ALTERNATIVE CONTRACTING METHODS IN THE U.S. ARMY CORPS OF ENGINEERS

by

Craig L. Simoneau

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Signature of Author_____
Department of Civil Engineering
May 8, 1992

Certified by_____
Fred Moavenzadeh
Director, Center for Construction Research and Education
Thesis Supervisor

Accepted by_____
Eduardo Kausel
Chairman, Departmental Committee on Graduate Students

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ABSTRACT

This thesis examines the contracting methods used by the United States Army Corps of Engineers (USACE). While USACE typically uses the traditional approach to construction contracting, they have recently begun using two forms of a design/build method. The traditional method uses separate design and construction firms. The construction contract is generally a firm fixed-price contract awarded in open competition to the lowest responsible bidder. This study found that there are many disadvantages to using this method, especially when it is used almost exclusively. The design/build approach employs a single organization to perform both the design and construction of a project. The two variations used by the Corps, the One-Step Negotiated process and the Two-Step Sealed Bidding process provide flexibility to USACE in their construction contracting. The primary advantages of the design/build methods are a savings of time, a reduction in costs, a reduction in time-consuming and costly disputes, allowing competition between designs, and the ability to award contracts based on quality as well as price. The environmental area, mobilization requirements, and base closure projects were all found to be particularly suitable for design/build use.

After examining how USACE acquires facilities, the study looks at the various contracting methods available in the construction industry. The study found that some of these other contracting and award methods may be suitable for use by the Corps of Engineers. These include the cap type award method, guaranteed maximum price (GMP) contracts, and multiple parameter bidding.

Finally, the Corps' current project selection criteria is examined. This selection process assists the user in identifying appropriate procurement methods, but it does not permit the consideration of the relative advantages of the different criteria, nor does it stimulate any real innovation in the construction industry. Instead, it attempts to capitalize on successful new construction methods that have already been tried and proven successful.

Thesis Supervisor: Fred Moavenzadeh
Title: Director, Center for Construction Research and Education

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AUTHOR

The author, Craig L. Simoneau, is a Captain in the U.S. Army Corps of Engineers. He was born in Cumberland, Rhode Island in 1961. Following his graduation from the United States Military Academy at West Point, he was commissioned in the U.S. Army. He has served as a platoon leader, assistant brigade engineer, executive officer, battalion training officer, and company commander in combat engineer units in the United States and Germany. He has also managed various construction projects while serving in a Directorate of Engineering and Housing. He is a licensed professional engineer in the state of Virginia. He is married and has one son.

TABLE OF CONTENTS

1
INTRODUCTION

The United States Army Corps of Engineers (USACE) has about 850 requests for relief and/or claims filed each year on construction contracts. In the end these claims will cost approximately $570 million in FY90 and an estimated $550 million in FY 91.[1] These costly disputes have inspired the Corps to institute various methods aimed at reducing the non-productive time and costs of construction disputes. These changes have included Alternative Dispute Resolution (ADR) and Partnership between the Corps and its contractors. In addition to these changes, USACE began testing design/build forms of construction contracting. Having proven successful during its test period, the Corps recently published its guidance on the use of the design/build methods.

The Corps of Engineers is a very large construction management agency. In fiscal year 1988 (FY 1988), it paid $608 million in fees to private A-E firms ($102 million on civil works contracts; $506 million on military contracts).[2] Its FY 1992 Military Construction, Army (MCA) budget was $851 million. This only includes the budget spent on Army projects. They also manage construction projects for the Air Force, other federal agencies, and a large program of civil works projects. In line with the overall military down sizing, the military construction budget is currently being dramatically reduced. In FY 1993, the MCA budget is estimated to only be $369 million (including $185 million for chemical demilitarization). Only critical health, safety and environmental projects were funded. The focus is now on revitalizing

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[1]John Elmore, "Which Procurement and Contracting Methods Reduce Disputes?" Speech given at the Constructive Resolution of Construction Disputes Conference, Washington, D.C., 7 November 1991.

[2]Jordan W. Cassell et. al., *Streamlining the Architect-Engineer Acquisiton Process,* Technical Report, Logistics Management Institute (Bethesda, Maryland: November 1990), p. 1-1.

enduring (after drawdown) facilities.[3] This budget reduction make it even more critical for USACE to try to get as much value out of each construction dollar.

In the civil work arena the work is stable, but has shifted away from building the large lock and dam projects. Environmental concerns are now more important as well as rebuilding our deteriorating infrastructure. Support to other agencies, especially the Department of Energy and the Environmental Protection Agency, has continued. The Corps is now taking the lead in developing a national infrastructure strategy. Recent support of foreign nations include: $14 billion in construction of five major military infrastructure projects in Saudi Arabia; $430 million for recovery services in Kuwait; a project to alleviate the impact of flooding in the Sula Valley in Honduras; and support for the EPA in the purchase, delivery and installation of water treatment, wastewater treatment and laboratory equipment at public work facilities in Poland.

Certainly the complexity and nature of the Corps support has and will continue to change as the needs of the country and the world change. This comes at a time when the Department of Defense and the Corps of Engineers is seeing a large reduction in its budget. To support this evolving mission the Corps must efficiently use all its available resources and the resources of the entire construction industry, including all possible contracting methods to obtain those resources.

In this thesis, I examine the traditional procurement process used by the Corps of Engineers. This process has numerous problems that stem from the over regulated nature of their business to their heavy reliance on the design/bid/build method of contracting.

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[3]Lieutenant General Henry J. Hatch, USA, "Meeting the Challenges of Global Change," *The Military Engineer,* (SAME, Vol. 84, No. 547, Jan-Feb 1992) p. 42.

I focus my discussion on how various contracting methods can help improve the process. To do this, I examine the various contracting methods commonly available and used in the construction industry and those generally available to USACE. While the Corps is limited in their use of many of these methods, the recent Congressional authorization to test various contracting methods has led to the current guidance that permits two forms of design/build, with some restrictions.

I outline the history of design/build in military construction, describe the current guidance on its use, and examine possible applications of the method. The environmental area, mobilization requirements, and base closure projects were all found to be particularly suitable for design/build use.

Finally, I address the Corps' current project selection criteria. This selection process does not permit the consideration of the relative advantages of the different criteria nor does it stimulate any real innovation in the construction industry. Instead it attempts to capitalize on successful new construction methods that have already been tried and proven successful.

The study also found that other contracting and award methods may be suitable for use by the Corps of Engineers. These include the cap type award method, guaranteed Maximum Price (GMP) contracts, and multiple parameter bidding.

2

THE TRADITIONAL CONSTRUCTION DELIVERY SYSTEM

The Department of Defense's Military Construction Delivery System consists of organizations which manage construction, such as the Army Corps of Engineers and the Naval Civil Engineering Corps; military engineering staffs reporting directly to the military commander they represent; facility and base engineers; and troop construction units.[4] The construction management organizations are responsible for managing the design and construction for the organizations they represent. Because of their limited in-house design capability, they normally contract with private firms for both design and construction work. I will focus on the United States Army Corps of Engineers (USACE), but many issues can apply to the other military construction organizations with differences mostly due to their size and congressionally imposed limitations on their authority to handle larger contracts.

The Army Corps of Engineers is the Army's construction agent responsible for the nation's civil works and all the congressionally appropriated military construction for the Army and Air Force. They also provide technical advice to the other construction organizations within and often outside the Army. The other services; foreign nations; and federal agencies, such as the Environmental Protection Agency (EPA), also frequently call upon the Corps of Engineers to manage design and/or construction activities.

In this chapter, I will discuss the organization of the Corps of Engineers, the military's construction requirements, the facilities acquisition process used by the military, and the problems of this traditional contracting approach.

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[4]Greg F. Martin, *Construction: The Foundation of National Defense* (Cambridge, Massachusetts: a thesis submitted to the Department of Civil Engineering, Massachusetts Institute of Technology, April 1988), p. 78.

2.1 Organization of the Corps of Engineers

The United States Army Corps of Engineers is currently organized into 12 engineer divisions and 40 districts with stateside and overseas responsibilities. They also operate four engineer research laboratories in support of their mission.

The Corps of Engineers has a long history as the *nation's engineers* supporting both peacetime and wartime construction needs. They also have vast experience working with other federal agencies, state and local governments, and the construction industry. USACE has many missions. The major ones are listed below:

- Manage and execute engineering, construction and real estate programs for the Army and Air Force.
- Perform research and development in support of the above programs.
- Provide specialized engineer and technical support to:
    - Facility Engineers
    - Staff Engineers
    - Unit Commanders of Army engineer organizations.
- Provide specialized assistance to theater commanders in base development planning for contingency operations.
- Manage and execute Civil Works Programs.
- Perform Research and Development (R&D) in systems, specialized equipment, procedures and techniques relevant to engineer support of combat operations.[5]

USACE performs these missions during peacetime, mobilization for armed conflict and wartime operations. Additionally, the Corps of Engineers performs emer-

[5]Ibid., p. 84.

gency actions in response and in preparation for natural disasters especially flooding and coastal emergencies.

The highly decentralized nature of USACE allows it to be extremely flexible and responsive to local needs. It can, however, limit the integration of new ideas and concepts. Lessons learned, or mistakes made, in one district may not be quickly shared with other district offices.

2.2 The Military's Construction Needs

The military's construction needs vary depending on the situation they are facing. Peacetime requirements are certainly different from mobilization and wartime needs. I will address the needs of the military for each of these phases.

During peacetime the military's construction requirements emphasize many of the same principles as the civilian construction industry. Most facilitates are constructed with permanence, durability, ease of maintenance and economy in mind. Because of their limited in-house capability, USACE contracts out more than 80 percent of their peacetime design work and almost all their construction to private industry.[6] This has resulted in a large market for civilian architect-engineer firms and builders.

Most of these contracts are competitively bid using the traditional separate design and build approach. This is used extensively by most government agencies and in varying degrees by private owners. Its popularity with government agencies rests in the *impartial* nature of the competitive bid process. Its impartiality helps to eliminate favoritism and corruption. This is considered more important when dealing with public projects because of the need to protect the public's funds.

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[6]Cassell, et al., p. 1-1.

During mobilization speed and expediency will be emphasized. The normal peacetime standards of permanence, durability and economy will likely be sacrificed. The civilian construction industry will be the primary provider of the mobilization construction requirements in the United States. This is especially true since a large portion of the Army's engineer units are in the National Guard and Army Reserve. During conflicts where there is a long build-up to hostilities the President's ability to call up these engineer forces may be limited; or he may be deem it politically inappropriate to do so. Once forces reach the theater of operations, U. S. troop construction units will likely begin to handle some of the construction tasks. This is especially true in the situation where there is a protracted build up before actual conflicts arise.

Our view of how we will fight future wars has changed, especially considering the recent Gulf War. We once thought that Europe was the most likely setting for a large scale conflict. This scenario entailed little notice and time to mobilize our forces. Most scenarios envisioned troops fighting almost immediately upon their arrival in the area of interest. The long build up time placed demands on the construction industry that were not fully anticipated.

Future wartime construction requirements will also be somewhat unpredictable. We no longer can accurately predict where, when or how long we can expect future conflicts to last. Therefore, our wartime construction delivery system must be flexible to meet these very unpredictable requirements.

Consider the case of the VII U. S. Army Corps who was ordered to deploy from Europe to Saudi Arabia. Simple items such as constructing blocking and bracing material, necessary to properly secure vehicles to the railcars for their journey to the ports, became difficult. This corps that had the mission to defend Europe since the end of World War II was always prepared to drive their vehicles directly to the place of conflict. Now a new mission created new construction requirements.

The recent end of the *Cold War* will also affect the way we anticipate fighting future conflicts. We must now prepare to fight anywhere, for any length of time, on little or no notice. Our construction delivery system and the construction industry must be equally ready to support this mission. A construction delivery system that is not prepared to meet this challenge will undoubtedly severely limit our military capability.

2.3 The Military Facilities Acquisition Process

The Military Construction Program is the primary method for obtaining new facilities and major renovation of facilities in the Department of Defense.[7] Within the U. S. Army this program is called the Military Construction, Army (MCA) program. The MCA process consists of three basis phases (1) Programming, (2) Design and (3) Construction.

When a need for a military facility is recognized it is brought to the attention of the local engineer (usually the Directorate of Engineering and Housing) organization. Programming documents are then prepared and sent through the Major Army Command (MACOM) to Headquarters, U. S. Army. Programming documents include cost estimates, conceptual designs, and the functional requirements of projects. The goal of the programming phase is to establish project feasibility and outline the parameters for the project. As the programming documents make their way through the organizational channels, projects are prioritized until finally Congress approves the Army's list of projects. Congressional approval and appropriation of funds mark the end of the programming phase.

The second phase is the design phase. The design phase can overlap with the programming phase because preliminary designs and estimates are needed in the pro-

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[7]William W. Buckingham, *An Investigation of the Application of the Design/Build Method to Military Construction Program* (a thesis submitted to the School of Systems and Logistics, Air Force Institute of Technology, September 1989), p. 1.

gramming phase. The preparation of design specifications and drawings continues, sometimes before Congressional approval is obtained. If a project is designed, but not approved by Congress, then the design can be saved until it is approved.

Construction is the third phase of the acquisition process. It includes solicitation of bids from contractors, management of the construction contract, and final inspection and acceptance of the project. A contract cannot be awarded before Congressional approval and appropriation of funding is obtained.

This procedure usually involves awarding two contracts: one to an Architect-Engineer Firm to design the project and one to a general contractor who will construct the facility. This process usually takes from four to five years (from project identification to final acceptance).[8]

2.3.1 The Architect-Engineer Contract

The Federal Government did not always employ private Architect-Engineer (A-E) firms. Before 1939 the in-house design capabilities of government agencies generally were sufficient to handle most needs. In those rare instances when a government agency needed to employ outside A-E firms, they had to advertise and seek competitive bids. In 1939 Congress authorized the Secretaries of War and Navy Department to contract with practicing A-E firms for designs, plans, drawings, and specifications for public works and utilities projects. Congress gave this authority as part of a large effort to upgrade existing military facilities and to construct additional facilities on military bases in preparation for the pending hostilities. This authorization eliminated the need for advertising and competitive bidding of A-E contracts.

Like most federal regulations, this new authorization came with some limitations. Specifically, Congress limited the fee for an A-E firm to six percent of the

[8]Ibid., p. 16.

estimated construction cost.[9] Although it took an imminent war to begin the process of change this did at least begin moving the government away from competitive bidding of A-E contracts.

Currently, A-E selection is governed by the Brooks Act (Public Law 92-582) passed in 1972. The Brooks Act requires:

- Public announcement of all requirements for A-E services.
- Negotiation of all A-E contracts with the awards based on the demonstrated competence and qualification for the type of professional services required.
- Discussion with at least three firms.
- Selection of the three most qualified firms in order of preference.
- Negotiations with the three most qualified firms in order of preference until a fair and reasonable price agreement is reached.

The Brooks Act selection criteria are implemented in The Federal Acquisition Regulation (FAR). It requires that selection of A-E firms be based upon their professional qualifications, specialized experience and technical competence in the specific type of work required, ability to complete the work in the required time, past performance on government contracts, geographic location and knowledge of the locality of the project, and acceptability under appropriate evaluation criteria.[10]

The FAR also prohibits the awarding of a construction contract "to the firm that designed the project or its subsidiaries or affiliates, except with the approval of the head of the Agency or authorized representative."[11]

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[9]Cassell, pp.1-2 and 1-3.

[10]Ibid., pp. 1-3 and 1-4.

[11]The FAR as quoted in James R. Berger, *Federal Agencies and Design/Build Contracting*, (a thesis submitted to the College of Civil Engineering, University of Florida, July 1991), p. 21.

Therefore, USACE selects private A-E firms based on negotiations with at least three different firms. The most qualified (based on specific criteria) is selected -- **not the one offering the lowest price**. USACE generally pays market prices for these A-E services.

2.3.2 The Construction Contract

Under the traditional design/bid/construct arrangement the construction contract is separate from the design or A-E contract. Once the detailed design drawings, specifications, and plans are completed the contract is advertised for competitive bidding. While USACE examines the qualifications of the general contractor, their qualifications must only meet a **minimum standard**. Unqualified contractors are eliminated from bidding on the project. Contractors are not judged by their relative qualifications, but only against the minimum standard. A more qualified firm is given no preference over any other less qualified firm. Therefore, **price** is the sole evaluation criteria.

A firm fixed-price contract is then awarded to the minimum qualified bidder. Any changes to a contract awarded under the traditional method because of design error, differing site conditions, or owner requested changes are negotiated with the contractor.

2.3.3 How Federal Projects Differ From Commercial Projects

There are numerous factors that distinguish a federal construction project from a privately run commercial construction project undertaken by an owner who is divorced from any formal governmental relationship. The major difference is that federal construction is closely governed by a large amount of legislative restrictions and requirements. The Federal Acquisition Regulation (FAR) is the implementing document for most of the legislative requirements. While the FAR governs federal agencies, the Army must also follow the DOD (DFARS) and Army Supplements (AFARS)

to the FAR. These place further restrictions on the Army construction process, give more guidance to USACE construction personnel, and clarify the guidance already put forth in the FAR. I will now highlight some of the major differences which impact on the way USACE manages construction projects and on the way contractors operate when working for the Corps.

