through the design engineer or an independent third-party construction manager; attends established progress meetings; approves appropriate changes to the project (working with the design consultant if the changes involve the design); and issues payments to the contractor. When the project is completed and accepted, the owner issues a project completion statement, the date of which establishes the beginning of the warranty period. Often the notice of completion is recorded with the county recorder. The contract documents must define the terms of acceptance.

Postconstruction phase. During the latter stages of the project, as components become ready for their intended use, the owner's staff may need training in the operation of the components. The owner at this point becomes responsible for O&M of the project.

Consultant (Engineer)

In the traditional construction project, the consultant's main responsibility is to prepare the project plans, specifications, and contract documents. In recent years (particularly with more complex projects), the consultant's role has come to include tasks such as

- Performing preliminary studies
- Generating final reports
- Securing permits and environmental clearance
- Performing financial studies
- Conducting the bidding
- Providing construction contract administration
- Assisting with project startup
- Assisting with O&M
- Public outreach

Preliminary phase. The owner may hire the consultant to perform or assist with the preliminary study and final report. The consultant often estimates the construction costs and may present design and financing options. The consultant may assist the owner with obtaining regulatory agency approval as well as approval of the utility's governing board.

Design phase. The consultant's main responsibility is to generate the project drawings and specifications. The owner and consultant agree to various stages of the design, at which times the plans and specifications should be reviewed. The consultant may coordinate the design approval with both local and other regulatory agencies. The consultant usually furnishes the owner with an estimate of probable cost of the project at key milestones and cost upon completion of final design. The owner and the engineer should review the project cost estimates at each milestone to ensure the project stays within the owner's budget. Most of the time, the consultant prepares the bidding and construction contract documents for the bidding procedure.

Bidding phase. The consultant can assist the owner with the bidding process or conduct the process on behalf of the owner. Specific activities in the bidding process for which the consultant can assist the owner are

- Recommending publications in which the project should be advertised
- Prequalifying bidders (discussed in detail in chapter 3)
- Conducting or attending the prebid conference
- Responding to inquiries from bidders and preparation of addenda, which are changes to the bidding and contract documents during the bid process
- Conducting or attending the bid opening
- Tabulating the bidding results
- Evaluating the bids and recommending the winning contractor
- Preparing a notice of award to be presented by the owner to the contractor

Boards and commissions overseeing agencies should be made aware of the fact that the bid price awarded will not likely be the final total cost at completion of construction.

In writing the letter of recommendation of the low bidder, it is often recommended that the staff and directors be made aware of the fact that the project budget should include some amount for contingencies to cover unforeseen changes during construction. An allowance of up to 5 percent more than the lowest bid price is reasonable but varies by project size.

Construction phase. The consultant may or may not be retained to perform construction contract administration, and the consultant's responsibilities vary accordingly. The following list of responsibilities assumes the consultant is an active participant in the construction phase:

- Perform periodic observation of the constructed project to check for compliance with the intent of the design. The consultant can provide full- or part-time construction observation staff on-site.
- Evaluate construction progress and process progress payment requests for submittal to the owner.
- Provide information and clarification.
- Evaluate construction quality and identify deficiencies.
- Review shop drawings for compliance with the contract documents.
- Review test reports.
- Conduct and attend preconstruction and construction progress meetings.
- Witness and review tests.
- Report to owner any proposed changes to construction schedule, scope, and budget.
- Review and process change orders for submittal to owner for approval.
- Collect warranty information from the contractor and provide to owner.
- Transpose contractor documented-as-constructed information to project record drawings (also called *as-builts*).
- Verify that vendors of project components submit O&M manuals where required.
- For complex projects, such as a treatment plant, develop project O&M manuals or other documents and provide utility operator instruction and startup.
- Furnish certification of completeness to the owner and to applicable regulatory agencies.

Postconstruction. In the traditional construction project, the consultant's role usually ends at the completion of the construction phase. In a few instances, however, the consultant may provide services such as

- Assisting the owner with warranty issues
- Providing advice on O&M problems
- Evaluating and reporting on the project performance after a defined period of time
- Assisting the owner in resolving other outstanding issues, claims, and litigation

Contractor

Traditionally, the contractor's sole responsibility is to construct the project according to the plans and specifications. With nontraditional projects (discussed at length in section II), such as design-build projects, the contractor's role has been expanded. The following paragraphs focus on the traditional role of the contractor during each phase.

Preliminary and design phase. In the traditional construction project, the contractor is not involved in the preliminary and design phases.

Bidding phase. The contractor is responsible for preparing a bid according to the bidding instructions and may have to submit prequalification documents (refer to chapter 3). The contractor must follow the bidding directions upon receiving clarification of the plans and specification; such directions are intended to maintain fairness to all bidders.