2.3.3.1 Administrative Requirements

The Corps of Engineers requires contractors working for them to submit numerous reports or plans. Contractors may prepare some of these reports/plans regardless of whether they are working for a private owner or the Corps of Engineers, but for some contractors many of these present additional requirements. While many of these reports/plans may not seem excessive or unnecessary, they are generally more than is required by most private owners. Additionally, USACE most often requires contractors to submit these reports/plans in a specific format. Therefore, a contractor may have to reformat reports that he normally prepares to meet USACE requirements.

Eight typical reports/plans required by the Corps of Engineers are shown below.[12] Individual project requirements may be different.

1) Safety Plan
2) Progress Schedule
3) Davis Bacon Report
4) Hazards Communication
5) Phase Hazard Analysis Plan
6) Quality Control Plan
7) Quality Control Daily Report

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[12]Andrew D. Pope, *The Military Construction (MILCON) Program and Privatization: A Comparative Analysis* (a thesis submitted to the School of Systems and Logistics, Air Force Institute of Technology, September 1990), p. 55.

8) Submittal Register

I will not provide a lengthy discussion of whether these reports/plans are necessary or not. The point is addressed merely to show that contractors face different, most often additional, administrative requirements when working on projects for the Corps of Engineers than on projects for the typical private owner.

The second area of administrative requirements which many contractors feel is more burdensome on USACE projects is the number of conferences and meetings held by the Corps of Engineers. Three examples of conferences/meetings held by USACE are: (1) Preconference meeting, (2) Mutual understanding conference-QC (Quality Control) and (3) Mutual understanding conference-Safety.[13]

2.3.3.2 Construction Standards

Most often, the military requires contractors to construct facilities to its own standards. These standards may or may not be the same as those generally followed in commercial construction. When a contractor builds a facility for a private owner he will generally do so according to national standards. Additionally, a contractor must follow any state or local standards (when more restrictive than the national standard). Private owners may require construction to meet an even stricter standard, due mostly to the individual nature and requirements of their business. Usually the national standards are followed in private construction, except in the limited cases where local standards are stricter.

Contractors generally know the national and local standards where they work very well. While I will not argue whether the military should have standards different from the national standards, these construction standards impact on contractors who perform construction for the military. Unless contractors frequently work on military

[13]Ibid., pp. 58-59.

projects, these military construction standards require additional knowledge for not only the contractors, but also architects and sub-contractors.

The FAR now allows industry standards to replace military when suitable standards exist.[14]

2.3.3.3 Contract Clauses

The Corps of Engineers uses different contractual clauses than do most private owners. Private owners generally use one of the two most popular types of *standard* contracts. These contracts contain contract clauses and provisions covering what each party is responsible for and what happens when certain events occur during a project. The two most popular standard contracts are the American Institute of Architects (AIA) and the Engineers Joint Contract Documents Committee (EJCDC) documents. While many state and local governments, as well as some larger private owners, use contracts with their own boilerplate contract clauses, the AIA and EJCDC documents are probably the most widely recognized.

The Corps uses its own form of standard construction contract. Many of the clauses included in Corps construction clauses are mandated through the FAR and the DOD, Army and Corps of Engineer Supplements (EFARS) to the FAR. While each specific contract will include different clauses, many clauses must be included in all construction contracts. Some clauses will have little effect on the contractors' method of operating or procurement of materials while others have a more pronounced effect.

One could argue that the mere use of unique contract language by the Corps imposes unique requirements on its contractors. Certainly there is a knowledge barrier that must a contractor must initially overcome when he first works on a project for the

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[14]Thomas R. Napier and Michael E. Lierman, *Industrialized Building System/Two-Step Procurement Pilot Projects: Three Case Studies*, Technical Report, (Champaign, Illinois: U.S. Army Corps of Engineers, Construction Engineer Research Laboratory, January 1985), p. 44.

Corps. Requirements, such as how and when to submit requests for equitable adjustment of time and/or money due to differing site conditions must be understood before beginning a USACE contract. This initial knowledge requirement is generally not overburdening since contractors face these problems regardless of whom they are working for. Additionally, once they begin to have repeat work with the Corps this knowledge burden will be reduced.

The real difference between USACE contracts and those of private owners lies in the operating effect these contract clauses have upon contractors. In a survey conducted with contractors in the Dayton, Ohio area, Andrew Pope found many contractors who felt that federal contract clauses did not seriously affect the way they operated on federal projects. The one area where he did find a noticeable difference was the effect that the Buy American Act had upon the contractors.

The Buy American Act was enacted during the depression to protect American industries and its workers. The act gave preferential treatment of American material in federal procurement. It required that the government procure only those materials, supplies, or manufactured articles produced or manufactured in the United States from substantially all domestic material. This act governed not only those items directly procured by the U. S., but also those items used by contractors working under contract with the U. S.[15] Thus, a construction contractor must investigate not only where the materials he intends to use on government contracts were manufactured, but also where the raw materials that went into the product were originally produced.

While waivers to the Buy American Act are possible in extraordinary circumstances, the domestic article must generally exceed the cost of the foreign made item by 6% to qualify. When the domestic offer is from a small business or a labor surplus

[15]Pope, pp. 29-30.

area concern, then the domestic offer must exceed the foreign offer by 12% to reject the domestic offer.[16]

2.3.3.4 Davis-Bacon Act

Other legislated requirements which impact all federal construction contractors are contained in the Davis-Bacon Act. Congress passed the Davis-Bacon Act during the depression to allow contractors to compete against those contractors who were employing low-wage migrant labor. The act requires that the government pay *prevailing wages* (as determined by the Department of Labor) on all federal construction contracts over $2,000. The Department of Labor sets these rates for each labor category and project type for each locality.[17]

2.4 Problems with the Traditional Approach

This purpose of this section is to show some of the problems and limitations of the traditional facility acquisition process used by the Corps of Engineers. In its 1986 *Defense Acquisition Report,* the President's Blue Ribbon Commission on Defense Management (the Packard Commission) said of the defense acquisition system:

> All of our analysis leads us unequivocally to the conclusion that the defense acquisition system has basic problems that must be corrected. These problems are deeply entrenched and have developed over several decades from an increasingly bureaucratic and overregulated process...In general, we discovered, these problems were seldom the result of fraud or dishonesty. Rather they were symptomatic of other underlying problems that affect the entire acquisition system. Ironically, actions being prescribed in law and regulation to correct...tend to exacerbate these underlying problems by making acquisition procedures even more

[16]Ibid., p. 30-31.

[17]Ibid., p. 25-26.

inflexible and by removing whatever motivation exists for the exercise of individual judgment...[18]

2.4.1 Problems with Obtaining A-E Services

The military has recognized that there are problems with the way they obtain Architectural-Engineer services. As a result they have been seeking ways of improving the way they select and award A-E contracts as well as the procedures used in the process. To address these concerns the Navy Facilities Engineering Command (NAVFAC) commissioned a Total Quality Management Team in fiscal year 1989 (FY89) to examine their A-E acquisition process in an effort to expedite it.

The Corps of Engineer has also been trying to improve their A-E contracting procedures. In 1988, the Engineer Inspector General (EIG) conducted a special inspection of USACE A-E contracts. As part of FOCUS 89, the Corps has also tasked the Logistics Management Institute to develop recommendations for streamlining the A-E acquisition process. I will now address the specific problems USACE faces when obtaining A-E services.

2.4.1.1 Too Slow

One of the most glaring problems with the Corps A-E acquisition process is that it is too slow. This is the primary reason that the Corps and NAVFAC began addressing the issue. The Logistics Management Institute (LMI) conducted a survey in 1990 as part of their study and found that the average time for the Corps to select an A-E contractor and award an A-E contract was as shown in Table 2-1. These duration's do not include the time it takes the A-E firm to perform the actual design work.

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[18]Cassell, p. 3-8.

REPORTED AVERAGE DURATION TO AWARD A-E CONTRACTS

Contract Type	Duration	
	Fee less than $500,000	Fee greater than $500,000
Military Construction	192 days	281 days
Civil Works	236 days	288 days
Indefinite Delivery	153 days	235 days

Table 2-1[19]

The Logistics Management Institute report found these average duration's excessive. They recommended that USACE adopt maximum duration standards and goals as shown in Tables 2-2 and 2-3 respectively.

MAXIMUM DURATION STANDARD TO AWARD A-E CONTRACTS

Contract Type	Duration	
	Fee less than $500,000	Fee greater than $500,000
Military Construction	123 days	209 days
Civil Works	132 days	199 days
Indefinite Delivery	109 days	172 days

Table 2-2

[19]Ibid., p. 2-8.

MAXIMUM DURATION GOALS TO AWARD A-E CONTRACTS

Contract Type	Duration	
	Fee less than $500,000	Fee greater than $500,000
Military Construction	102 days	181 days
Civil Works	113 days	176 days
Indefinite Delivery	94 days	156 days

Table 2-3

By merely establishing maximum standards and goals the Corps of Engineers can begin to reduce the time it takes to award A-E contracts. This is because managers will now have a standard against which they can measure their organization and their workers. If employees' performance appraisals take into considerations these standards and goals, then the organization will certainly be motivated to reduce the award time of A-E contracts. Simply providing motivation for employees to meet these goals may not be sufficient to fully achieved them. Other factors may be impeding the organization's ability to effectively award A-E contracts.

2.4.1.2 Over Regulation

Because A-E services are negotiated contracts (as prescribed by the Brooks Act), they are more closely reviewed and regulated. The LMI report found that the acquisition process was over regulated. While the Corps does not have the authority to make direct changes to the FAR, it can modify the EFARS, its own regulations and policies as well as make recommendation for changing the FAR.

Over regulation creates an acquisition process which is very difficult to understand. This has a tendency to slow down the process because there are not as many personnel who are fully knowledgeable of the procedures (often resulting in a

lengthy review process). Additionally, private firms will have more difficulty understanding and be less willing to participate in the process.

Some areas where the LMI felt that streamlining could occur were:[20]

1. Eliminate some provisions of the EFARS and allow contracting officers to exercise greater judgment in interpretation of procurement regulations.

2. Allow more authority for contracting officers to waive audits. Eliminate audits on indefinite delivery A-E contracts that do not include option years.

3. Reduce the review time of Business Clearance Memorandums (required for negotiated contracts exceeding $100,000).

2.4.1.3 Negotiation of Cost Takes Too Long

The time required to negotiate A-E contracts can be lengthy if personnel are not thoroughly familiar with the prevailing costs of A-E services. Tracking historic costs and the prevailing private sector costs can save time when it comes time to negotiate a fee.

2.4.1.4 Too Low a Threshold for Indefinite Delivery Contracts

Indefinite delivery type (IDT) contracts allow contracting officers to direct work to pre-selected firms. Since a firm, or a list of firms, has already been selected all the contracting officer has to do is to prepare a delivery order. This significantly reduces the time required to begin A-E work on a project. There is, however a greater chance that the pre-selected firm(s) will not be able to perform the specific type of design required. To reduce this possibility a number of firms, with different specialties, can be awarded IDT contracts.

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[20]Ibid., p. 3-11.

Increasing the threshold limitations for IDT contracts will allow more flexibility for contracting officers. LMI recommends an increase to a contract ceiling of $500,000 per year and $200,000 per order.

2.4.1.5 Need More Innovative Contracts

The IDT contract is one method of increasing the turnaround time for A-E services. USACE should try different innovative approaches to using IDT contracts. For example, a district could maintain a list of A-E firms by facility type and rank order the firms by the *best qualified.* When a project is ready for design they can negotiate with the firm at the top of its list. Additionally, Engineer Divisions could maintain a pool of A-E firms with a larger dollar limitation. Districts could then ask the division to use its pool of IDT firms for emergency projects and those projects that begin too late in the programming cycle to allow normal procurement actions.

Language in the FAR requiring the agency head or his representative to authorize projects where the construction agency is from the same firm as the designer slows down and discourages certain forms of single organization (design/build, turnkey, etc.) construction delivery methods.

2.4.1.6 Optimum Design Usually Not Considered

The A-E, due to time and cost limitations, usually only considers a few feasible design possibilities. They then select one design early in the design process. Since there is no motivation for the A-E to find the *optimum* design, he will usually seek only an *acceptable* one. Additionally, there is no motivation for the designer to go back and change his design because of new information.

2.4.2 Problems with the Traditional Construction Contract

The traditional design/bid/build process does not work well for all types of projects. While it may work well for projects with certain characteristics, it may not be as effective when one considers other factors. I will now describe some of the problems that may be encountered when the traditional approach to construction contracting is used. For this discussion the traditional approach is characterized as having separate design and construction contracts with the construction contract competitively bid and a firm fixed-price contract awarded to the lowest qualified bidder. This section will focus on the problems that are associated with the traditional *contracting method* not with the legislative and regulatory requirements that make USACE construction contracts different from private sector contracts.

2.4.2.1 Requires Detailed Plans, Specifications and Drawings

A lump-sum competitively bid contract requires detailed plans, specifications and drawings for two reasons: (1) to tell the contractor exactly how something should be done since changes will cost someone (usually the owner) more money than originally planned and (2) to create a level playing field for all bidders.

Ambiguous bid documents usually cause contractors to "guess" at what the owner really wants. If the contractor who is awarded the contract "guesses" incorrectly, then he will usually seek an extension of time and/or money from the owner -- seeking to regain some of his profit through negotiated changes. This often results in wasted time and money just to resolve the disagreement. One purpose of a lump-sum contract is to fix the price at the beginning of the work. Ambiguous bid documents usually result in disputes and *change orders*. "If the scope (of work) changes more than about 15 per cent the contract becomes a negotiated, lump sum deal

priced as it goes or at the end of the job."[21] Thus, detailed bid documents are necessary to realize the full advantages of the traditional lump-sum competitively bid process.

Another method taken by some bidders is to simply add a higher margin to their bid price to account for potential ambiguities in the bid documents. This additional margin is added to the markup the bidder has already included because he must bear the risk of his subcontractors. Since, the contractor is bearing the entire financial risk on lump-sum contracts he may try to protect himself through this higher profit margin.

This also applies to other types of changes such as owner requested changes, differing site conditions and design errors. The more change that occurs on a lump-sum contract the more the price becomes negotiated not fixed as intended.

A solution used by some owners is to ensure that their plans, specifications, and drawings are reviewed in great detail to avoid ambiguities and change orders. However, this may be counter-productive. An owner must pay more for the level of design and review to make this possible. Overdesign of simple projects is a potential result of a concerted attempt by an owner to reduce ambiguities and change orders. Why tell a sub-contractor how to install items that are fairly standard within the industry? Thus, an owner must weigh the cost of a more detailed design and review against the potential savings of reducing changes.

Richard Edmister claims that the construction industry has never been more cost effective as it is now. The industry has controlled wages, eliminated restrictive work rules, and implemented world class computer scheduling and management systems. Much of this effectiveness was due to the competition nature of the bidding process. Transaction costs have risen during this time. These transaction costs include

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[21]Richard R. Edmister, "Cost Effective Construction: Attacking the Transaction Costs," *Construction Business Review,* (March/April 1992), p. 53.

the owner's in-house staff, consultants, contract bid costs and all other associated costs. Perhaps, Edmister argues, money would better be spent in more direct involvement with the work. These personnel assigned to handle transaction costs do not cause the actual construction to continue any faster.[22]

2.4.2.2 Disputes and Litigation

The U. S. Army Corps of Engineers has approximately 850 requests for relief and/or claims filed each year on construction contracts. The costs of these claims were approximately $570 million in FY90 and $550 million in FY91. These claims employed 45 Corps attorneys and required a tremendous amount of time to review and prepare files and dispositions by other Corps personnel.[23]

By multiplying the above figures by two, to account for the contractors' costs, one can easily see that disputes can only add time and costs to the traditional construction project. The disputes and subsequent litigation resulting from lump-sum competitively bid contracts have led to a very profitable business for many lawyers, dispute resolvers and consulting firms. This has done little to help get facilities built.

The causes of these disputes are numerous: bid protests, defective designs, differing site conditions, ambiguous bid documents, owner requested changes, and errors by the contractor and/or his sub-contractors. Regardless of what causes the dispute one thing is clear -- since the contractor is bearing all the financial risk, he will usually attempt to compensate himself by going to the owner and requesting relief.

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[22]Ibid., p. 50.

[23]Elmore.

2.4.2.3 Places Too Much Risk on the Contractor

Another criticism of he traditional construction delivery method is that it places too much risk on the contractor. The greatest risk the contractor must bear is the financial risk. If the cost exceeds the contractor's expectations, then the contractor must absorb the additional costs. This means that contractors must make detailed cost estimates to avoid losing money since contractor is bearing all financial risk. These detailed cost estimates can become very costly.

Placing the entire financial risk on the contractor can have additional effects when competitively bidding multi-million or multi-billion dollar contracts. Only a few companies can compete for this type of work -- the risk and bonding are too great for most. This may effectively reduce competition -- a necessary ingredient of the traditional process. This may mean one large company may be the sole bidder on a large contract, creating an effective monopoly for that company.[24] This does not allow the owner to get the best possible price for the project. If the owner was willing to share some of the financial risk, then other companies might be willing to seek the contract.

Because **price** is the only criteria for award of the lump-sum competitively bid contract, most bidders are forced to reduce their bid to an unrealistically optimistic level to win awards. They do this by cutting their allowance for contingencies against unforeseen conditions to an absolute minimum, being unrealistic about production forecasts, and finding ways to unbalance their bids to take advantage of what they think is an error or incorrect estimate in the bid documents. If contractors included these margins in their bids, then their bids would be less competitive and they would never

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[24]Dwight M. Bower, "Innovative Contracting Procedures." *Engineering 21st Century Highways,* (ASCE, 1988), p. 228.

receive any work. Litigation and claims are the inevitable result when the project does not go as planned.[25] Some contractors intentionally submit bids that are below their anticipated costs -- knowing they will try to obtain the difference they need to turn a profit on change orders.

A new book, *Contractors Guide to Change Orders,* has been written to help contractors find these hidden change orders.

> It's no secret that up to 95 percent of change orders are buried in the specs and fine print. But now *Contractors' Guide to Change Orders* helps you fight back and win top payment for these potential delays and hidden expenses. Here you'll discover where to look for change orders...how to uncover them in time...how to figure costs...how to maximize your prices and justify them...how to negotiate the most favorable outcome. In addition, the guide includes everything you need to change "hidden" change orders into profit opportunities.[26]

2.4.2.4 Relationships are Too Adversarial

The traditional approach to construction contracting produces very adversarial relationships between the owner, the A-E, and the contractor. The lump-sum contract creates a zero-sum game where anything gained by the owner is lost to the contractor and vice-versa. If a contractor's bid comes in very low, then the owner suspects he might cut too many corners and seek reimbursement through changes. Consequently, if the winning bid is higher than expected the owner suspects the contractor of seeking a windfall. Additionally, when the owner loses a dispute to the contractor he may seek relief from the A-E because of defects in the plans or specifications caused by the A-E.

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[25]Joseph Nicholson, "Rethinking the Competitive Bid." *Civil Engineering* (ASCE, Vol. 61, No. 1, January 1991) pp. 66-67.

[26]John I. Carlson, Jr, "Which Procurement and Contracting Methods Reduce Disputes?" Speech given at the Constructive Resolution of Construction Disputes Conference, Washington, D.C., 7 November 1991.

The owner, USACE, on many occasions must now referee disputes between A-E and contractor.

As discussed previously, the low mark-up nature required to win the bid often causes the contractor to look for compensation even if the cost and/or time over run was his own fault. Because all disputes can not be totally eliminated, the system must allow for timely and fair resolution of these unavoidable disputes. The traditional system often leads to litigation, which is expensive and time consuming.

Contractors under the traditional approach have the goal of maximizing their profit. The owner's goals are to construct a quality facility in the least possible time at the least possible cost. Since the contractor is forced to use very slim margins in his bid, the only way he can truly maximize his profit is to cut corners or to find change orders -- for which he receives a higher profit. Thus, the nature of the contract put the owner and contractor's goals in direct competition.

2.4.2.5 Lower Quality Facilities

A 1986 Corps of Engineer Inspector General Report found that the lump sum bid contract often produced undesirable contractors with inferior quality records.[27] This may be a result of allowing too many bidders, thereby increasing the chance of getting a low bid from a lower quality contractor. Higher quality contractors will eventually stop bidding on these contracts because their chances of receiving the contract is low. The higher quality contractors can not differentiate themselves because price -- not previous record of delivering quality facilities on time and on budget -- is the only criteria for contract award. Additionally, there is a lower chance of repeat work on government contracts, further discouraging good contractors.

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[27]William B. Moore and Trevor L. Neve. "Contracting for Quality Facilities." *Excellence in the Constructed Project,* (Proceedings of the Construction Congress I, ASCE, 1989), p. 370.

Lower quality contractors also lead to a greater chance of default on a project. A company who is financially weak, can not handle unexpected problems as easily. While requiring contractors to be bonded helps to protect the government, it still takes time and money to work through a defaulted contractor's bonding agency.

Even if a quality contractor is found he will only be motivated to construct the lowest quality facility that meets the specifications. Again, quality is not rewarded or encouraged. Low cost is often associated with low quality. The owner must be allowed to make price versus quality decisions so that he can obtain the best quality facility within his budget. The traditional method *strives* to achieve the most inexpensive facility built to a pre-determined quality. This pre-determined quality and lowest cost, as previously discussed, are difficult to accomplish.

2.4.2.6 Time Consuming

One of the most common criticisms of the traditional process is that it takes too long to deliver a completed project. The linear nature of the traditional process -- the design must be completed before construction can begin -- causes much of this problem. Additionally, the large number of disputes, claims and litigation that results further slows the project. A third component that takes time is the bidding process. This entails selecting an A-E, advertising the contracts, reviewing the bids and resolving the bid disputes. Further, a full review of the design must take place before advertising the construction contract. The requirement to obtain Congressional authorization and appropriation may further slow the military process.

Government agencies do not often subscribe to the old adage that *time equals money*. In many instances public projects do not result in a direct saving of money -- they may instead obtain greater public good. For example, a delay in a new gymnasium project will cause the old facility to be used longer (if the new gym is replacing an older one) or the existing facilities to continue handling the greater

volume. Thus, there is probably no monetary incentive for the government to complete the facility quickly. While the private sector might consider the benefit of increased level of physical fitness or the increased morale of its employees in its consideration of the desired construction speed, the government is less likely to do so. Therefore, the owner must be able to make price versus speed decisions.

Finally, delays in the project cause the design to age. This may mean that the user's needs have changed before the final delivery of the project. There is then a greater desire to incorporate these owner requested changes into the project. Since these owner requested changes have not been pre-negotiated or designed, the owner usually pays a premium for them with time and money.

2.4.2.7 Stifles Innovation

Since the contractor cannot deviate from the design he has no incentive to help find innovative methods of constructing the facility. The contractor's lack of input during the design phase of the project further hampers any innovative efforts the contractor may have. This may result in less *constructible* facilities. Further, if the contractor manages to find a cost saving *technique,* within the limits of the specifications, none of the savings will be passed onto the owner. However, the contractor usually does not have the resources to try new techniques or upgrade the quality of his current product because of the low margins on traditional contracts.[28]

Additionally, there is no chance for competition among alternative designs making it difficult to find the most cost effective design.[29] This results in a catch 22:

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[28]Nicholson, p. 67.

[29]Thomas R. Napier and Steven R. Freiberg, *One-Step and Two-Step Facility Acquisition for Military Construction: Project Selection and Implementation Procedures,* Technical Report, U.S. Army Corps of Engineers (Champaign, Illinois: Construction Engineer Research Laboratory, August 1990), p. 12 .

"New methods can't be tried until they're specified and they can't be specified until they're tried."[30]

2.4.3 The Impact of Legislative and Regulatory Requirements

This discussion will consider all the other requirements and restriction normally encountered when the Corps of Engineers awards a construction contract. This process was described in section 2.3.3. A summary of the impact the various legislative and regulatory requirements have on a federal construction contract is shown below:

IMPACT OF LEGISLATIVE/REGULATORY REQUIREMENTS ON COST OF FEDERAL CONSTRUCTION CONTRACTS

	Government Consensus	Contractor Consensus
1. Administrative Requirements	No impact	Increase
2. Construction Standards	Increase	Increase
3. Contract Clauses	Increase	Increase
4. Davis-Bacon Act	Increase	Increase

Table 2-4[31]

2.4.3.1 Administrative Requirements

The impact of conforming to the additional administrative requirements imposed upon contractors on USACE construction contracts is not clear. Pope discovered that government representatives generally felt the additional requirements did not have an impact on the final cost of the project. When he talked to government contractors he found just the opposite opinion. The results ranged from contractors who increased the number of supervisory personnel on their government jobs to attend meetings to a

[30]Nicholson, p. 67.

[31]Pope, p. 53.

contractor who had a full time supervisor and a full time quality engineer on government jobs while he only had part time support on similar private jobs.

The contractors interviewed claim that his additional manpower adds additional cost to federal jobs. One contractor estimated that it cost him an extra 5-8% in overhead. Overall the contractors estimates range from 2-30% in additional cost because the added administrative requirements on federal construction contracts.[32]

2.4.3.2 Construction Standards

A-E's and contractors must be familiar with CEGS (Corps of Engineers Guide Specifications) when working for the Corps of Engineers. While contractors and Corps personnel do not agree on whether the CEGS are stricter than national standards, Pope found that they all agreed USACE would pay an additional premium to meet these different specifications.[33]

2.4.3.3 Contract Clauses

The major area of USACE contract clauses that has an impact the project is the Buy American Act. Contractors must thoroughly investigate not only the source of a finished part, but also the source of the material used to manufacture that item. For example, bolts manufactured in the United States may not be allowed on federal construction jobs if the steel was obtained from a foreign source. One can see the work required to fully investigate the source of all the materials used on a construction project. This investigation increases the cost of a federal project. Additionally, if U. S. supplies are more expensive than foreign ones, then the subsidy paid to obtain the more costly U. S. product increases the project cost.

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[32]Ibid., pp. 58-60.

[33]Ibid., p.62.

2.4.3.4 Davis-Bacon Act

The final area that has an impact on federal construction contracts is the Davis-Bacon Act. Problems arise when the prevailing wages set by the Department of Labor are not in line with the actual commercial sector wages. When the prevailing wages are less than the commercial sector wages, then contractors are discouraged from bidding on government jobs. One would think that prevailing wages set higher than the commercial sector wages would increase contractors' desire to bid on government jobs. This may not always be true.

Pope found that the assignment problems faced by contractors in the Dayton, OH area (where he found prevailing wages 37-149% higher than commercial sector wages) caused at least one contractor to stop bidding on government jobs. This contractor found it difficult to keep a motivated work force when he had to pay some workers, assigned to a government job, more than other workers doing the same work on a private job. Workers also have no incentive to work hard on government jobs because when they finish they will return to lower paying non-government jobs.[34]

The Davis-Bacon Act also does not permit paying lower wages to helpers. If a contractor uses helpers on a federal job, then he must compensate him at the fully qualified journeyman rate.[35] This is very inefficient and not in compliance with modern industry practices.

The Davis-Bacon Act does not provide any incentive for contractors to fully compete since the wages they must pay are fixed. The government can not realize the immediate effect of commercial wage changes or of private sector initiatives -- such as the use of helpers.

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[34]Ibid., p. 69.

[35]Ibid.

3
CONSTRUCTION CONTRACTING METHODS

This chapter will describe the common contracting methods used throughout the construction industry. They consist of the type of organization performing the work; the type of contract between the owner and the contractor; and the method used to award the contract and/or determine the price. Figure 3-1 shows the various combination of contracting methods frequently used. For a more detailed explanation of the various contracting methods, the author is referred to Christopher M. Gordon's *Compatibility of Construction Contracting Methods with Projects and Owners,* (Cambridge, Massachusetts: a thesis submitted to the Department of Civil Engineering, Massachusetts Institute of Technology, 1991) from which this figure was developed. This chapter will also cover the types of contracts typically used on U. S. Army Corps of Engineer projects.

3.1 Construction Organizations

When considering which type of organization to choose, an owner must decide what functions he wants that organization to perform. Inherent in any construction project are four requirements: design, construction, financing (short and long term) and operations of the completed facility.

3.1.1 Separate Design and Construction Organizations

The traditional construction contract involves different design and construction agencies. The contractor only performs the construction portion of the project. The owner arranges for the design to be completed by his in-house personnel or by a

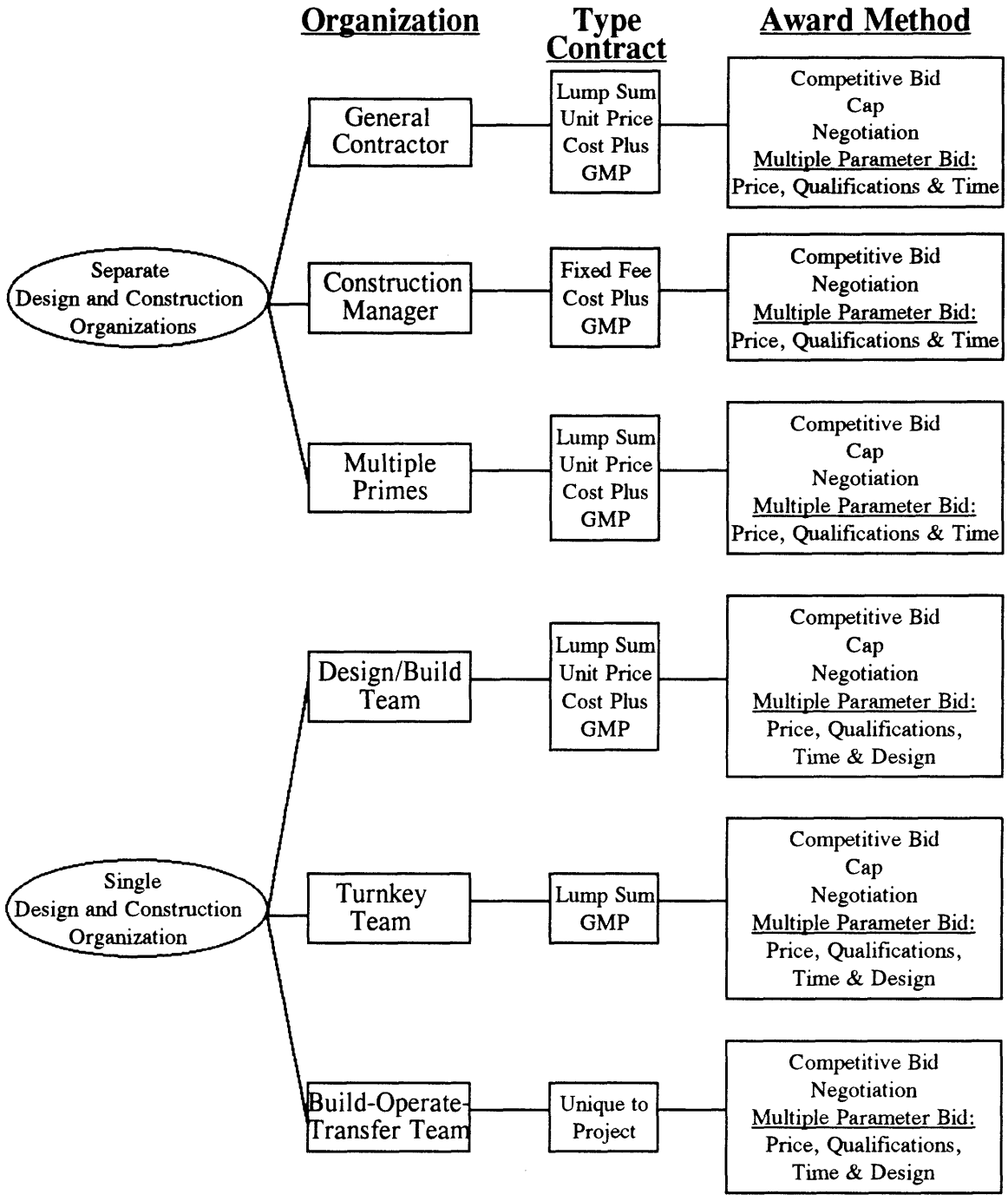

Figure 3-1

Typical Construction Contracting Methods

separate A-E firm. Long term financing and operation of the completed facility is also a the responsibility of the owner. The owner performs these functions with his own resources or by arrangement with agencies other than the construction contractor. Progress payments are also usually paid to the contractor, thereby providing a sharing of the short term financing for the project between the owner and the contractor. The separation of the design and construction functions between two agencies can cause a great deal of finger pointing between the design firm and the contractor. The design firm usually blames the contractor for performance problems while the contractor claims problems are because of design deficiencies. The owner must choose sides in these disputes -- usually the owner sides with the design professional.[36] Another disadvantage of the separate design and construction organizations is the failure to include the contractor in the design process. Contractors must ultimately build the facility and their expertise is lost in the design process. A-E's cannot always keep abreast of the latest construction practices and often tend to place more an emphasis on a facility's aesthetics, while a contractor tends to concentrate on a facility's constructibility. While the general contractor form of organization is the most popular separate construction organization, the construction manager and multiple primes organizations are also used.

3.1.1.1 General Contractor

A general contractor acts as the owner's sole representative in charge of all aspects of the project's construction, including material procurement, supervision of construction personnel, equipment procurement and jobsite safety. This is the normal arrangement most owners are familiar with. In most instances, the general contractor

[36]Farley, "Which Procurement and Contract Methods Reduce Disputes?" Outline of Speech given at the Constructive Resolution of Construction Disputes Conference, Washington, D.C., 7 November 1991.

assumes the responsibility for the control of project quality, time, and cost. Regardless of the contractual arrangement the owner has with the general contractor, the general contractor may employ trade sub-contractors to perform portions of the project under his control. The general contractor may have a different contractual relationships with his sub-contractors than he has with the owner. In many cases, sub-contracts are bid to the various trade firms.

There are numerous types of contracts and award methods that the owner can use when employing a general contractor. Generally, the contract will either be fixed price (either lump sum or unit cost) or a reimbursable price (cost plus or a guaranteed maximum price) contract. The advantage and disadvantages of each contract type will be addressed in section 3.2.