Along with the bid, the contractor is normally required to submit additional information such as

- Bid bond or bid surety (the form varies from state to state)
- Questionnaire on ability to perform the project (e.g., past projects, safety plan and safety record, references)
- List of major suppliers and subcontractors
- Preliminary schedule

Construction phase. The successful bidder enters into a construction contract with the owner. Bound by the contract, plans, and specifications, the contractor is responsible for constructing the project within bid price and within the defined time frame. Construction activities are expected to begin upon receipt of the notice to proceed.

The contractor should follow the lines of communication and authority established in the contract. For example, the contractor should submit progress payment requests as scheduled, give required notice for inspections, attend progress meetings, and negotiate change orders on schedule changes with the owner or contract administrator.

When the project is substantially complete and ready for its intended use, the contractor notifies the owner to demonstrate that the project components have been started, tested, and are performing to the requirements of the contract documents.

If the contract so specifies, the contractor coordinates training the owner's staff, often using manufacturers' specialists. In addition, the contractor assembles and gives to the owner the vendors' O&M manuals.

Postconstruction. The contractor's postconstruction responsibilities can be any of the following depending on the contract documents:

- Maintain the bonds active for a defined period of time.
- Maintain completed products' insurance for a defined period of time.
- Return to the site to correct defective work not known at the time of construction completion.
- Coordinate the various manufacturers' return to the site for warranty work.
- In some cases, contractors are engaged to operate the project for a period of time before complete assumption by the owner's staff.

ADVANTAGES AND DISADVANTAGES

The traditional project has evolved to an extent that it offers some degree of flexibility; however, many new forms of project delivery are available. These alternatives are described in more detail in section II. The advantages and disadvantages of the traditional project are listed in the following sections.

Advantages of the Traditional Project Delivery

Advantages of the traditional project delivery are as follows:

- All participants are usually familiar with the processes, responsibilities, and expectations.
- Traditional project delivery has a long history of experience in the utility industry.
- Owner maintains direct control over the contractor and the design engineer.
- Design engineer works for the owner and so is more apt to optimize the design to meet the owner's needs.

Disadvantages of the Traditional Project Delivery

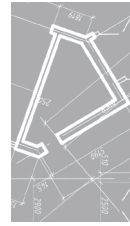
The disadvantages of the traditional project are as follows:

- Traditional project delivery requires owner's involvement to resolve disagreements between the contractor and the design engineer.
- The process requires a complete set of plans and specifications and the project work must be completely defined. Overall time frame from design to project completion takes longer than other alternative delivery systems.
- There is less opportunity to take advantage of the contractor's skill and ingenuity in construction.

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Chapter 2

Construction Documents: Overview and Application

This chapter discusses the general content of traditional construction documents that define project requirements. Historically construction contract documents were organized and assembled according to the traditions of the owner or consulting firm. There was a general lack of uniformity. To address this, the Construction Specifications Institute (CSI) established a standard format for the organization of the construction contract documents to provide uniformity, minimize misunderstanding and confusion, and make the bidding and construction processes more efficient and less time-consuming. Most consulting organizations and agencies follow the CSI format.

THE CSI FORMAT FOR CONSTRUCTION DOCUMENTS

Because of its appeal, the CSI format for the organization of construction contract documents will be the focus of this section. Table 2-1 presents the CSI's format for the organization of the bidding and contract documents.

The documents listed in Table 2-1 are self-explanatory for the most part; however, a few warrant additional discussion.

General Conditions. These are the contractual-legal elements of the construction contract and define the role of the parties, method of payment, payment procedures, and procedures for making changes to the work, making claims for additional compensation or time, and so forth. As such, this General Conditions section should be limited to the legal issues. The General Conditions section is typically a standard document that has been thoroughly reviewed by the owner's legal counsel. It is typically not changed. Any changes that are necessary or that are required to meet specific job requirements are typically made through the Supplementary General Conditions.

Supplementary General Conditions. This section modifies provisions of the General Conditions or supplements (adds to) them. The Supplementary General Conditions section is typically tailored to each project.

Specifications. Each section of the specifications is subdivided into three parts: General, Products, and Execution. The General section provides information on the design constraints, conditions of use, and other information. The Products section refers to the

Table 2-1 CSI organization of the bidding and contract documents

Type of Document	Specific CSI Section Details
Bidding documents	Advertisement Information for Bidders Bid Form Bid Security Certificates and Affidavits Addenda
Conditions of contract	General Conditions Supplementary General Conditions Agreement Bonds
Specifications	Specifications were formerly 16 divisions, now over 30 major divisions with latest revision. Within each division there are sections (General, Products, and Execution). The sections can be very narrow scope, i.e., “butterfly valves,” or broad scope, “valves.” The use of sections is left to the owner and engineer.
Drawings	
Contract modifications	Change Orders

materials that will be incorporated into the project. The Execution section describes the workmanship and method to install the materials. By standardizing in this fashion, engineers, owners, and contractors have a much easier time finding the items of interest.

Division 1 of the Specifications entitled “General Requirements.” This section contains job specific instructions on the progress and sequencing of the work, testing, startup, project office, submittals and shop drawings, project schedule, and so on. Virtually everything that is of a general nature, applicable to the entire project work, and not of a legal context is included in Division 1.

Some organizations are reluctant to give up their own terminology and have generated a hybrid of their own format and the CSI format. They might have General Conditions and General Provisions, for example. Such a hybrid is an unnecessary duplication and will lead to confusion and conflicts. This format should be avoided if at all possible.

STANDARD FORMS FOR THE BIDDING AND CONTRACT DOCUMENTS

Various organizations have developed standard construction documents. The main purpose in developing such standard documents is to provide consistency in terminology, organization, and procedures. The use of such documents should result in higher quality, quicker completion, and fewer disputes in design and construction. (NOTE: In the following discussion, the design consultant is referred to as the *engineer* to be consistent with the documents being described.) Organizations which have developed standard forms include:

- American Institute of Architects (AIA)
- Engineers Joint Contract Documents Committee (EJCDC)
- Design-Build Institute of America (DBIA) for design-build documents (refer to chapter 7)

In addition, the larger public agencies and consulting engineering organizations have developed contract documents and other forms for use on their projects.

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE _____

The Engineers Joint Contract Documents Committee is a national (US) committee. The committee began in 1963 with the formation of a Contract Documents Committee by the Professional Engineers in Private Practice (PEPP), a practice division of the National Society of Professional Engineers (NSPE). The Contract Documents Committee of the American Consulting Engineers Council (ACEC) joined with NSPE-PEPP in 1975. A similar committee of the American Society of Civil Engineers joined in 1978. In 1981, the Construction Specifications Institute joined, but in 1992 changed its status from member to observer. The overall committee adopted EJCDC as its name.

The committee retains outside legal counsel and in recent years has sought the counsel of other groups in the construction community by establishing liaisons with the American Water Works Association, the American Council of Independent Laboratories, the American Institute of Architects, the Associated General Contractors of America (AGC), and the Association of Engineering Firms Practicing in the Geosciences of Soils and Foundation Engineers.

Through its publications, seminars, and other educational programs, the EJCDC also educates owners, members of the design profession, the construction industry, and attorneys, as well as the interested public, on the importance of understanding the proper roles and responsibilities of the contracting parties and on the wording and coordination of engineering services, bidding, procurement, and construction documents. The standard language and format of EJCDC documents are well known to contractors and can result in more competitive bidding because of fewer ambiguities. The reader is encouraged to contact the EJCDC.

The EJCDC's documents must be purchased for use. There is a licensing agreement with the purchase. Once purchased, the user (agency or consultant) has unlimited use of the documents on the agency's or consultant's projects. The documents can be purchased from the American Society of Civil Engineers, from the Associated General Contractors of America, or from the National Society of Professional Engineers.

Purpose of EJCDC Documents

The aim of the EJCDC standard documents is to define clearly the functions and responsibilities of the participants in designing and constructing a project. When all participants understand their roles and the roles of the others, the chances for misunderstandings and disputes will be greatly reduced.

The EJCDC standard documents reflect the experience and knowledge of owners, engineers, lawyers, and contractors involved in utility and other types of construction throughout the United States. The documents are adaptable to water utilities, large or small, and have been written so that the requirements of a particular owner or project location can be added to the standard text. The standard documents are constantly being updated to reflect changes in project administration.

The EJCDC documents can be divided into four broad categories.

1. Engineering consulting services
2. Construction
3. Procurement (purchasing goods and services)
4. Commentaries and updates that provide background information and comparisons of different EJCDC documents

Engineering consulting services documents. EJCDC engineering services documents help define standards of engineering practice in the United States. Water utilities and engineering consultants use the documents to arrive at acceptable consultant service agreements. Of course, as with any standard document, each specific project must be evaluated for any requirements that might necessitate modifying the documents. Procedures for modifying the documents are discussed later in this chapter.

Construction documents. EJCDC construction documents help define the agreement between the owner and the contractor from bidding, to the contract, to payment requests, to change orders, and to the certificate of substantial completion. Again, each specific project must be evaluated for any requirements that might call for modification of the standard documents. Procedures for modifying the documents are discussed later in this chapter, as are examples of the potential problems and benefits of standard documents.

Procurement documents. EJCDC procurement documents help define the agreement between the owner and suppliers of goods and services. Again, each specific situation must be evaluated for any requirements that might call for modification of the standard documents. Procedures for modifying the documents are discussed later in this chapter, as are examples of the potential problems and benefits of standard documents.

Commentaries and updates. EJCDC commentaries and updates are descriptions and comparisons of the documents listed in the previous sections. Frequently, several documents are referenced in a single commentary.

Modification of EJCDC Documents

Each construction project is unique, and EJCDC standard documents cannot cover all situations. Some of the common areas where projects tend to differ are

- Specific owner requirements
- Local statutory requirements
- Type of service to be performed
- Type and complexity of the project
- Conditions under which the work is to be performed
- Relationships between the parties

Extreme care should be used when modifying or supplementing the standard forms because their provisions are interrelated. Modifications of the language of the standard forms and supplemental provisions should always be made to cover in full the intent of the parties. For example, a change in one place or an addition in another may create an ambiguity or produce an unintended result in the legal obligations of the parties. To reduce such problems, EJCDC documents cross-reference related documents and provide warnings to modify the documents correctly.