3.1.1.2 Construction Manager

During the late sixties the construction manager (CM) organization emerged.[37] Currently, there are many versions of construction management, but in its purest form it involves an individual or firm acting as a construction consultant to the owner. The construction manager oversees the project for a fixed fee or for a fee measured as a percentage of the cost. By using a construction manager, the owner can have the advise of a construction expert throughout the design and construction phases of a project. The owner, in the pure form, contracts with sub-contractors to perform the actual work. There are many adaptations of the basic form of construction management. They vary in the different responsibilities and risks the construction manager assumes. Some responsibilities the CM can assume are: supervision of the design as well as the construction process (Design CM), actual construction with his

[37]Derek A. Calomeni, "A Model Cost Comparison Between Construction Management and General Contracting," *Excellence in the Constructed Project,* Proceedings of the Construction Congress I (ASCE, 1989), p. 40.

own forces (Constructor CM), holding the contracts with the sub-contractors (Contracting CM), guaranteeing a maximum price for the work at some stage of the construction (GMP CM or CM 'at risk') or when the owner's own agency takes on the role of the CM (Owner CM). Owner CM is also known as multiple primes and will be discussed in section 3.1.1.3.[38] It is also important to note that many forms of construction management are actually other forms of organizations. For example, under Contracting CM -- where the CM holds the contracts with the sub-contractors -- if the CM selects the sub-contractors, then he is actually performing the role of a general contractor.

One disadvantage of the CM process is the heavy reliance placed upon the construction manager. Overall, CM creates a very flexible process that can produce many advantages for the owner.

Advantages:[39]

1) Reduces the adversarial relationship of the traditional method

2) Permits fast-tracking a better opportunity to change the project (because of the fee nature of the CM's relationship)

3) Still can competitively bid all sub-contracts

4) Allows the owner to use different contract types with the various sub-contractors depending on which is most appropriate

3.1.1.3 Multiple Primes

Multiple primes occurs when an owner holds contracts with more than one contractor for work on a single project. As with CM, multiple prime contracting

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[38]Christopher M. Gordon, *Compatibility of Construction Contracting Methods with Projects and Owners,* (Cambridge, Massachusetts: a thesis submitted to the Department of Civil Engineering, Massachusetts Institute of Technology, 1991), pp. 44-46.

[39]Ibid., pp. 56-58.

allows fast-tracking and the use of different types of contracts with each contractor. It also offers a very flexible arrangement where changes are more easily incorporated into the project. Multiple prime contracting, however, places much of the risk on the owner and requires a very knowledgeable staff to manage the various contracts.

3.1.2 Single Organization Performing Design and Construction

A single organization that performs both design and construction for the owner is generally called a design/build or design/construct agency. This single organization performs at least the design and construction functions of the process, but in some forms provides additional services.

Design/build is not new to the U.S. In the 19th century, turnpikes, railroads, and transit systems were built and operated by design/build entrepreneurs. After a century of disuse in the United States, design/build contracting is experiencing a rebirth.[40]

Design/build now accounts for approximately 20 percent of the total construction volume in the U.S.[41] In 1989, design/construct contracts totaled $54.1 billion, a 21% increase over 1988. The top 50 design/construct firms performed $45.0 billion, or 83.2%, of the design/construct work. This included a marked increase in public agency use of design/build.[42]

The separation of design and construction began during the Industrial Revolution because of the great demand for buildings, the division of labor, mechanical

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[40]Gene M. Randich, "Take 2 for Design/Build Contracting," *Construction Business Review* (March/April 1991), p. 56.

[41]Jacques R. Courtillet, "Have You Considered Design/Build?" *Navy Civil Engineer* (Fall/Winter 1992), p. 18.

[42]Michael Lawson, "Owners Warming Up to Design-Construct," *Engineering News Record* (24 May 1990), p. 77.

production and the publication of plan books. Architectural services began a refinement where design became institutionalized and separate from construction.[43]

In the 19th century, while competing with design/builders who called themselves "package dealers," architects adopted a system of ethical principles which placed the client's interests above those of the architect. It also prohibited architects from acting as design/builders. This prohibition was incorporated into the American Institute of Architects (AIA) mandatory code of ethics in 1909. This code went largely unchallenged for nearly a century. During World War II the design/build system began to re-emerge.[44] In 1978, dissension to the mandatory prohibition against design/build caused the AIA to authorize architects to participate in design/build during a three year trial period. Before the end of the three year period, the AIA dropped its mandatory code of ethics. It instituted a voluntary statement of ethical principles in its place. This essentially permitted architects to participate in design/build. In 1986, the AIA again adopted a mandatory code of ethics. The new code did not prohibit design/build, but claims it is a *potential* conflict of interest.[45] Thus, the AIA has resisted the use of design/build throughout its history, but many of the formal opposition is gone today.

The structure of this single design/build organization can vary. There are design/build organizations that have the design and construction capabilities internal to them. Secondly, they can take the form of joint ventures or partnerships between contractors and architectural-engineer firms. Thirdly, they can be a contractor or AE taking the lead and hiring the other to perform that portion of the project it can not

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[43]Philip J. Lund, "The Design/Build Alternative," p. 22.

[44]Calomeni, p. 40.

[45]Christopher Wist, "Design/Build Methods Mature," *Architecture,* (October 1986), p. 107.

handle. Finally, a construction manager can sub-contract the design and construction tasks (also known as "design construction manager").[46]

Advantages:

1) Ability to fast track -- phase construction as the design of that particular phase is completed. This saves time and allows the early procurement of items requiring long lead times. This is by far the most advantageous and most undisputed advantage to using a single design/build organization. In Massachusetts, where they have tried alternative contracting methods, the traditional approach takes from six months to three years longer than the design/build method.[47]

2) Single management entity

3) Design risk and liability are passed on to the contractor

4) Promotes accountability within the construction industry[48]

5) Flexible to scope changes

6) Only requires one selection process instead of the two required under the separate design and construction organizations. This potentially saves time and money.

7) Allows contractor input during the design stages producing a more constructible design

8) Eliminates virtually all change orders

9) Easier to consider life-cycle costs

10) Pre-award discussions foster trust and understanding[49]

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[46]Gordon, p.75.

[47]John I. Carlson, Jr., "Changing Times in Massachusetts: Alternative Delivery Methods," *Construction Business Review,* (March/April 1991), p. 66.

[48]Wist, p. 107.

[49]Farley.

11) Ability to quickly change design and construction methods in response to field conditions

12) Allows more innovation

Disadvantages:

1) Because of the reduced number of firms able to handle these projects, current rules for incorporating disadvantaged business enterprise and local firms may have to be reevaluated.[50] Some, such as Laurence D. Bory, senior legislative counsel of the American Consulting Engineers Council (ACEC), claim that this will reduce competition and squeeze out small firms altogether.[51] NAVFAC, however, found that they received eight bidders on each of the four design/build projects they had during FY 1990.[52]

2) When applied to the public sector these projects may require a more detailed level of pre-contract scoping so that a price can be set

3) It is more costly to prepare a bid for a fixed priced project involving a single design and construction agency (a certain level of detail will have to determined by the bidder) -- can be offset by paying an honoraria to a few firms chosen as finalists. The Massachusetts Division of Capital Planning and Operations (DPCO) paid an honoraria of $150,000 to each of three selected finalists on a design-build contract. This $450,000 total cost was less than one percent of the total project cost of $50 million.[53]

4) Requires a more sophisticated client

5) May require more staff to administer the contract

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[50]Randlich, p. 58.

[51]"Design-Build Issue Heats Up," *Engineering News Record,* 22 July 1991, p. 7.

[52]Courtillet, p. 21.

[53] John I. Carlson, Jr. "Which Procurement and Contracting Methods Reduce Disputes?" Speech given at the Constructive Resolution of Construction Disputes Conference, Washington, D.C., 7 November 1991.

6) The owner loses some control over the design process.

3.1.2.1 Design-Build Team

The design/build team is the organization that manages a design/build contract. The design/build team only performs the design and construction activities of a project, receiving progress payments from the owner throughout the project.

3.1.2.2 Turnkey Team

A second type of organization that performs both design and construction activities is the turnkey team. It differs from a design/build team in that it also performs short term financing of the project for the owner. In this arrangement, the owner does not provide progress payments to the turnkey contractor. Rather, a one-time lump sum payment is made at the completion of the project (or when the contractor turns the keys over to the owner). A turnkey contract is appropriate when the owner is *temporarily* unable, due to budget limitations, to obtain funds to pay for the construction expenses or the turnkey team is able to obtain short term financing more cheaply than the owner.

General usage treats design/construct and turnkey construction interchangeably, but in its most precise form, turnkey involves the turnkey contractor obtaining the project financing[54] and sometime the land where the construction will take place. Turnkey construction is sometimes said to be design/build plus project financing and sometimes land acquisition.

Turnkey construction provides the additional advantage of delaying the payment to the owner. This, however, may be more costly to the owner if he is able to obtain financing more cheaply than the contractor.

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[54]Lund, p.23.

3.1.2.3 Build-Operate-Transfer (BOT) Team

Some of the rebirth of design/build includes public agencies who are including a period of operation by the design/build team.[55] This is a specialized form called Build-Operate-Transfer (or privatization) with the agency called a Build-Operate-Transfer Team. The period of operation is usually fixed at the beginning of the contract and is usually of an adequate duration for the agency to recover its investment. After this time the facility is transferred to the public agency's control.

Payment of funds is usually not made by the owner to the BOT Team. Rather, the team recoups its funds through the operational funds collected during the operation of the facility.

Advantages:

1) Makes use of not only the construction experience of the BOT Team, but also their knowledge in operating the facility.

2) Sometimes allows completion of a facility which would have otherwise not been possible because of the large up-front cost.

Disadvantages:

1) BOT team must have the ability to obtain project financing -- may limit the number of potential firms seeking the project.

2) Requires a pay back of the teams financing costs, as well as management costs in operating the facility.

3) Some control is lost in both the construction and operation of the facility.

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[55]Randlich, p. 56.

3.2 Contract Types

A contract type refers to how the owner will pay the contractor. The price can be obtained through some form of competitive bidding or negotiation. The two general types of contracts are fixed price or reimbursable. This section will outline the specific forms of contract types.

3.2.1 Lump Sum

In a lump sum contract the contractor agrees to perform the necessary construction for a fixed price that is set before construction begins. The price can be obtained through negotiation or competitive bidding and includes all contractor costs plus his profit. The project must be completely designed before a price can be set.

Advantages:

1) Allows competitive bidding

2) Is very effective if the project is simple and changes are not anticipated

Disadvantages:

1) Changes to the contract usually require a change order which is costly and time consuming.

2) All financial risk lies with the contractor resulting in either large contingencies (to cover unexpected occurrences) or smaller contingencies (due to competitive bidding) with a larger chance of default and/or claims.

3) Design documents must be very detailed to prevent excessive claims.

4) Causes the zero-sum relationship where anything gained by one party is lost to the other.

3.2.2 Unit Price

When the scope of work is known, but the exact quantities are not, then a unit price contract may be used. The price of each item is determined, either through negotiation or competitive bidding, then the quantities are measured as construction progresses. The price paid to the contractor is simply the agreed upon price for each item times the total quantity of that work performed. The advantages and disadvantages of unit price contracts are similar to that of lump sum contracts, except that unit price contracts allow *some* flexibility for changes -- as long as the item was priced before contract award. The owner must, however, carefully measure quantities on the jobsite.

3.2.3 Cost Plus

In a cost plus contract, the contractor is paid for his actual costs plus a fee. The fee can be fixed, a percentage of the contract amount or a combination of both. This type of contract is commonly used in emergency situations.

Advantages:

1) Allows fast-tracking
2) Permits changes throughout the project
3) Encourages quality work by the contractor

Disadvantages:

1) Price of the contract is not known at the beginning of the project
2) The contractor is not motivated to save money
3) The owner must carefully monitor the contractor's costs

3.2.4 Guaranteed Maximum Price (GMP)

A guaranteed maximum price contract is identical to a cost plus contract except it contains a maximum price. If the maximum price is exceeded, then the contractor must absorb the extra costs. Often cost savings below the GMP are shared between the contractor and the owner. It is often difficult to establish what the GMP should be. The GMP contract is seen as an alternative to the lump sum at one extreme and the cost plus at the other. The financial risk is somewhat shared by the two parties.

3.3 Award Methods

The contract award method describes what basis the owner will use to select the contractor and/or the price. In most cases the method the owner will use to award the contract is clearly spelled out in the preliminary documents sent to all prospective contractors. It is important for the owner to tell prospective contractors what criteria he will use to select the contractor or arrive at the contract price. In that way the owner is telling the contractor what is most important to him. The contractors can then incorporate what is important to the owner in his proposal. For example, if the owner is awarding the contract based on a lump-sum competitive bid, then prospective bidders realize that the owner is most concerned with obtaining the lowest possible price for a given quality project. In this case the quality is stipulated in the design documents.

3.3.1 Competitive Bid

Competitive bidding takes advantage of market competition to obtain the lowest price proposal. In pure competitive bidding, price is the only consideration for contract award. The *open* competitive bid takes most advantage of the market forces. The open bid allows anyone to bid on a project. Even on government projects true open bidding rarely exists. There is usually some qualification restriction placed upon contractors,

such as obtaining sufficient bonding, before a contractor is allowed to bid. This is called *pre-qualification* of contractors. Some pre-qualification criteria are: experience, capabilities (financial, physical and technical), workload and track record of the contractors.[56] Owners can use some or all of these pre-qualification criteria. In some instances owners will invite only certain firms to bid on contracts. This is using pre-qualification in its extreme form.

Owners use pre-qualification criteria to ensure they obtain a contractor who meets their minimum criteria and who is able to deliver a quality product in a timely manner. They may also be used to limit the number of bidders on a project. A large number of bidders will usually cause contractors to reduce their margin. This, however, will often scare away many quality contractors who are unwilling to shave their margins to a highly risky level.[57] These unrealistically low bids will often cause problems as the contractor tries to regain his margin on change orders or ultimately defaults because of his poor financial position.

Advantages:

1) Obtains a competitive market price for the project
2) The owner knows the cost of the project at the beginning
3) Helps to eliminate favoritism or corruption in the selection process

Disadvantages:

1) Bidding process is expensive for both the owner and contractor
2) Requires very detailed plans and specifications to avoid future claims. These are costly to produce and must be completed prior to beginning work eliminating the possibility of overlapping design and construction (fast-tracking).

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[56]Gordon, p. 134.

[57]Ibid., p. 133.

3) When a fixed priced competitively bid contract -- the price must be high enough to cover all contingencies, but low enough to get the job.[58] This sometimes results in unqualified contractors and/or a lower quality product. In many cases it leads to an adversarial relationship between the owner, contractor, and sometimes A-E.

4) Scope can only be changed through change orders.

5) Should only be used only when the chance of selecting a quality contractor is high.[59]

6) Does not encourage innovation or research in the industry

3.3.2 Cap

The cap method is a variation of the competitive bid. When using a cap, the owner specifies a fixed price at the outset of the process. Bidders then specify a level of quality for that fixed price. The owner can also specify a list of options or quality upgrades for the project. A bidder can then propose how many upgrades and/or options he can complete, in addition to the base building, for the fixed price.[60] An owner who lists only upgrades or add-on options is assuming that the contractors can at least complete the base building for the specified price. In order to be completely safe, the owner should consider listing option deductions and quality downgrades, if he is willing to settle for them. Therefore, if all bidders cannot build the base building for the specified price, then the owner can see what he can get for the fixed price. If an owner fails to do this, he may receive no bids -- requiring re-scoping and re-bidding of the project. Finally, the owner should list the add-ons/deductions and upgrades/downgrades in priority order.

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[58]Farley.

[59]Moore, p. 370.

[60]Gordon, p. 136.

Advantages:

1) Obtains a competitive level of quality for a fixed price

2) The owner knows the cost of the project at the beginning

3) Helps to eliminate favoritism or corruption in the selection process

Disadvantages:

1) Bidding process is expensive for both the owner and contractor

2) Requires very detailed plans and specifications to avoid future claims. These are costly to produce and must be completed prior to beginning work, eliminating the possibility of overlapping design and construction (fast-tracking).

3) Sometimes results in unqualified contractors and/or a lower quality product. In many cases it leads to an adversarial relationship between the owner, contractor, and sometimes A-E.

4) Scope can only be changed through change orders.

5) Should only be used only when the chance of selecting a quality contractor is high.[61]

6) Does not encourage innovation or research in the industry

3.3.3 Multiple Parameter Bid

Multiple parameter bidding allows owners to consider more than just the proposed price when deciding which contractor to select. There are many different parameters an owner can choose to include in his decision making process. The weight of the various parameters may be outlined on a very detailed percentage basis, then incorporated into a scoring formula, as done by many government agencies. Conversely, the weighting of the parameters may not be pre-determined, but rather done on a very informal basis by the owner. In all cases, bidders propose a fixed price

[61]Moore, p. 370.

bid in their proposal. Price, therefore, is usually always a factor in multiple parameter bidding.

Advantages:

1) Considers many factors, in addition to a competitive market price, that are important to the owner.

2) The owner knows the cost of the project at the beginning.

3) Helps to eliminate favoritism or corruption, if the decision criteria are objective in the selection process.

Disadvantages:

1) Bidding process is expensive for both the owner and contractor.

2) Except when used in conjunction with a single organization performing both design and construction (design/build, turnkey and B-O-T), it requires very detailed plans and specifications to avoid future claims. These are costly to produce and must be completed prior to beginning work, thus eliminating the possibility of overlapping design and construction (fast-tracking).

3) Owner must decide how he will evaluate the proposals. This can be time consuming and expensive for the owner and the contractors.

4) Can result in an adversarial relationship because of the zero-sum low mark-up nature of bidding

5) Scope can only be changed through change orders.

Some very common factors used in multiple parameter bidding are explained below.

3.3.3.1 Contractor Qualifications

By considering prospective contractors' qualifications, owners can eliminate less qualified contractors, thus increasing the chance of a better quality product. This is especially advantageous in complex projects or ones that requires special contractor

qualifications. Some factors that can be considered are: experience, capability (physical, financial and technical), workload and performance record.

3.3.3.2 Contract Price

Contract price is simply the proposed price of each contractor. In the traditional competitive bid project price is weighted 100%. In multiple parameter bidding the relative weight of the price component is reduced to allow the other factors to be considered. Once again, the owner must decide the relative weights of these components.

3.3.3.3 Time Schedule

When time is critical the owner may use the proposed schedule of each bidder in his decision criteria. The owner can consider this time factor in two different ways. First, he may merely use time as another parameter and weight it like all other factors. Secondly, he may determine a price value-per-day that the project is worth to him. He can then add this cost to the proposers bid prices to determine the actual cost to the owner. The owner then compares these costs to determine the most inexpensive proposal. It may, however, be difficult for the owner to determine this value-per-day.

3.3.3.4 Design

An owner can also consider the quality of the proposed designs in his decision making process. This is done when using a single organization that performs both the design and construction (design/build, turnkey and B-O-T type arrangements) of the project. Formal evaluation criteria can be used to compare the proposers' designs or it can be done on a more informal basis. By considering the designs of the contractors, the owner can obtain competitive market prices for a variety of design alternatives. This increases his chances of obtaining the most cost effective design for the project.

Additionally, it is much easier to consider life-cycle costs of the proposed designs in the evaluation criteria. This allows an evaluation of not only the immediate construction cost of the project, but also the long term maintenance and energy cost associated with each design.

3.3.4 Negotiation

In a negotiated award process the owner selects a contractor and/or price through negotiations with one or more contractors. On one extreme, only one contractor may be selected for negotiation. In this case a price or fee is established based on industry standards and/or an independent estimate of the price or fee. On the other extreme an owner may elect to use competitive negotiations that involves more than one contractor. In this case, the owner usually asks each contractor to submit a price and other information, such as a proposed schedule. The owner then negotiates back and forth between the contractors to obtain the best possible proposal (based on price, schedule and/or any other evaluation factor the owner may wish to introduce). This allows value engineering and constructibility analyses, sometimes creating value for both parties.[62]

Negotiation may be used without limit by most private owners, but is generally very limited in the public sector. Negotiation is consider appropriate, even in the public sector, when (1) there is a lack of competition for that particular project, (2) urgency will not permit enough time for competitive bidding, (3) there is an opportunity to substantially improve the project value through interaction.[63]

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[62]Gordon, p. 138.

[63]Ibid.

Advantages:[64]

1) The owner is able to pick the contractor of his choice.

2) Time and money can be saved by eliminating bidding.

3) Constructibility, value engineering and other value-creating creating advise can be given to the owner during the negotiation.

4) Less adversarial relationship is likely because of early two-way communication, a perceived possibility of future negotiated work with the owner and normally higher profit margins.

Disadvantages:

1) Owner can not use market competition to force down the price of the project and achieve the true market price,

2) Its use is extremely limited in the public sector.

3.4 Contracting Methods Used by USACE

The Federal Acquisition Regulation (FAR) is the governing document for all USACE procurements. The FAR does not specifically direct the type of construction organization that the Corps must contract with. The general contractor is by far the most popular type of organization employed by USACE on construction projects. On some very large projects the Corps may occasionally contract with more than one contractor, but this is rarely done. Because of the engineering knowledge within the Corps, they seldom have the need to employ construction managers. Construction managers, however, may bid on traditional or design/build projects if they are willing to marshal all the necessary resources to complete the project. When performing this Contractor CM role they are essentially performing the role of general contractors. On

[64]Ibid., pp. 138-139.

very technical projects, or where the Corps' technical knowledge is not available, they can hire construction managers to perform in their pure consulting role.

USACE has been using the Design/Build organization more frequently (see Chapter 4) and it is permitted subject to certain limitations. Because the federal government cannot obligate money before it is appropriated, it does not have a great need for the short term project financing advantage of the true turnkey organization. The federal government can generally obtain funds cheaper than any other organization further reducing the incentive for having outside project financing. The Corps does use Build-Operate-Transfer Teams on projects such as family housing, energy production and wastewater treatment facilities. They call these Commercially Financed Facilities (CFF). The employment of this method is also limited.

The FAR permits the following types of construction contracts:

3.4.1 Firm-Fixed-Price

The firm-fixed-price lump sum contract is by far the most common type of construction contract used by the Corps. It requires reasonably definite design or performance specifications prior to award. (FAR 5.202)

3.4.2 Unit Price

Unit price contracting is used when the quantity is indeterminate and the cost per unit is fixed. It can be used on heavy construction, dredging and other similar projects. (FAR 16.2 and 12.403(c))

3.4.3 Cost Reimbursement

These cost reimbursement type contracts use either award, incentive or fixed fees. This type of contract is allowed when conditions affecting performance are

unknown, such as during periods of conflict or under emergency conditions like natural disasters. (FAR 16.404-1 and 16.404-2)

3.4.4 Award Method

Competitive bidding is the preferred method of awarding contracts in the federal government. All contractor must meet certain minimum qualifications, such as having sufficient bonding, to compete on USACE projects. In most circumstance the federal government selects the minimum qualified bidder, based solely on price, for the contract. Negotiated awards are possible under *very limited* conditions, such as when a contractor is the likely sole source of the desired service. With the recent acceptance of One-Step Negotiated Contracts, multiple parameter bidding is gaining more popularity in the limited situations when One-Step Design/Build Contracting is appropriate (see Chapter 4 for further details).

4

USE OF DESIGN-BUILD IN THE U.S. ARMY CORPS OF ENGINEERS

4.1 History

USACE has not used procurement methods other than the traditional design/bid/construct much in its long history. During the 1970s design/build contracting and other alternative procurement methods began getting more popular in the construction industry. Faced with increasing delays and costs on its construction projects, the Corps began questioning whether some of these alternative contracting methods could be useful in reducing cost and time on military construction projects. The section will outline the military's, particularly USACE's, use of design/build contracting. While the military sometimes calls these projects "turnkey," they do this only in the general sense of the word. In almost all instances USACE, or the appropriate construction agency, provides the necessary land and progress payments to the contractor. Therefore, these projects are really design/build or design/construct type projects.

4.1.1 Vietnam

Before 1966, the U.S. Navy used a single firm for all contracted construction in Southeast Asia (SEA). The Navy was designated the construction agent responsible for supervising all DOD civilian contracted construction in SEA. The firm called RMK-BRJ, a joint venture of four construction companies (Raymond International, Inc.; Morrison-Knudsen Co. Inc.; Brown-Root Inc.; and J. A. Jones) operated under a cost-plus-fixed-fee type contract for all its Navy work. In 1966, as the pace of the military build-up increased, it became apparent that RMK-BRJ would not be able to meet the desired completion date of a recently proposed air base.

RMK-BRJ was already working on three other airfields, as well as other critical construction projects for the three services within the Department of Defense. The Air Force proposed using another state-side contractor to perform the construction of the fourth air base at Tuy Hoa, South Vietnam. They recommended using a turnkey approach for the project to meet their strict time schedule -- the Air Force promised the Department of Defense that combat air missions would be flying out of Tuy Hoa by December 1966, just seven months away from the date approval was given by the Secretary of Defense. Previously, all RMK-BRJ projects were designed by a separate design agency. Except for land acquisition and physical security, the contractor would be responsible for the entire project.

Anticipating DOD approval, the Air Force began soliciting estimates from construction firms in March 1966. After receiving an enthusiastic response from the construction industry, the Air Force narrowed the field to two firms -- eventually selecting Walter Kidde Construction (WKC). A cost-plus-fixed fee contract was awarded with an effective date of 31 May 1966. Tuy Hoa was the first time since World War II that DOD awarded a design/build construction contract.

The project was divided into two phases. Phase I was the construction of an interim airfield using government furnished AM-2 aluminum matting and support facilities for this temporary airfield. Phase II was the construction of a fully operational concrete airfield with all supporting facilities to support four jet fighter squadrons and several thousand men. The established schedule is shown in Table 4-1.

TUY HOA AIR BASE CONSTRUCTION SCHEDULE

Activity	# of Days	Completion Date
All designs	90	31 Aug 1966
Mobilization and delivery of personnel, material and equipment. Begin work on interim airfield facilities.	30	30 Sep 1966
Construction of interim airfield facilities	90	27 Dec 1966
Construction of remaining airfield facilities	180	24 Jun 1967

Table 4-1

Three types of incentives were also included in the contract: (1) Employee bonus of $1,000 per person for meeting established conduct and diligence standards. Either all employees would receive this bonus or none would. (2) WKC would receive a $100,000 bonus for controlling employees' discipline and for controlling inflationary impacts of the project on the South Vietnamese economy. (3) WKC would receive up to $900,000 for meeting or exceeding scheduled dates ($400,000 for interim facilities; $360,000 for permanent facilities; and $140,000 for meeting demobilization goals).

TUY HOA AIR BASE CONSTRUCTION RESULTS

Activity	# of Days Ahead of Schedule	Completion Date
All designs	0	31 Aug 1966
Mobilization and delivery of personnel, material and equipment. Begin work on interim airfield facilities.	30	1 Sep 1966
Construction of interim airfield facilities - airfield -other facilities(roads,buildings,fuel storage,etc.)	45 0	12 Nov 1966 27 Dec 1966
Construction of remaining airfield facilities	14	10 Jun 1967

Table 4-2

Table 4-2 shows the successful results of the actual construction. To meet the schedule and the Air Force's requirements, designs were only completed in rough detail. Refinement of plans occurred immediately on-site. Additionally, the contractor

made maximum use of off-the-shelf products, such as pre-fabricated buildings and packaged systems. Designs of existing structures in SEA were also adapted to meet the requirements at Tuy Hoa.[65]

Lessons Learned

1) Confirms that **speed** can be achieved through the selection process (avoiding bids); limited amount of design; avoidance of disputes; fast tracking construction; and use pre-fabricated and packaged items -- shortening installation and material procurement times. Tuy Hoa was built faster than two other comparable air bases in SEA.

2) Can **save money**. Despite paying over $1 million in bonuses, Tuy Hoa had 30 percent more facilities constructed for the same cost than two other air bases (Phan Rang and Cam Ranh Bay) built during the same time in SEA. The final cost of the project was $52 million, including the $2.17 million fixed fee and the $1 million in bonuses.

3) **Incentives** are powerful in getting contractors to achieve the speed and/or quality desired by the owner.

4) Design/build allows **innovation** to be brought into the construction process.

4.1.2 TACOM Facilities -- Warren, Michigan

In 1979, Volkswagen of America (VWA) became interested in converting the Army's 300-acre Michigan Army Missile Plant (MAMP) to an automobile production plant. VWA was limited by time and cost, therefore sought a facility that could quickly and easily be converted to automobile production. Acquiring the facility through the General Services Administration's (GSA) property disposal process

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[65]Summarized from Jeffrey L. Tyley, Project Turnkey Construction of Tuy Hoa Air Base, South Vietnam -- A Historical Perspective -- Is There Future Application? Research Report, (Air Command and Staff College; Maxwell AFB, Alabama; 1987).

normally takes 3 to 4 years; considered unacceptable by VWA. VWA proposed a real estate exchange to expedite the transfer of the MAMP facilities.

Before VWA could occupy the MAMP site, the Army Tank Automotive Command had to relocate from MAMP to new facilities. The State of Michigan offered to build TACOM two new 196,000 square foot buildings at the Detroit Arsenal in nearby Warren, Michigan in exchange for the MAMP site. After the Army and the State of Michigan came to agreement on the details of the exchange agreement, Congress enacted special legislation to approve it.

The Michigan Job Development Authority (JDA) agreed to: (1) Build the two new buildings to Corps of Engineer standards with beneficial occupancy of the first building by 1 May 1981 and the second building by 1 August 1981; (2) Warranty the new buildings for one year; (3) Relocate TACOM to the new buildings; and (4) Pay the Federal Government any money they received from VWA over the cost of the new buildings. If the TACOM buildings cost more to construct than the state eventually receives for MAMP from VWA, then the state will absorb this amount. Besides deeding the MAMP facility to the state, the federal government agreed not to delay the project through untimely reviews and approvals of documents; unreasonable delays in building acceptances; and changes in the project scope, unless approved by JDA. The state agreed to pay up to $19.873 million for the new buildings.

VWA proposed a design/build contract be awarded with fast-tracking to complete the new buildings in the shortest possible time. The state's A-E, Ellis, Naeyart and Genheimer, helped oversee the contract and was paid a $1 million fee for their preliminary document preparation and construction management services. The contract was a design/build lump sum contract with the award based on design and price. Four firms submitted design and price proposals to 20% design completion. Ultimately the state awarded the contract to the lowest bidder, Andreas, Storan and

Reinhart. This contract was awarded before Congress authorized the real estate exchange.

A building delivery team was formed consisting of representatives of the Corps of Engineers, MAMP, VWA, the state of Michigan. They decided to use the systems approach to construction wherever possible to further speed the construction process. The buildings constructed were very largely pre-fabricated.

Both buildings were occupied within 19 months of the start of design. The Omaha District of the Corps of Engineers estimated that this project would have taken 1 year to design and 3½ years to construct using the traditional process. Thus, a significant time savings of 35 months was achieved.

The final cost of the project was approximately $19 million, including the fee for the construction management services. Change orders were less than one percent of the total construction cost. The Omaha District estimates that this project would have cost about $24 million using traditional procurement and construction techniques. Design fees of $1.4 million would bring the total cost to about $25.4 million (this would not include any construction management services). Additionally, the Corps normally would expect change orders and claims to amount to about 5 percent of the total construction cost.[66]

Lessons Learned

1) The significant **time savings** was attributed to fast-tracking, systems approach to construction, and the single entity inherent in the design/build approach.

2) The design/build and systems approach saved 25% over the estimated **cost** of a project performed using conventional contract and construction practices.

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[66]Summarized from Michael G. Carroll and Thomas R. Napier, A Case Study of Industrialized Building Products and Innovative Building Delivery Techniques Used for TACOM Facilities in Warren, MI, Technical Report (Champaign, Illinois: U.S. Army Corps of Engineers, Construction Engineer Research Laboratory, March 1983).

3) **Quality** was not compromised. All members of the management team stated that the quality of the facilities was excellent.

4.1.3 Family Housing/Commissary Construction

In the 1970's the services began procuring family housing using One-Step "Turnkey" negotiated contracts. This practice was particularly suited for family housing units because of the easy transfer of knowledge from the civilian residential construction industry, the economies that can be achieved through larger scale housing projects, the frequent need for multiple housing purchases (rather than buying units one by one), the desire to have housing units with a uniform appearance and design within the same housing area, the desire to recognize quality in housing projects, and the need to quickly deliver these new housing units for morale and economic reasons. If needed units are delayed, then the government must continue paying a housing allowance to those personnel not occupying government controlled quarters. The more quickly these housing units can be built the less money the government must pay in housing allowances. This advantage assumes that it is cheaper for the government to house personnel in government controlled housing rather than paying a housing allowance to them to live in civilian housing.

In 1980, USACE published a guide, *Procurement Procedure Manual for One-Step "Turnkey" Negotiated Contract for Army Family Housing,* outlining the One-Step method of procurement. This method of procurement has become fairly standard when the Army *procures* new family housing units. The One-Step process is described in section 4.1.5.

4.1.4 U.S. Army Two-Step Turnkey Projects

In 1980, the Office of the Chief of Engineers (OCE) directed that a program be developed to verify whether industrialized building systems could be effectively

employed in military construction. The objective was to take advantage of the pre-fabrication and industrialization of building systems, that was becoming increasingly popular in the construction industry, to save time and money. In order to accomplish this, it was immediately apparent that the Corps would have to also address the way it would acquire an industrialized building. The traditional facility acquisition process did not allow contractors to propose their own construction methods; this is needed if the owner expects to receive different design proposals. This is why USACE decided to use a design/build approach for the projects.

The procurement of the facilities would use a "Two-Step Formal Advertising" method because it was the only design/build method allowed in the MCA process that permitted bidders to propose their own construction solutions. Step 1 involves advertising a Request for Technical Proposal (RFTP). Firms respond to the RFTP by submitting their design and construction proposals. USACE then evaluates the proposals for compliance to the RFTP. Step 2 involves seeking bids from all firms found in conformance to the requirements and specifications of the RFTP. Award of the contract is to the lowest responsible bidder (Note: in step 2 generally all bidders are considered responsible because firms who submitted non-conforming proposals are not asked to bid). Therefore, the Two-Step method employs a single organization, or design/build team, to design and construct a facility using a lump-sum competitively bid contract. The sole basis of contract award is on price.