How EJCDC Documents Can Reduce Common Problems: Some Examples

The following examples show how using the EJCDC documents can reduce common problems in construction projects.

Specifying contractor–subcontractor relationships. Potential conflict in construction projects can occur when the owner or engineer attempts to become involved in the relationships between the contractor and subcontractors. The EJCDC documents are based on the principle that the owner and engineer will deal only with the contractor, not directly with a subcontractor or supplier. The documents provide that the contractor is

fully responsible for the acts and omissions of the subcontractors and that nothing contained in the documents creates any contractual relationship between any subcontractor and the owner or engineer.

There are two basic reasons for this approach. One is the strong belief that both the owner and the engineer should avoid undermining a contractor's authority to deal in a businesslike manner with its subcontractors. The other is to avoid discouraging the contractor from fulfilling any of several primary responsibilities: supervising, directing, and inspecting the work and coordinating the activities of subcontractors and suppliers. Several court decisions have held that when owners or engineers undertake the responsibility of supervising and coordinating a contractor's work, they have a duty to perform that function with skill and care and are liable for the results of that action.

On many projects, however, the owner and the engineer desire to retain a degree of control over the contractor's selection of subcontractors. EJCDC documents provide two opportunities for the owner and the engineer to exercise judgment about the capabilities and qualifications of prospective subcontractors and suppliers.

The documents may require that after receipt of bids, the apparent successful bidder obtain the owner's and engineer's acceptance of those subcontractors specifically identified in the documents as being of special importance for the successful completion of the project. If the apparent successful bidder cannot obtain acceptance of a subcontractor nominee before the notice of award is given, that bidder may either furnish an acceptable substitute without an increase in the bid price or withdraw the bid without forfeiting the bid security. If the owner or engineer objects to a subcontractor or supplier after the contract is awarded, the contractor is allowed an appropriate increase in the contract price to reflect any required substitution. The EJCDC believes that it is good practice to resolve the acceptability of subcontractors and suppliers before the contract is awarded and that the allocation of expenses resulting from rejection and substitution before or after award of the contract should be fair and reasonable to all parties.

Clarifying changes to contract price and time. A perfect set of plans and specifications is unlikely because changes are frequently needed either due to unforeseen conditions or due to the desires of the owner. Therefore, the owner should establish a contingency fund to cover some unexpected changes.

A lack of clarity on the issue of changes in the work is seldom the source of conflict. Most contract documents clearly require that if changes are needed that affect cost or time, they can be effected only by a written modification to the contract. The vehicle for such modification is a formal change order reviewed and recommended by the engineer and signed by the owner and contractor.

Serious problems do arise, however, from the way in which change-order procedures are followed during construction. Frequently, conditions arise that make the routine processing of a change order impractical. The stakes are high for everyone involved. The pressures of time and cost are often enormous, and no one needs the added pressures of disruption and delay that changes generate.

To provide an improved and workable procedure for handling the change-order process, the EJCDC developed the concept of the work change directive. Earlier editions of the EJCDC standard documents provided that changes in contract work, contract price, or contract time could be made only by a change order recommended by the engineer and signed by both the owner and contractor. However, the EJCDC recognized that it is often difficult, if not impossible, for a contractor to estimate, or forward-price, the full impact of contract changes. This difficulty is a primary reason for contractors delaying the execution of change orders—or in some cases even refusing to execute them. To specifically address this problem, the EJCDC developed the concept of the work change directive to permit the contractor to proceed without delay before price and time are finally determined.

When a work change directive form is issued, the contractor must perform the work as recommended by the engineer and as authorized by the owner. This form provides for an estimate of the additional cost and time, which the contractor cannot exceed without prior authorization. But because the contractor is not required to sign the work change directive form, the contractor's right to request additional relief, if required, is reserved. When the owner, contractor, and engineer agree on the total effect of the change in the work, a change order properly signed by all parties is issued. Those who have used a work change directive report that it has significantly reduced conflicts during construction.

Another area of conflict in the change-order procedure is the basis for pricing changes in the work. Most standard documents provide that the value of the work covered by a change order will be determined in the following order: (1) by the application of unit prices previously bid, (2) by a mutually agreed-upon lump sum, or (3) on the basis of cost of the work plus a fee for overhead and profit. Because of the need to justify the cost of changes to higher authority or to regulatory or grant agencies, many owners require that changes be performed on the basis of the cost of the work. However, although many owners' documents state the allowances that can be used for overhead and profit, the documents frequently are silent, or sketchy at best, on what charges do or do not constitute "cost of the work" and to what "costs" the allowances or overhead and profit apply.

Clear and unambiguous definitions of these terms can prevent unnecessary conflict. The EJCDC documents were developed for use with contracts based on a unit price, lump sum, or cost plus fixed fee. As such, the documents contain comprehensive definitions of "cost of the work" and contain guidelines on applying allowances for overhead and profit. The definitions are useful in that they provide a road map for the forward-pricing of a change order when changes are to be performed on the basis of a mutually agreed-upon lump sum.

Lessening delay and acceleration problems. Another way conflicts can be readily minimized is to avoid using unenforceable clauses in documents. Such clauses make contract administration more complex and may prompt the owner to resist settling legitimate claims.

Damages for delay are a specific example of such clauses. Delay in construction projects is common. Contractors are almost invariably subject to the proposition that "time is money." Delay in performing the work or acceleration to overcome the delay frequently results in cost increases for the contractor that far exceed the direct cost of the change or of the changed condition that caused the delay. For these reasons, delay damages have become a major factor in many litigated or arbitrated construction claims. Careful evaluation of the project schedule is the basis for determining responsibility and extent of an excusable delay. There may be a concurrent delay over which the contractor has control, in which case damages are adjusted accordingly.

When the contractor causes the delay, the contract documents are usually clear and stipulate an amount in the form of liquidated damages to compensate the owner. But what about other types of delays, such as those caused by the owner or by circumstances beyond the contractor's control? For example, damage from Hurricane Katrina, as shown in Figures 2-1 and 2-2. When the contract documents do not address delays beyond the contractor's control, the courts usually hold that the contractor is entitled to recover damages.

Historically, many contract documents have contained "no damage for delay" clauses that preclude monetary adjustment and attempt to limit the contractor's recovery to an extension of time. Interpreted literally, these clauses may create an unreasonable risk to the contractor. As a consequence, many courts have interpreted these clauses narrowly, frequently finding that the contractor should be compensated for a delay in situations in which the clause's literal reading would have barred recovery. The courts' reluctance to enforce "no damage for delay" clauses arises from the inequity that such clauses engender.



Figure 2-1 Damage from Hurricane Katrina



Figure 2-2 Repairs after Hurricane Katrina

The EJCDC believes the prudent course of action is to provide in the contract documents for monetary adjustment when a delay occurs. The documents provide that (1) the contractor may be entitled to delay damages when the owner causes the delay and (2) the owner is entitled to delay damages (in the forms of liquidated damages) when the contractor causes the delay. Additionally, provisions are made for an extension of time following delays not caused by either party.

Allowing for unanticipated conditions. All contractors that perform work under fixed-price contracts determine their bids on the basis of certain fundamental assumptions concerning the conditions they will encounter and the effect of those conditions on price and time. Unanticipated conditions such as concealed subsurface or concealed physical conditions in or around existing structures can greatly disrupt project scheduling and otherwise increase the cost of performing the work.

The owner has an affirmative duty to disclose to a contractor information about conditions that will affect cost, progress, or performance of the work. This information usually includes reports of exploration and tests of subsurface conditions that the engineer has used to prepare the contract documents. If the work is to be performed in or around

existing structures, the information usually includes the owner's record drawings of those structures.

In an attempt to discourage contractors from inflating their bid prices to cover the contingency of unanticipated conditions, most contract documents include a "changed conditions" or "differing site conditions" clause that allows price or time or both to be adjusted when such conditions are encountered. To reduce the risk assumed under such clauses, however, these documents also include disclaimers concerning the accuracy or adequacy of the information provided and a related "site investigation" clause that requires contractors to make, at their own expense, all such investigations and tests as they determine necessary to prepare their bids.

Reliance on the "changed conditions" clauses and associated disclaimers, particularly with respect to subsurface conditions, has not had the desired effect. Contractors continue to include significant contingencies in their bids to provide for unanticipated conditions. Additionally, contractors' lawyers have been successful in the courts in showing the inequity of a design-construction system that puts virtually all of the responsibility for subsurface conditions on contractors and does not provide adequate time or funding for them to identify those conditions properly. Stronger wording of disclaimer has not been an effective method for changing these results. As a result, there is a trend to require the owner to bear the costs when information about the subsurface does not describe the actual conditions.

In recognition of this trend, the last two editions of the EJCDC standard construction documents take a somewhat different approach to the sharing of risks by the owner and contractor for unanticipated subsurface or physical conditions. As previously discussed, the documents provide for furnishing the contractor with all information on subsurface and physical conditions used by the engineer in preparing the contract documents. The significant change is in the disclaimer for the furnished information. The documents now provide that the contractor is entitled to rely on the technical data contained in the furnished information but not on nontechnical data, interpretations, or opinions. With regard to subsurface conditions, the technical data would include the boring method, location of borings, identification of materials encountered, level of subsurface water, laboratory test methods and results, and similar factual data, all as of the date(s) made.

The EJCDC believes this more equitable basis for sharing the risks for unanticipated subsurface or physical conditions will encourage contractors to decrease the contingency amounts in their bids and will reduce conflict by providing a better basis for determining an unanticipated or changed condition.