Three projects from the FY 1982 MCA program were selected as test projects. The projects were a battalion headquarters and classroom at Fort Drum, NY; a physical fitness center at Fort Benjamin Harrison, IN; and a fire station at Fort Stewart, GA.

Fort Drum Battalion Headquarters and Classroom

The Fort Drum facility was a one-story 14,850 square foot facility composed of offices and a 200-person classroom. A concept design was performed by an A-E under contract to the Corps. This concept design contained only the minimum specifications

for the project and contained general site plan, floor plan, elevations and general specifications. The method of construction and construction details were left to the bidder. Eight proposals were received with considerable diversity among them. Three proposals called for preengineered metal building systems, while the others represented variations of steel frame and masonry construction. All eight proposals were found in compliance with the RFTP and resulted in bids. The low bidder, the R. M. Buck Construction Corp., was awarded the contract based on a bid of $842,800 -- 28 percent below the Government Estimate. Construction time was approximately 250 days -- original government estimate was 550 days.

Fort Benjamin Harrison Physical Fitness Center

The Fort Benjamin Harrison Physical Fitness Center is approximately 48,000 square feet containing a gymnasium, natatorium, exercise and training equipment, and handball/racquetball courts. The concept design for this facility was performed in-house based an existing facility located a Fort Leonard Wood, MO. The RFTP was also done in-house. Because the RFTP was completed approximately four months before the new fiscal year began (and Congressional appropriated funds were available), the District requested the authority to advertise Step 1 of the proposal early. This request was approved since bidders proposal development does not financially obligate the government. The RFTP did, however contain the statement that Step 2 depended on the receipt of construction funding and would not proceed until then. Thus, the project was advertised prior to construction funding, avoiding potential delays in the project.

Thirteen proposals were submitted by eight proposers (some submitted more than one proposal). Again, significant diversity was achieved between designs. All, but one proposal was found in compliance with the RFTP. The low bid was awarded to Guepel Demars, Inc., with a low bid of $2,546,000 -- 27 percent below the

government estimate. The contractor completed the preengineered building in 350 days -- 130 less than the government requirement.

Money and time was saved in all areas of this project, from RFTP preparation through the actual construction, as compared to the government estimates. Although a problem was found with condensation in the walls of the natatorium, the contractor has admitted it was design error and agreed to correct the situation.

Fort Stewart Fire Station

This 9500 square foot single-story facility provides kitchen, dining, dayroom/classroom, sleeping administrative and vehicle storage for the fire prevention and rescue team. The concept design and RFTP was prepared by an A-E under contract to the Corps. The layout was similar to an existing facility at Fort Riley, KS. Only two proposals were submitted. Both were found in compliance with the RFTP and the contract was awarded to the low bidder, C&G Construction Co., Inc. C&G proposed using a conventional steel frame and masonry construction. Their $864,000 bid was 29 percent below the government estimate and well below the $1,215,000 bid received from the other contractor -- who proposed a preengineered building. The losing contractor's bid was the exact figure stated in the RFTP as the maximum contract amount. The contractor stated that had he known that he would not be given any credit for quality above the minimum, he would have designed and priced his proposal accordingly. The RFTP, however specifically said that no credit would be given for quality above the minimum and that the contract would be awarded based on the lowest priced proposal.

The contract took 480 days to complete -- the government's estimate was 300 days. The delays were due to bad weather (30 days) and the mechanical subcontractor's default, not to the procurement approach. This default also caused redesign and equipment delivery problems for the contractor who was now left holding the bag. Despite this, the contract contingencies only amounted to 1.5% of the total

project cost (well below the 5% normally programmed by USACE). This project was important because it verified the advantage of allowing all types of designs to compete to give the owner the lowest possible facility. This project also advertised the project prior to receiving construction funds.[67]

Lessons Learned

1) Two-Step procurement does not reward quality above the minimum specified in the RFTP.

2) USACE can save cost and time, sometimes significantly, using Two-Step procurement. This was accomplished because of fast tracking and the integration of the design and construction agents under one entity.

3) Quality was judged at least as good as in conventional MCA projects.

4) The Two-Step method is not as well known in the Corps as the traditional design-bid-build method.

5) Although the cost to a bidder to prepare a Two-Step proposal can be two to five times more than a conventional bid, the contractors all felt that it was an acceptable part of doing business. It did not seem to discourage participation in the process.

6) Two-Step procurement seems to attract different types of bidders. On projects where notice was sent only to those firms on the District's standard bidders' list, participation was low. On other projects, with more diverse advertisement, participation was much greater.

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[67]Detail of the projects summarized from Thomas R. Napier and Michael E. Lierman, *Industrialized Building System/Two-Step Procurement Pilot Projects: Three Case Studies,* Technical Report, (Champaign, Illinois: U.S. Army Corps of Engineers, Construction Engineer Research Laboratory, January 1985).

4.1.5 U.S. Army One-Step Turnkey Projects

The House Armed Services Committee directed the DOD, through the 1984 Military Appropriations Bill[68] to pursue the use of nontraditional building methods. HR 98-238 defined these as:

1) Construction techniques
2) Turnkey (One and Two-Step)
3) Packaging
4) Standard design and One-Step procurement
5) Performance specifications
6) Legislative actions
7) Materials -- modular and prefabricated.[69]

The Corps of Engineers had been seeking clarification on the use of One-Step Turnkey in programs other than Family Housing. USACE used the HR 98-238 as its authority to test the One-Step approach. In October 1983 two physical fitness centers; one at Fort Bliss, TX and the other at Fort Stewart, GA, were selected from the FY 1984 MCA program.

Physical Fitness Center, Fort Bliss, TX

This 22,774 square foot facility already had a completed concept design when the District was informed that it would be used as a One-Step test project. Therefore, the Engineer District decided to prepare the RFP (Request for Proposal) in-house based on the completed concept design. After advertising the RFP, the District received four

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[68]Contained in House Report (HR) 98-238, Military Construction Appropriations (1984).

[69]Thomas R. Napier et al., *Six Case Studies on Alternative Construction Methods: One-Step "Turnkey" Facility Acquisition and Architectural Fabric Structure Technology,* Technical Report, (Champaign, Illinois: U.S. Army Corps of Engineers, Construction Engineer Research Laboratory, May 1988) p. 13.

proposals. Each proposal was checked and found to be in technical compliance with the RFP. Quality scoring of all proposal now began by a team representing USACE and the using agency. Points were awarded for conformance with the minimum criteria, with additional points given for quality beyond the minimums. The scores of each team member were then averaged. The scores were added achieving a total score for each proposal. The quality evaluation team did not know who the contractor or what the bid price was for each proposal. After scoring, a quality/price valve was assigned to each proposal. This was simply a ratio of the bid price and the quality score.

The contract was awarded to J. T. Construction Co. (General Contractor) with Foster, Henry, Henry & Thorpe (A-E) based on a bid price of $1,939,126. This proposal represented the *second* best quality proposal with the *second* lowest price. The final cost of the facility was $1,969,345 -- a 28 percent savings over the Corp's estimate using conventional methods. The quality of the facility was deemed high. Finally, the project was completed within the revised (due to time extensions for weather and change order delays) schedule without the aid of fast-tracking.

Physical Fitness Center, Fort Stewart, GA

This 62,000 square foot facility, was significantly larger than the Fort Bliss project. Like the Fort Bliss project, a concept design (costing $134,000) was already complete and was therefore used as a basis for the RFP. During the RFP's development the programmed amount was reduced from $6.2 to $4.8 million. Notices were only sent to firms on the District's standard bidders' list resulting in only one proposal. The bid on the proposal was $5,455,000, $655,000 over the maximum authorized $4,800,000. In his proposal the contractor added a list of items that would reduce the cost of the project within the maximum amount. The District, however considered this proposal non-responsive to the RFP.

The Corps then significantly revised the RFP, reducing the project requirements to more closely match the new programmed amount. A wider latitude was given to the bidders in the design of the facility. After re-advertisement, the Corps received three proposals. All three proposals were considered in compliance with the RFP and were evaluated for quality. In this instance the highest quality proposal was the most costly, the second highest quality proposal was the second most expensive, and the lowest quality proposal was the least expensive. The lowest cost/lowest quality proposal achieved the highest quality/value ratio and the proposer, was awarded the contract. The bid was $4,575,000 for both design and construction. The final construction cost was $ 4,643,250 -- approximately 16 percent less than estimated for conventional construction.

Lessons Learned

The One-Step method confirmed most of the lessons learned of the Two-Step method. Below are some of the additional items found in the test of the One-Step method of procurement:

1) Both projects had a variety of building methods proposed.

2) Bidders' cost to prepare RFPs was approximately three times the cost of preparing conventional bids. While proposers accepted this cost, they suggested that an honoraria be paid to help defray the cost of these proposals thereby encouraging more competition in One-Step procurement.

3) Proposers were very sensitive to the short time given for proposal preparation.

4) Proposers indicated that USACE should allow greater flexibility in allowing commercial standards and specifications.

5) USACE RFP's contained too much detail, allowing little room for contractors to provide economic or technical innovation.

6) Significant cost savings and some time savings were realized with the One-Step methods.

4.1.6 Current Guidance

The FY 1987 Military Construction Act authorized the Army to initiate up to three One-Step "Turnkey" MCA projects per year. Currently, use of the One-Step procedure on MCA projects is still limited. Use of the One-Step method is not limited, however, on Nonappropriated Funded Construction Projects (NAFCP) and Surcharge Funded (SF), such as commissary construction, projects. As noted previously use of the Two-Step method is unlimited for all (NAFCP, SF and MCA) projects.

In August 1990, USACE published an implementing guide for One and Two-Step facility acquisition called *One-Step and Two-Step Facility Acquisition for Military Construction: Project Selection and Implementation Procedures.* This report provides guidance in selecting appropriate projects for design/build; describes the procedures used in preparing the necessary contract documentation, especially in RFP and RFTP preparation; describes how to evaluate the proposals; explains proper construction administration; and provides examples of the necessary contract documentation. This will help overcome the inexperience of some USACE personnel that was noted as a time consuming part of the test projects.

The new contracting guide does not significantly change the One and Two-Step methods. There are two issues that were modified from the test projects. One concerns how USACE resolves proposal difficulties in the One-Step method. Negotiations are not required in the One-Step method, but if conducted they must include all proposers within a predetermined "competitive range." These negotiations must take place individually and will only cover the proposers own proposal. After the negotiation a best and final price is requested from the proposer, but the price itself is *not* negotiated. Secondly, Headquarters USACE recommends using "adjective based"

value assignments (i.e., poor to outstanding) when determining the quality value rating. Price is no longer used to determine a ratio, but instead is a factor in the value rating.[70] Factors are assigned a weighted percentage based on their relative importance on the project. The project is awarded to the firm with the highest value rating.

4.2 Applications of Design-Build in the U.S. Army

This section will address the application of design/build contracting to the Army's various needs for construction services. While certain areas appear to be particularly suited for applying the design/build method, the Army's experiences are still extremely limited. The best approach is to utilize design/build on individual projects and report the results so that they can be shared between the field agencies who will be using design/build contracting. In this way wider application of design/build can be achieved in areas that it has proven successful. Each district will not have relearn the lessons of other districts.

4.2.1 Peacetime

One of the most potentially beneficial applications of design build is in the **environmental clean-up** arena. This is true because of the large amount of work that must be done with a shrinking military budget. The FY 1993 MCA Budget has been severely reduced -- only critical health, safety and environmental projects were funded. Additionally, the Corps has been called upon by the EPA to support them in managing environmental remediation projects. Therefore, USACE can expect to manage a large volume of environmental remediation work. The Corps must have at its disposal every available contracting method to handle this mission.

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[70]Thomas R. Napier and Steven R. Freiburg, pp. 9, 63-64.

Design/build contracts seem to be more popular in the environmental remediation area. This may be due to an owner's unwillingness to accept the "liability gap" on environmental projects where the stakes are higher than on other facility construction projects. This "liability gap" exists in the traditional contracting process between the owner's requirement to provide an error-free design to a contractor, but to have recourse against his designer for negligent acts only.[71] The single entity organization of the design/build contract *may* close this liability gap for the owner.

One-step procurement can reward environmentally superior projects. This can result in (1) cost savings -- especially when life-cycle costs, not just immediate construction costs, are considered (2) an immediate transfer of environmental technology from civilian to military applications (3) Better protection of our environment and natural resources. An additional advantage to using design/build for environmental projects is the speed inherent in it. Delaying environmental remediation projects can end up causing more damage and costing the government more money.

USACE should continue using design/build for family housing, industrial power plants, gymnasiums, office buildings and other types of projects where it has been proven successful, either because of an urgency of need for the required facility or because innovation will help reduce the cost, provide better quality, or a more acceptable design. The Corps must challenge the construction industry to apply their technology to military facilities by giving them the opportunity, through design/build, to propose their products.

In the area of civil works, the Corps can use design/build to quickly respond to natural disasters. The speed of the design/build process is especially helpful in this regard. Finally, when called upon by other nations to support their infrastructure needs

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[71]Andrew D. Ness, "Contracting for Environmental Remediation," *Construction Business Review*, (March/April 1992), p. 72.

the Corps must be ready to respond and use the design/build method if it is appropriate for the needs of that particular situation.

4.2.2 Mobilization

Design/build offers even more advantages during mobilization and wartime than it does during peacetime. **Speed of construction** during these periods is one of the most critical elements of a project. Additionally, USACE may have limited resources to monitor contracts. Certainly the disputes, delays, and litigation typical of the firm-fixed-priced low bid contract can not be tolerated during periods of military mobilization.

In the future we may be faced with limited 'undeclared' conflicts where full mobilization of our reserve engineer forces is not possible while the requirement to follow peacetime procurement practices still exists. This is applicable during the build-up to *imminent* hostilities when the President deploys military forces, yet Congress does not formally declare war. Therefore, we must practice using the construction delivery methods in peacetime that we expect to use during mobilization and during 'limited' conflicts. These peacetime procurement methods must not be so limited that our ability to respond is hampered.

Typical projects that would be appropriate for design/build contracting are construction of base camps and support facilities during military build-up in the theater of operation, stateside construction on military bases to handle the influx of activated troops, security enhancement on military facilities, and the construction of critical facilities, such as air bases during the early stages of mobilization.

4.2.3 Wartime

Design/build contracts may spur more innovation in the design of facilities. This is especially true in our need for wartime construction where speed and a large

degree of flexibility is needed because of the unknown nature of our actual requirements. One particularly promising development in the construction industry that has wartime application is modular or pre-fabricated construction. These facilities are typically delivered using the design/build approach because of the limited knowledge many A-E's have regarding contractors' sometimes propriety structures.

These facilities are especially useful to wartime construction because much of the work can be done away from the combat area, thus putting less people in the direct threat of hostilities. Work can be done prior to capture of the area where the facility will be constructed. These facilities can sometimes be relocated, if necessary, either during the conflict as needs change or afterwards as facilities are converted to peacetime use.

These structures can be pre-fabricated then shipped to the area of operation or the pre-fabrication facility can be located in the area of operation, if the situation permits. This would bring more precision to wartime construction. Engineer troop construction units could help place the pre-fabricated units in place, exposing less civilians to hostile fire. Weather would have less effect on the construction process, as the pre-fabrication site can be shielded (i.e., in a warehouse) against the elements thus speeding production. This is particularly important when deploying to areas of severe weather. This type of construction would also decrease the effects of reduced work rates due to the requirement to wear protective overgarments to combat possible nuclear, biological, or chemical attacks. This can slow the work rate by 50%.

Design/build process allows the contractor to easily transfer this technology because performance statements, not detailed designs are used. Modular construction has proven itself on prison construction in Massachusetts where courts have ordered new prison construction in a very limited time. Another successful application is in the

area of affordable housing where a Massachusetts firm constructed a 3,165 square-foot three family house in just 11 hours using eight workers and a crane.[72]

Specific wartime projects that would benefit from design/build are the continuation of base and other critical facilities; the immediate replacement of damaged facilities; and post war recovery operations, including environmental remediation.

4.2.4 Base Closure and Drawdown

The Army expects to dispose of 35,535 million square feet of facilities from FY 1992 to FY 1996 and expects to demolish one square foot of temporary facilities for every square foot of new construction.[73] This creates many construction requirements to construct new facilities for relocating units. In most instances units are being relocated because of a closure at their present installation. Under these circumstances time is money. The sooner facilities can be constructed, the sooner the government can begin to realize the savings inherent in the consolidation.

Closing military bases are presenting environmental challenges never before anticipated. The quicker these facilities can be cleaned the quicker they can be converted to civilian use. In most instances the local communities want this land for economic activity that will yield additional revenue and jobs for the community. Design/build can again be used to speed the base closure process.

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[72]Susan Bradford, "Modular in Mattapan," *Builder,* (May 1990), p. 124.

[73]Lieutenant General Henry J. Hatch, USA, "Meeting the Challenges of Global Change," p. 42.