DESIGN-BUILD INSTITUTE OF AMERICA

The DBIA has standard documents and forms specifically for design-build projects (see chapter 7). In addition, the organization has a number of specialty publications related to project delivery systems and design-build.

STANDARD SPECIFICATIONS

Many agencies and organizations rely on standard specifications for their routine work. These standard specifications often include "contract type" provisions and, as such, can be used with minimal modification. However, use of the standard specifications requires a thorough knowledge of the contents, and, if the contents are not applicable for a project, supplementary general conditions or "special provisions" are needed to modify the standard. Failure to do this will result in confusion and claims.

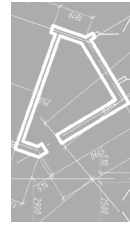
One of the most common standard specifications used in many locations in the United States is the Standard Specifications for Public Works Construction (SSPWC), or "Greenbook," available from the Building News Institute. Organizations and groups that

participated in the development of the “Greenbook” and that continue to update it include the American Public Works Association, the Associated General Contractors of California, the Engineering Contractors Association, and the Southern California Contractors Association. (NOTE: although the “Greenbook” originated in Southern California, it now has nationwide appeal.)

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Chapter 3

Prequalifying and Selecting Contractors

This chapter focuses on selecting qualified contractors for construction projects. Generally called the competitive bidding phase of a project, specific contractor selection procedures vary among states, entities, and projects. This chapter introduces the principal steps in a typical bidding process, including the steps in prequalifying contractors.

Prequalification is the selection of contractors that will be permitted to bid on a given project. Not every project involves prequalification of contractors; indeed, regulations may not allow some entities to use prequalification.

The chapter begins with a discussion of prequalification, including its advantages and disadvantages. The remainder of the chapter presents the process of competitive bidding.

PREQUALIFICATION

Whether the contractor will be selected through competitive bidding with open advertising or through a limited bidding of a list of contractors, the contractor that eventually is awarded the project must be able to perform the work competently and effectively. The owner must make sure that the awarded bidder is qualified. The difference with prequalification is that only those contractors considered to be qualified are permitted to bid.

The following discussion presents the general issues, advantages, and disadvantages of prequalification, as well as the steps of the process.

General Issues

The general issues involved in prequalification are discussed in the following paragraphs:

Goals. The important goals of prequalification are

- To increase the probability of a successful project by selecting a contractor that has the appropriate experience, adequate capacity, a strong financial position, a written safety program, a safe work history, a sound environmental program, proper staff and equipment, quality management, and that has been proven cooperative.

- To reduce the possibility of delays, cost overruns, and associated lawsuits.
- To obtain equipment or materials that are compatible, have a proven record of performance, and are from a manufacturer that will provide necessary service.

Regulations. For most general construction work, public entities are bound by traditional advertised bidding procedures. Often the only contractor qualifications required are valid licenses to perform the work and financial capability to enter into a contract by providing bid and performance bonds (ASCE 1990 updated 2000). Privately owned entities may be able to skip the competitive bid process and contract with firms with which they want to work. For projects that are more specialized or may have unusual characteristics, such as a tunnel (Figure 3-1) or an environmentally sensitive area (Figure 3-2), the regulations under which public entities operate may allow for prequalification.

Local laws and regulations might also impose specific criteria for prequalification such as requirements for disadvantaged business participation, use of union-made products, disqualification of products made in specific foreign countries, and requirements for US-made products or components. Because of the variations in regulations, the owner or engineer should verify that prequalification is allowed (or possibly required).

Disqualification of a prequalified bidder. When a firm has been prequalified, it may be very difficult to disqualify that firm after bids are received and opened. Prequalification documents should include language such as: (1) all bidders must meet the qualification requirements detailed in the bidding documents, (2) prequalified bidders could be disqualified if those requirements are not met, and (3) the contractor's prequalification information is required to be submitted and approved prior to the submission of the contractor's bid for the project is submitted.

Examples of other situations benefitting from prequalification. There are other contracting situations besides the selection of prime contractors that might benefit from prequalification. Some common examples are



Figure 3-1 Moffat Tunnel/Winter Park, Colo.



Figure 3-2 Environmentally sensitive area in Mojave desert



Figure 3-3 Pipeline repair

- Establishing a standing list of firms eligible for certain kinds of projects (such as pipeline repair, as shown in Figure 3-3), rather than just for a single project
- Establishing a list of subcontractors or materials suppliers, including specialty subcontractors (e.g., instrumentation, supervisory control and data acquisition [SCADA] systems, and laboratory equipment and supplies)
- Continuing consultant services
- Continuing services for construction projects of a routine nature (e.g., short pipeline installations, rehabilitations, or relocations; package lift stations;

and short force main construction) based on established or negotiated unit prices

- Establishing lists of materials suppliers (meters, valves, hydrants, and so on)

Standing lists of prequalified contractors, subcontractors, and suppliers are usually valid for a specific time period, such as a year or two. Before the time period ends, a call for firms to submit prequalification documents is issued. Contractors may be more amenable to this process if the list is compiled fairly, if it is updated routinely, if there is a substantial amount of work to be awarded, and if the work is distributed among eligible contractors.

Another similar practice by design consultants is the naming of acceptable manufacturers of specific equipment in contract documents. The list is based on the requirements of the project and the consultant's and owner's knowledge and experience with products and suppliers.

Advantages

The advantages and disadvantages of prequalification vary with every project and must be evaluated to determine whether prequalification is justified. The advantages of using prequalification for a particular project depend on such things as location, complexity, timing, local bidding climate, and owner's and design consultant's experience with that particular type of project.

Advantages include benefits to bidders and owner. The owner benefits from accomplishing the goals of prequalification stated previously in this chapter. The owner reduces the time required to review and evaluate bids from unqualified bidders. It is easier for the owner to disqualify a bidder before bids are received than after they are opened.

Bidders and owners benefit from elimination of unqualified competition that could skew the bidding process by submitting unqualified low bids. Owners may save time over a typical full contractor selection process by using a standing list of acceptable contractors.

Bidders benefit from advanced knowledge of project requirements that could disqualify them; thus, unqualified bidders avoid the expense of preparing a bid and save themselves from the possible embarrassment or aggravation of public disqualification. A bidder's thorough, objective review of project requirements and its own qualifications could allow it to avoid the difficulties or losses that would result from contracting for work for which it is not qualified.

Continuing service agreements are typically used to eliminate or shorten the time-consuming selection process. The agreements are often used when a number of projects are anticipated and repetition of the normal selection process would be burdensome.

Owners may save on project costs by assuming the risk and eliminating or reducing the need for surety bonds from prequalified contractors.

Disadvantages

Most disadvantages associated with prequalification concern criteria that do not accurately evaluate a contractor's ability to complete the work successfully. For example, an owner that may have had a bad experience with a contractor that used rental equipment may wish to eliminate contractors that use rental equipment.

Prequalification may be viewed as a subversion of the general competitive bidding procedures. Prospective bidders may be disqualified based on some criteria that could be arbitrary, contrived, or based on a purely speculative concern for avoiding potential project difficulties. In these cases, the owner may be perceived as favoring a few contractors.

Prequalification may increase project costs by eliminating competition among bidders or by eliminating bidders that might have an innovative and cost-saving approach to executing the work. Disqualified bidders may be stifled in their growth if they are eliminated from projects in which they do not have experience even though they may be able to perform adequately.

Other examples of disadvantages to potential bidders would be cases where a bidder is eliminated because of poor performance on a previous project that is not representative of the bidder's current staff and ability. For example, a bidder might be disqualified because of previous poor performance by subcontractors, circumstances beyond the bidder's control, or ill-advised actions of the owner.

Prequalification Procedure

The following paragraphs identify the steps the owner (or consultant or both) should take to prequalify prospective bidders for a project. These steps are presented in approximate order of completion, although some may occur concurrently. Usually the project design is complete or nearly so when the process begins.

Determine advantages and disadvantages. Review the project design and conditions to determine whether prequalification is desirable for the project or for certain of its components. Weigh advantages and disadvantages as described earlier in this chapter. If the advantages clearly outweigh the disadvantages, then proceed with prequalification.

Identify critical characteristics. Identify the critical characteristics of potential bidders as required for the project. Set minimum acceptable criteria below which potential bidders would be disqualified. Depending on the project, the types of information to be submitted by the contractor include

- Performance and experience references
- Experience with similar work
- Types of materials or equipment produced
- Financial status (ownership)
- Equipment owned
- Personnel on staff
- Utilization of a written safety program
- Safety history including experience modification rate (EMR) and Occupational Safety and Health Administration (OSHA) forms.
- Pending litigation
- Bonding capacity

Minority business enterprise (MBE) status or woman-owned business enterprise (WBE) status or a description of a corporate commitment to use MBE/WBE firms. Note that there may be potential problems with requesting certain kinds of information (financial data, pending lawsuits) that by law are confidential. An attorney should review the types of information requested. Sometimes alternative information could be acceptable; for example, rather than providing a financial statement, a letter from a bonding agency might be acceptable. (NOTE: The contractor may also desire to learn the financial status of the owner.)

Prepare and send the statement-of-qualification form. Standard forms can reduce the time and expense of preparing prequalification forms and the time reviewing responses. One such form is Associated General Contractors of America Document No. 220, *Construction Contractor's Qualification Statement for Engineered Construction*.

The form should be evaluated to verify that it fits project conditions and owner requirements. Whichever form is used, it should clearly and precisely state which information is required; this will minimize the need for clarification or additional data.

The next step is to announce, advertise, and publish requests for qualifications (RFQs) from prospective bidders and send RFQs directly to known prospective bidders. These RFQs must include detailed instructions and explain precisely the minimum qualification requirements. In addition, RFQs specify when prequalification decisions will be made and whether disqualified firms will be notified of the basis for decisions. If appeals of prequalification decisions are allowed, the associated procedures should be detailed.