5
OTHER WAYS USACE IS IMPROVING ITS CONSTRUCTION DELIVERY PROCESS

5.1 Extensive Review Program

In order to reduce ambiguities and design errors, USACE has implemented an extensive review program called Bidability, Constructibility and Operability Review. This review is conducted at 35% and 95% design completion. It is performed by construction, engineering and operations personnel with extensive knowledge of the construction industry and experience in supervising and managing construction projects. So far the managers are extremely happy with the results obtained through this program. The success can be seen in the large number of review comments incorporated into designs prior to their advertisement.[74] The benefits in reduction of change orders must be weighted against the extra time and money extensive reviews can cost. If major problems are being caught prior to advertisement, then the reviews would appear to be worthwhile.

5.2 Quickstart

Quickstart is a new approval and design process for the Military Construction, Army, program. It places an emphasis on master planning and gives project approval authority to major commands and Corps of Engineer Divisions. Specifically, Quickstart increases the time, to almost one year, a Corps District has to reach 35%

[74]Elmore.

design on a project. The added time allows more accurate designs, hopefully meaning fewer change orders and better project cost estimates.[75]

5.3 Alternative Dispute Resolution (ADR)

In the 1980's, the Corps realized the increasing toll that litigation was taking, especially in the area of contract claims. The cost of these claims as well as the time required for the Board of Contract Appeals to decide them were increasing. First efforts in ADR focused on the mini-trial. The mini-trial is a procedure were the parties to the dispute are allowed to present their cases in summarized form to key decision makers in an organization. The key decision makers would then use this information to negotiate a resolution of the dispute.[76] The mini-trial was a way of avoiding a lengthier and more costly litigation process.

In 1984 the Corps begin a period of experimentation using mini-trials. Soon afterwards, they published an Engineer Circular concerning the mini-trial process. Since then, the Corps' mini-trial experience has increased substantially and additional ADR techniques, such as facilitation, meditation, fact-finding, non-binding arbitration and disputes-review panels have been tried. In 1988, the Corps developed a multifaceted ADR program.[77]

"...the policy of the Corps of Engineers is to resolve disputes at the first appropriate management level through negotiation and, where appropriate, Alternative Dispute Resolution (ADR) techniques. By taking the time at the start of a project to identify common goals, common interests, lines of communication, and a commitment

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[75]"Quickstart Jumpstarts MCA Design," *The Military Engineer,* (No. 548, March-April 1992), pp. 83-84.

[76]Lester Edelman, "Alternative Dispute Resolution in the Public Sector." Speech given at 1991 CII Annual Conference, Monterey, California, 14 August 1991.

[77]Edelman, "Alternative Dispute Resolution in the Public Sector."

to cooperative problem solving we encourage the will to resolve disputes and achieve project goals."[78]

The Corps of Engineers has demonstrated its ability to resolve disputes through ADR. The types of ADR used in the Corps are: the mini-trial, non-binding arbitration, dispute review panels, mediation and facilitation. These various ADR techniques can be arrayed along a line or continuum according to increasing procedural complexity and third-party involvement. Table 5-1 shows this continuum of ADR techniques. There is a dividing point along the continuum (immediately after the disputes panel) where the decision is turned over to a third party.

Continuum of ADR Techniques

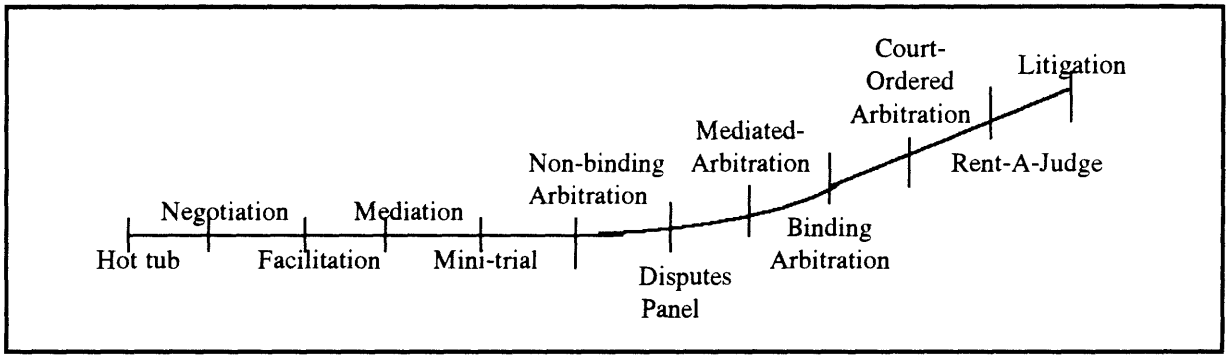

Table 5-1[79]

Managers are encouraged to experiment with these ADR techniques to create new ones that may build on their experiences. Therefore, Table 5-1 does not prescribe a list of accepted techniques, but rather shows some of what is available to the manager. Creativity is highly encouraged.

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[78]Lieutenant General Henry J. Hatch, USA, "Commander's Policy Memorandum #11, Subject: Alternative Dispute Resolution." U.S. Army Corps of Engineers, 7 August 1990.

[79]Lester Edelman, "Resolving Disputes Without Litigation," *The Military Engineer,* No. 536 (July 1990), p. 21.

Principles of the ADR Program: (1) Not a substitute for negotiation (2) Not looking for ways to turn decisions over to third parties (3) Not all cases may be good candidates for ADR. Managers must make informed choices about which method, including litigation, is best for each particular case.[80]

The Corps has attempted to institutionalize ADR as part of the culture of the agency. They have promoted ADR from within by educating its personnel. They have developed training programs for managers, engineers and attorneys to give them the background about the various ADR techniques. USACE has also published pamphlets and case studies to help share recently acquired ADR experiences. They also offer assistance to field offices in resolving disputes.

Flexibility and innovation are key to the success of ADR. It has been used with a great deal of success in all areas of Corps operations, including resolving inter-agency differences.

5.4 Partnering

"Clearly, the best dispute resolution is dispute prevention."[81]

The term partnering has recently received a great deal of attention in the construction industry. While partnering means different things to different people, the Corps defines it as, "the creation of a relationship between the owner and contractor that promotes achievement of mutual and beneficial goals."[82] It is not necessarily a contractual relationship, but a change in attitude that involves risk sharing and thinking with a 'we' mentality.

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[80]Edelman, "Alternative Dispute Resolution in the Public Sector."

[81]Lieutenant General Henry J. Hatch, USA, "Commander's Policy Memorandum #11 Subject: Altenative Dispute Resolution."

[82]Edelman, "Alternative Dispute Resolution in the Public Sector."

"We are seeking to move from the traditional adversarial relationship between contractor and government to a more collaborative ethic and contract 'partnership' where trust, cooperation, teamwork and the successful attainment of mutual goals are the hallmarks."[83]

Lester Edelman, Chief Counsel for the Corps of Engineers, notes the lack of incentives in the traditional method for the government to form close bonds with the contractor. Additionally, Edelman notes that some managers believe it is necessary to distance themselves from a contractor to avoid any appearance of impropriety and to preserve their objectivity. Some managers think that distrust is *beneficial* to the government because the adversarial system will sort out the truth and impart justice into the construction dispute process. By failing to consider the contractor's position, the government (and vice versa the contractor) sets one-sided goals and objectives. The result, as previously described is a relationship that is inefficient.

The objective of partnering is too prevent potential disputes before they happen. Thus far, the Corps' use of partnering has led to better cost control, a reduction in cost growth, a significant reduction in paperwork and better value engineering. No Corps contract using Partnering has led to litigation. Other by-products of using partnering are no late deliveries, no fatal accidents, a reduction in lost-time accident rates and a reduction in the amount of rework.[84]

Partnering can be used on all types of contracts from traditional lump-sum bid to design/build. Recently, NAVFAC used partnering in conjunction with the design/build method on the construction of the Naval Intelligence Center. They had less than a two percent change order rate on $35 million of work.[85]

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[83]Ibid.

[84]Ibid.

[85]Commander William B. Holmes, USN, "Partnering and Fast Tracking Keep the Naval Intelligence Center Project on Schedule," *Navy Civil Engineer,* (Fall 1991/Winter 1992), p. 16.

5.5 Development of a Computerized Data Base on Alternative Construction Methods

A data base of lesson learned on alternative construction methods will be developed and updated as new projects using alternative construction methods progress. Alternative construction methods include both construction technologies (such as preengineered buildings) and alternative contracting methods (such as One-Step). This data base will initially be a way of retrieving and storing information and problems encountered on projects employing alternative construction methods. There is a proposal, however, to connect each District's computer to a mainframe that will allow interactive participation from the user. Under the proposed system the user could ask the computer questions and receive answers based on the information stored in the system. This will provide the user with a decision. The user would then have to decide whether or not to follow this advise.[86] This system is an excellent way to share lessons learned and will hopefully help overcome the general lack of experience the Corps has regarding alternative construction methods.

There is a great resistance to change from within USACE and from contractors, especially regarding alternative contracting methods. To help overcome their lack of experience and/or knowledge, the Army is currently producing a contracting guide to help educate its contracting personnel. When these contracting personnel begin to lose confidence that public money is being adequately guarded, they then revert back to the traditional process with its built-in checks and balances -- even when is may be disadvantageous to do so.[87]

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[86]Ruth K. Garrett and Thomas R. Napier, *Development of a Knowledge Base on Alternative Construction Methods*, Technical Report, (Champaign, Illinois: U.S. Army Corps of Engineers, Construction Engineer Research Laboratory, January 1990), pp. 11, 26.

[87]Elmore.

6

SELECTING THE APPROPRIATE CONTRACTING METHOD FOR USACE CONSTRUCTION PROJECTS

When USACE published their guide, *One-Step and Two-Step Facility Acquisition for Military Construction: Project Selection and Implementation Procedures,* they included criteria to help managers decide which projects were good candidates for the One and Two-Step processes. The guide takes the manager through factors which differentiate projects. In this chapter, I will briefly describe this project selection process and identify some limitations these criteria place upon USACE projects.

6.1 USACE Selection Criteria

Current USACE guidance allows managers and contracting personnel to choose between the Traditional sealed bid contract, One-Step Competitive "Negotiation," and Two-Step Sealed Bidding. The only limitation is on the One-Step Competitive Negotiation process, which is limited for MCA projects. It is, however, not limited on non-appropriated and surcharge funded projects. I will now describe the selection process used by USACE.[88]

Special Project Goals and Objectives.

Special goals or policies directed by a higher authority may impose limitations on the procurement approach a district may take in regards to a specific project. Sometimes a specific procurement approach is directed for a project, while on other occasions special goals or objectives may imply, but not specifically direct a certain

[88]Thomas R. Napier and Steven R. Freiburg, *One-Step and Two-Step Facility Acquisition for Military Construction: Project Selection and Implementation Procedures,* Technical Report, (Champaign, Illinois: U.S. Army Corps of Engineers, Construction Engineer Research Laboratory, August 1990), pp. 18-29.

procurement approach. If a specific procurement approach is not directed, then the district must decide how the procurement approach will help to achieve the directed goals or objectives.

The following requirements suggest the use of the **traditional approach**:

1) A requirement to use a specific building technology if it is standard throughout the building industry, or to have complete control over the design using that technology.

2) A directive mandating the use of a particular category of A-E's or contractors (i.e., small or disadvantaged business), if it appears that the One or Two-Step process will complicate the selection of the targeted category of business.

3) Building rehabilitation, adaptive reuse, or historic preservation projects.

The following requirements suggest the use of a **One or Two-Step approach**:

1) Expanded competition or consideration of alternative construction methods.

2) A requirement to use a specific building technology for which standard materials, configurations, or practices do not exist in the building industry.

3) When design or construction innovation is sought.

4) When private construction market standards, practices and methods will be used.

5) When minimizing construction costs and maximizing design and construction efficiencies is sought. This, however, does not preclude the use of the traditional approach.

Security.

If security requirements for a facility limit the access to the construction site or limit the ability of the government to provide information necessary to design or construct the facility, then the traditional approach may be necessary. In this way all bidders will not gain access to the sensitive information.

Special project goals and security requirements may lead to an immediate decision of a procurement method. If not, the following criteria are examined to determine which is the most appropriate method. When any selection criteria determines that traditional method is the only one appropriate, then it is not necessary to continue the process. All criteria must be examined when the One or Two-Step is appropriate.

Building Types and Repetition of Buildings and Elements.

Facility types that are similar to those normally produced in the commercial construction market are considered repetitive. Those that are unique to the Army and not normally found in the commercial market are not considered repetitive. If, however, the Army is considering producing a large number of similar facilities, then repetition may result. Generally, repetitive facilitates are better suited for the One and Two-Step processes. First, the facility type should be examined to determine if it is repetitive, moderately repetitive, or not repetitive. Figure 6-1 can be used to help in this decision.

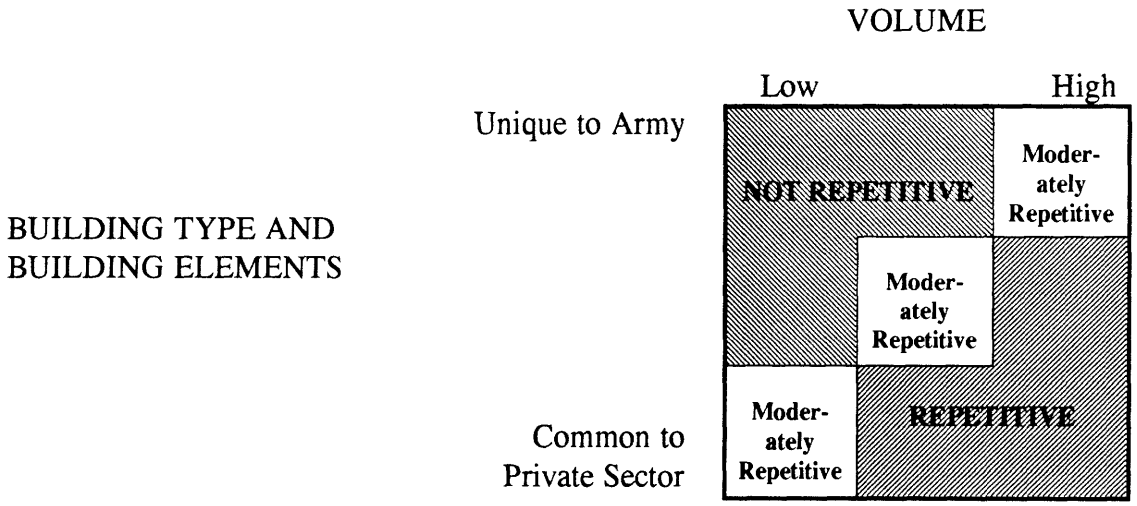

Figure 6-1
Identifying Repetitive Nature of Project

Once the facility is classified as repetitive, moderately repetitive, or not repetitive, then the appropriate procurement approach can be selected from Figures 6-2, 6-3, or 6-4, as appropriate.

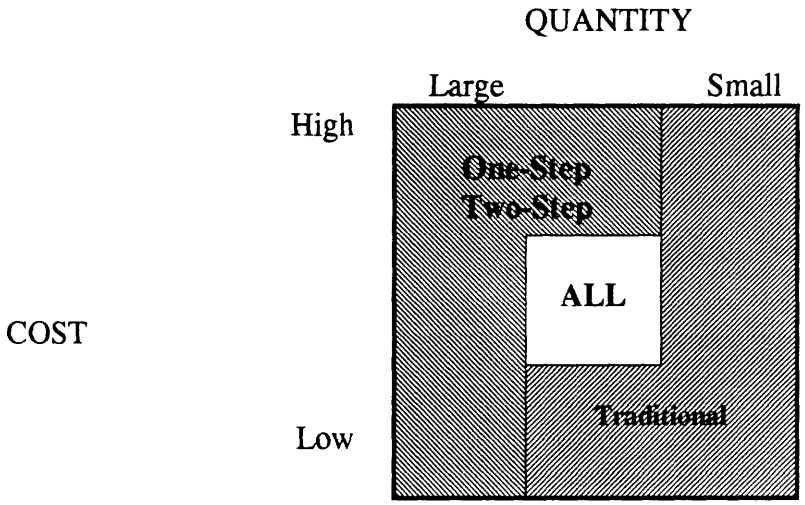

Figure 6-2
Appropriate Procurement Approaches for REPETITIVE Situations

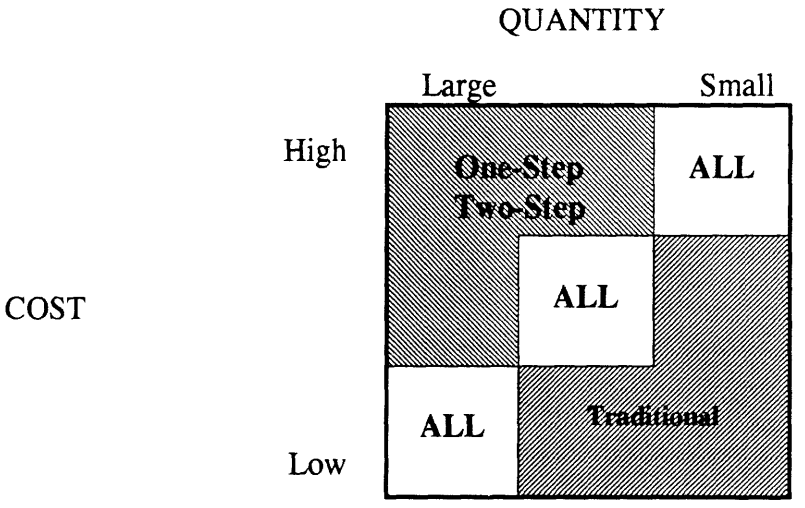

Figure 6-3
Appropriate Procurement Approaches for MODERATELY REPETITIVE Situations

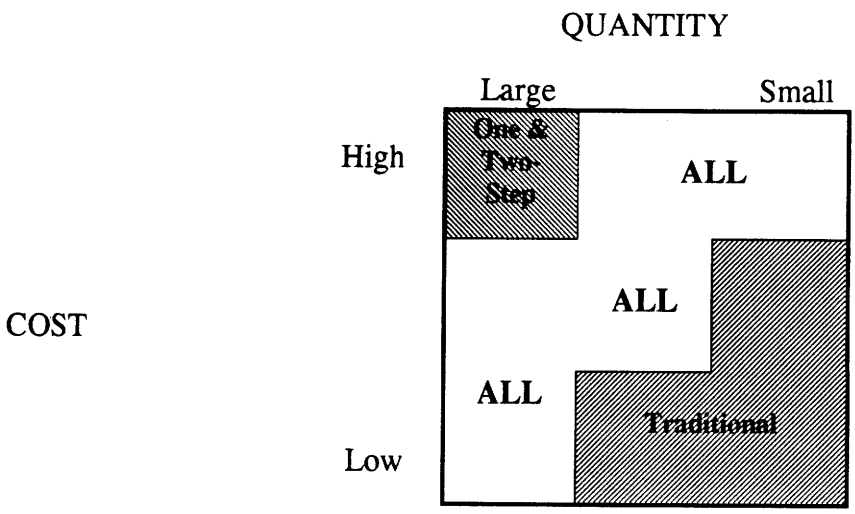

Figure 6-4
Appropriate Procurement Approaches for NON REPETITIVE Situations

Performance Levels and Understanding of Performance Characteristics.