Projects may require subcontractor prequalification as well. The RFQ should be sent out far enough in advance so that prospective bidders do not expend time and effort contacting subcontractors that are not prequalified.

Evaluate the qualification statements. The owner or engineer usually establishes a selection team of three to seven members to evaluate the statements of qualifications. The responsibilities and authority of the selection team—that is, whether the team recommends qualified applicants to the decision maker or makes final decisions—should be clear. Team members must understand selection criteria. When qualified bidders are selected, the list should be sent to all applicants and an explanation for disqualifications sent to all disqualified applicants.

COMPETITIVE BIDDING PROCESS

The intent of the competitive bidding process is to select a qualified contractor at the most competitive price, which usually is the lowest bid. For this process to work, the owner must prepare clear, complete, and detailed plans and specifications and also clearly state the necessary qualifications of the contractor. Bidding instructions and requirements must also be clear.

The remainder of this chapter presents the main steps and documents used in the competitive bidding process. This section assumes the project is publicly funded; privately funded projects may use the procedure as well, although they may not be bound to do so by law.

Documents

Bidding documents are strictly used for advertising the project and giving instructions to the bidders. Restatement or explanation of contract or technical provisions must be avoided (Smith 1987). Standard Engineers Joint Contract Documents Committee bidding documents were listed and briefly described in chapter 2. Typical bidding documents are described in the following paragraphs.

Advertisement and invitation to bid. The advertisement and invitation to bid contain the owner's name, a brief description of the project, the bidding schedule, and an explanation of where to obtain the bidding documents. The advertisement and invitation are called the legal notice and are sent to contractors and placed in appropriate newspapers and periodicals. If a monetary deposit is required for the bidding documents (which includes a complete set of plans and specifications), the amount should be specified. Plans may also be available for viewing, but not removing or copying, in the owner's or consultant's office or other agency's plan room.

Instructions to bidders. The instructions to bidders detail the steps necessary to submit a bid and vary from project to project. Instructions generally include documents that must be completed, information that must be given, deadline for bid submittals, bid-opening procedures, and contract-awarding procedures. If a prebid conference is scheduled, the date and time should be included in the instructions and it should be specified

whether this meeting is to be mandatory or not. Instructions should also suggest strongly that bidders visit the project site.

Bid form. The bid form lists the line items of the project and the basis for the bid (e.g., cubic yards, lineal feet, lump sum). The basis should be standard measurements used in the industry. The form also has spaces to list totals for each item and the grand total of the bid.

Bidder qualification. This information is required by the owner to ensure that bidders are qualified and able to complete the project. A list of subcontractors and their qualifications may also be required. Typical qualification information was discussed previously in this chapter. It is suggested that a requirement to return completed bids on this form be enforced for ease of tabulating results in a consistent manner.

Bid security and bonds. The bonding amount required is usually 5 percent of the bid, although it may be higher. A bid bond form is usually included in the bidding documents, although most bond agencies use their own forms.

Addenda. During the course of bidding, bidders may raise issues that need clarification. If one contractor receives such clarification or if errors are found that need to be corrected, all bidders must receive the clarifications or corrections. Official addenda are sent to bidders, and the bidders must acknowledge receipt, usually by signing the addenda as received and submitting them with the bid.

Bid Opening, Evaluation, and Award

The following procedures are performed by the owner or consultant on behalf of the owner.

Bid opening. The time to open bids must strictly be observed; late bids should be treated as if they were never received (Smith 1987). Normally bids are randomly selected and opened and the grand total read aloud. The receipt of addenda and other required forms are often announced at the opening. A bid tabulation form listing bidders is filled out with the prices; bidders can be given a copy of the blank form to fill out as bids are read. An official bid tabulation should be sent to all bidders.

The process described above represents a public utility bid-opening procedure; privately held management companies operating municipally owned utilities or privately owned utilities may follow alternative bid-opening procedures.

Bid evaluation. Assuming the low bidder has complied with bidding instructions (especially that the bid was signed), the next step is to verify the bid. If it seems too low, considerably less than the next lowest bid, the bidder should be asked to verify the bid. If the bidder has made a verifiable mistake, the bid may be withdrawn. Forcing the bidder to perform at the quoted bid is rarely to the owner's advantage. If the low bid is valid, the bidder's qualifications are verified according to preestablished criteria. The owner or consultant may desire additional information or clarification from the contractor, but this should be limited to valid requests related to the project.

The owner normally reserves the right to reject all bids, but this typically happens only if all bids come in over the budget or there are substantive irregularities in several of the low bids. If, during the bidding process, serious errors in design are revealed, bidding should be stopped before completion and all bids returned. If only one bid is received, the owner should return the bid unopened or be prepared to accept the bid if it is within the budget and the bidder is qualified (Smith 1987). Negotiating with the low bidder for a reduced quote or revised project scope is a tricky issue and is done less often with public projects than with private projects; other bidders might have legal grounds to protest. In short, negotiating should be avoided, but if circumstances warrant negotiating, a construction contract attorney should be involved.