Next, the level of technical performance required of the facility (i.e., mechanical requirements, structural conditions) and the understanding of the performance level of the facility is determined. A facility whose performance requirements are common to the private construction market and are very clearly understood, by Army and private design and construction personnel, is generally better procured through the design/build approach. Figure 6-5 shows how to determine the best procurement approach.

Design Criteria, Specifications, and Construction Details.

If private construction industry design criteria, specifications and construction details are determined appropriate for a project, then the One and Two-Step approaches are more appropriate. However, if standard USACE criteria will be used on the project, then the benefits of the One and Two-Step approaches are diminished. The traditional process permits the use of either criteria.

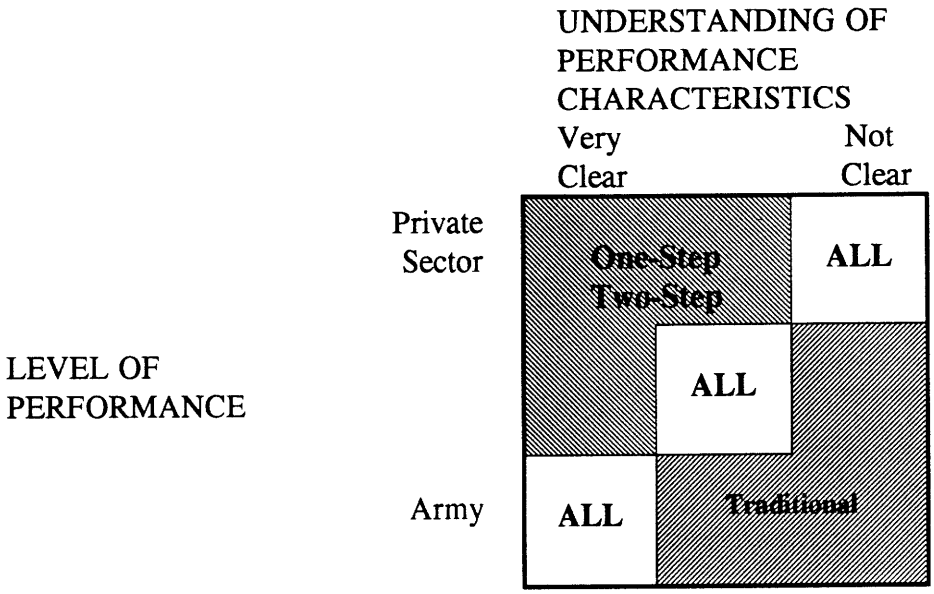

Figure 6-5
Appropriate Procurement Approaches Considering the Facility's Performance Level and the Understanding of its Performance Characteristics

Project Design and Construction Schedule.

The project's schedule and the availability of construction documentation is considered next. Existing construction documentation can be in the form of completed design specifications, performance based specifications, and RFP/RFTPs for the specific project in question or from a similar project. The appropriate procurement approach is shown in Figure 6-6.

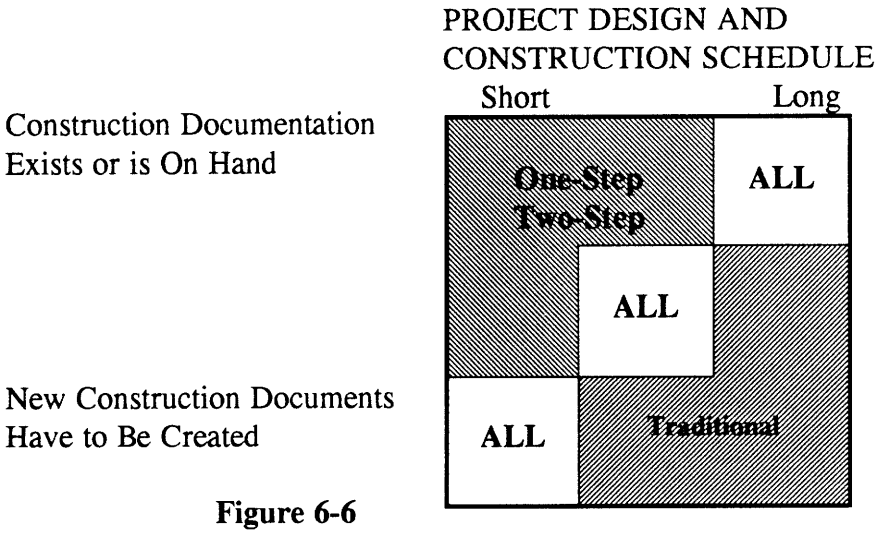

Figure 6-6
Appropriate Procurement Approaches Considering the Facility's Time Schedule and the Project's Document Availability

Site Accessibility.

The project should be assessed in terms of its proximity to an active, competitive construction market with available labor, materials, A-E services, etc. A project's site should be classified as not remote, somewhat remote, or isolated. The physical features of a site should also be assessed as ordinary or severe depending on their impact on the design or construction of the project. Only isolated sites and adverse physical conditions present constraints on a project. When these most adverse conditions are present, the traditional approach is generally preferred.

Deciding Between a One-Step and Two-Step Approach.

If the decision process determines that a One or Two-Step approach is appropriate for the project, then the district must next decide which is most advantageous. The One-Step approach is more appropriate for projects where quality above specified minimum levels is advantageous and the quality can be objectively measured. The second situation which favors the One-Step method is where there are a variety of products and methods available in the construction industry for the type of facility considered. The Two-Step process is more advantageous when the primary consideration for a project is cost and where quality above a minimum level will not enhance the project.

Agency Capabilities.

The agency administering the project should now consider its ability to execute it with the chosen procurement method. They should consider their expertise, experience, and availability of qualified personnel in terms of the specific procurement method selected. The USACE guidance stipulates that only when severe problems are anticipated should the agency abandon the One or Two-Step approach in favor of the traditional method.

Construction Industry Capability and Interest.

Finally, the agency should evaluate the local construction market's interest and capability of accomplishing design/build contracts. Design/build contracts tend to limit participation -- because of the need to form joint ventures/partnerships for firms with no in house design capability -- and should not be pursued when there would be little or no response to it.

6.2 Problems With the USACE Selection Criteria

The project selection procedures, recently developed by USACE, is a fairly detailed and specific process. It allows the agency to choose which method (traditional, one-step, or two-step) that best matches a projects characteristics. After examining these criteria, I believe there are numerous problems with them. In this section I will outline some of the problems inherent in this project selection process.

6.2.1 Does Not Permit the Consideration of the Relative Advantages Between Methods

The selection process is essentially a screening tool that attempts to eliminate projects that would not be appropriate for the design/build method. Because of the screening nature of the selection process, certain projects may be eliminated from design/build consideration based on a single criteria. It does not permit the weighing of the relative advantage of one criteria against another.

This can have a significant impact when considering which method is appropriate for a time sensitive project. The process evaluates the time available to complete the project against the need to develop new documents (see Figure 6-6). While this matrix does not eliminate the One or Two-Step approach for any project with a short schedule, other factors may eliminate the One or Two-Step approaches. For example, if the project is considered not repetitive and will only be build in small

quantities with low to moderate cost, then the USACE decision criteria directs the use of the traditional method (see Figure 6-4). The guide instructs the user to stop using the decision process and to use the traditional method. The user would not even reach Figure 6-6 to evaluate a project's time constraint. This leaves the project no chance of being completed in the short time available for this type of project. Since the design/build process (One and Two-Step) is the only realistic method available for the Corps to fast track a project, it should be considered for all time sensitive projects, except when other factors would absolutely prove it unworkable.

Secondly, there is nothing in the process that allows measured time versus cost tradeoffs. This could be important where a delay in the construction of a new facility results in an added cost, or lost savings, to the government. For example, units relocating to other posts frequently require new facilities before moving. If the old post was closing after the units departure, then a monetary savings probably results from the post's closure. By computing this savings on a per time basis, projects with shorter construction times, but higher costs might prove more beneficial to the government. Again, the USACE selection process not only discourages this comparison, but may prevent its consideration.

Therefore, the USACE selection process provides only a screening process, preventing the comparison of the relative advantages between the three available methods. The only occasion in which relative advantages are considered in when choosing between the One and Two-Step methods.

6.2.2 Does Not Stimulate Innovation

Using the USACE project selection guide, a project will only be considered an appropriate candidate for design/build when the performance characteristics are fairly well understood (see Figure 6-5). Similar facilities must be fairly common in the construction industry. This places a heavy reliance on the transfer of common practices

from the civilian market; innovation is allowed as long as it is already proven and in common use. Is this innovation or merely considering more than one type of proven design or construction method?

As one of the largest construction management organizations in the U.S., USACE must be willing to take the lead in trying new technologies **first**. USACE is forcing the rest of the industry to try these practices, then if successful and widely understood, they will allow them. This situation does not fully exploit the *potential* advantages of the design/build process.

One disadvantage of using the design/build process is the partial loss of control the owner has over the eventual design of the facility. This is a greater concern when innovation is allowed. USACE can add a degree of protection by writing good performance specifications, including escape clauses that can be exercised if it becomes apparent that the design is not fulfilling the original intent of the agency, and careful coordination in the design process. Since, the Corps contracts with private A-E firms for most projects, including those that are unique to the Army, they must relate their needs to an outside firm anyway.

7
CONCLUSION/RECOMMENDATIONS

The United States Corps of Engineers is currently undergoing a period of enormous change. They have implemented many new ideas which are significantly improving their ability to perform their mission. Two of the most promising of these are Partnering and Alternate Dispute Resolution. Together they have reduced the number, cost, and time spent on resolving the many disputes that arose from their construction contracts.

Most of these disputes developed from the adversarial relationships and the low margin nature of the traditional separately designed, competitively bid, lump-sum construction contract. This is the contracting method used most often by the Corps. While ADR and Partnering have been extremely successful in improving the results USACE has obtained, they do not change the actual contracting method that creates much of the problems. Recently, the Corps has received Congressional approval to test the design/build approach to contracting. After several years of testing, the Corps now permits contracting with design/build organizations using two procurement methods. This new design/build approach now allows the Corps some choice in their contracting methods.

The primary advantages the design/build approach brings to USACE contracts are (1) a time savings, primarily through the option to fast-track construction, (2) a reduction in disputes and change orders because one firm is designing and constructing the project, (3) the ability to obtain competition between designs not just price, and (4) the ability to reward proposals that are of a higher quality. The final two advantages come through the One-Step process which is still somewhat limited for Military Construction, Army projects. The Corps must push for changes which remove these limitations on the One-Step method.

The two forms of contracting permitted under design/build both still utilize lump sum contracts. This adherence to the lump sum contract severely limits the contract options of the Corps. Cost reimbursement and non-traditional contracts have received increased usage in recent years for civil and military contracts. This trend must continue. Selection of improper contract types can have a major impact on the cost, number of disputes, quality and completion time of projects.[89] USACE must continue to increase its usage of non-traditional contracting methods, including cost reimbursable type contracts. With much of its flexibility limited by legislation, now may be the time to push Congress to allow additional testing of other contract options. Specifically, I believe that USACE should seek authorization to implement the following.

1) Test the use of the cap type award method. This can be used on traditional design/bid/construct contracts and with design/build arrangements. With a price cap set by the owner, bidders propose either how many quality upgrades and/or options they can include for that set price. By using this method, the Corps would not have to redesign projects when funding is lower than anticipated or when all bids come in higher than estimated. The project would merely be downsized according to a pre-determined prioritized list of deductions or quality downgrades. Competition is still achieved, but price is firmly fixed.

2) Apply the multiple parameter bidding concept already employed in the One-Step process to traditional separate design/bid/build projects. When used in this manner price, time, and a contractor's qualifications could all be used to select a contractor. Evaluative criteria, similar to what is currently used in the design/build selection process, could be used. This would help to choose quality contractors and

[89]Elmore.

can reward contractors who can deliver a faster facility, when time is critical to USACE.

3) Guaranteed Maximum Price (GMP) contracts could also prove beneficial. This version of the cost reimbursable contract would contain a maximum price, providing a sharing of the financial risk between the Corps and the contractor. Any savings realized below the GMP could be shared between the Corps and the contractor. This would provide the contractor an incentive to save money and at the same time allow the Corps to share in the savings.

While most of these recommendations would require a relaxation of current legislative and/or regulatory practices, there are some things the Corps can do on their own to improve contracting. They should expand the use of design/build to other areas such as the environmental arena. The large volume, time, and cost of these projects invite even greater savings. Other potential application of the design/build process are covered in section 4.2. The United States Army Construction Engineering Research Laboratory (USACERL) could assist by studying other applications of design/build, then monitor and report on the success of projects in the various districts.

The Corps should also continue to encourage the use of industry, as opposed to Corps, design standards whenever possible. This would encourage more competition and allow a faster transfer of new technologies and/or construction methods to military projects.

Aggressive advertising of USACE design/build projects should also be done to attract competition to the process. On the Fort Stewart test project it was apparent that it was not sufficient to simply advertise to firms on a district's standard bidder list. Design/build projects, especially One-Step projects, will tend to attract different types of construction firms. The method of awarding One-Step contracts based on quality, qualification, and other factors in addition to price will tend to attract firms that are differentiated not by low price, but by quality.

There are many other legislative actions that make the military construction process inefficient. The primary one is the Davis-Bacon Act. The latest annual report of the Congressional Budget Office (CBO) estimates that approximately $5 billion dollars could be saved between now and 1997 by modifying or eliminating the Davis-Bacon Act and the Service Contract Act. The report admits what is known throughout the construction industry -- the Davis-Bacon Act keeps wage rates on federal contracts above the market level.[90] Pressure must be maintained on Congress to eliminate this inefficient act.

Finally, the Corps must do its part to promote Research and Development. By relying on others to pioneer new ideas and methods, USACE is making it difficult for industry advances to be tried on military projects. We must have a system where new contract types and construction methods can be tried before they become common throughout the industry. They can do this, in part, by rewarding innovative contractors through the design/build selection process. By incorporating criteria into the contractor selection process that considers a contractor's investment in R & D and the technology's potential impact on society, now and in the future, innovation will be encouraged. Thus, contractors who have demonstrated innovative technologies can be rewarded.

Under our present system it is difficult for contractors to test new technologies and even more difficult to try them on projects. Not only is there no financial incentive to develop new technologies, unless they result in immediate cost savings, but also there is the threat of lawsuits and/or insurance penalties. We must make it easier and less risky for innovation and R & D to take place in the construction industry. In Japan new technologies are tested in the laboratory and in the field and evaluated by neutral organizations such as the Japan Society of Civil Engineers, the Building Center

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[90]"How Congress Could Balance the Budget," *1590 Broadcaster (Nashua)*, 22 April 1992, p. 1.

of Japan and the Public Works Research Center. They are then approved for use on federal projects.[91]

A flexible system needs to be developed where innovative ideas and contract methods can be tested without the need to go to seek Congressional approval each time a small variation from existing practice is tried. Perhaps a permanently authorized number and/or dollar amount of contracts that qualify as test projects could be permitted annually.

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[91]Harvey M. Bernstein, "Forget the Bottom Line; Invest in R & D," *Construction Business Review*, (January/February 1992), p. 49.

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