Design-Build Project Delivery in Military Construction: Approach to Best Value Procurement

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Design-Build is rapidly becoming one of the most commonly used project delivery methods in the facility construction industry. The United States Air Force and the Air Force Reserve Command (AFRC) are expected to establish a target of 75% of all Military Construction (MILCON) projects delivered using the Design-Build method. The use of this delivery method will bring significant changes in the relationships between the various parties associated with facility project delivery when compared to the traditional Design-Bid-Build method. This paper demonstrates that Design-Build delivery with a best value selection is an important tool in accomplishing AFRC's cost efficient, rapid response transformation goals applicable to facility construction. Three hundred thirty two projects in program years 2002 through 2006, constructed using both traditional Design-Bid-Build or Design-Build delivery methods, were examined. Parameters used for comparisons were construction cost and schedule growth, project cost, vertical versus horizontal construction, and number of days required to prepare solicitation documents, advertise and accomplish construction award. This research reveals significant project schedule advantages with Design-Build best value selection delivery. The advantages are apparent in both pre and post construction award activities. Potential Design-Build cost advantages are hindered by Defense Federal Acquisition Regulations requiring firm fixed price contracts at construction award.

Keywords: Design-build, MILCON Transformation, Project Delivery, Best Value

Introduction

Design-Build is a method of project delivery in which one entity forges a single contract with the owner to provide architectural/engineering design and construction services (Webster 1997; Allen 2001). While the private sector has been using Design-Build since the 1940's, military use of this alternate project delivery method is still in its formative years. The Department of Defense (DOD) has been employing Design-Build since 1987, receiving the authorization via the Military Construction Authorization Act of 1986. This congressional sanction limited DOD to a maximum number of three projects per year delivered by the Design-Build method. In 1993, The National Defense Authorization Acts removed limits on the number of projects that could be executed using Design-Build procurement techniques. The Air Force permission to utilize Design-Build delivery, approved by the Secretary of the Air Force in 1995, came with strict limitations and guidelines regarding the types of projects that can be considered as candidates for this non-traditional procurement method. The choice to use Design-Build can now be based on its merits for each individual project in a military service's Military Construction (MILCON) program.

A number of factors contribute to the increased use of Design-Build for Air Force (AF) facility construction procurement including some that are extraneous to the inherent characteristics of the

project itself. Two of these external factors are the diminishing supply of available MILCON design funds and the increased number of MILCON projects congressionally inserted into AF programs each year. MILCONs are Military Construction Projects that are congressional funded at a specific authorized monetary amount. The authorized sums are established based upon historical data for projects of similar scope and functional use classifications. Frequently, traditional procurement methods employed by United States Corps of Engineers are not feasible project delivery options.

The purpose of the research and this paper is to show that Design-Build construction procurement can be an effective tool to assist the Air Force Reserve Command in meeting Air Force DIRTKICKER MILCON project execution criteria for design and construction schedule and cost control.

Research Methodology

Project data was obtained from the Air Force's Automated Civil Engineering System (ACES) database. This database tracks the milestones of all Air Force facility projects from program development through design and construction to beneficial occupancy, construction completion and finally financial closeout. After closeout projects move to a historical file within ACES and completed milestone data is available for projects executed over a period of time. At present Air Force projects spanning the last 10-12 years are available for review, report writing and analysis.

Three hundred thirty-two Air Force MILCON projects in program years 2002 through 2006 were drawn from the database, compiled into reports and analyzed. Schedule and cost growth comparisons for Design-Build and other than Design-Build delivered projects with programmed dollar values less than five million, five to ten million, and more than ten million were analyzed. Growth comparisons for vertical and horizontal construction type projects executed via the two delivery methods were also evaluated for the same five year Air Force MILCON program period. Analysis results were compiled and comparisons were graphed to detect trends. It was anticipated that this compilation of information would be beneficial for predicting future execution results using the two project delivery methods.

Challenges

It is reasonable to ask why the federal government in general and DOD and Air Force Reserve Command (AFRC) specifically have been slow to implement Design-Build alternative delivery for construction services. The reasons are copious with the restrictive language of the Federal Acquisition Regulations (FAR) often being cited. FAR Subpart 36.209 states that "No contract for the construction of a project shall be awarded to the firm, its subsidiaries or affiliates, which designed the project except with the approval of the head of the government agency or an authorized representative." (FAR 2005a) This statement does discourage utilization of Design-Build project delivery, however, perhaps the single most common reason this delivery method is avoided is because people involved in the procurement process simply do not want to change the way current business is conducted. Additionally, the Two Phase selection method, applicable

when a large number of prospective bidders are anticipated, is cumbersome, time consuming and lacks regulatory contractual guidance. It is basically a procedure used to short list the number of bidders eligible for award consideration to a maximum of five highly qualified firms. Each bidder is initially screened for compliance with a series of prerequisite criteria. This unwieldy FAR directed process further thwarts government agency enthusiasm for this alternate project delivery method.

Another reason for the reluctance to use Design-Build project delivery is the preponderance of small business and small disadvantaged business firms encouraged to participate in the DOD construction program process. These firms frequently lack the expertise and experience to efficiently execute facility project construction using processes other than traditional methods in which bid proposals are based upon fully designed scopes of work. This rational is especially pertinent to small projects, or less than $5,000,000, and those with less complicated requirements. Currently the primary Air Force Reserve Design-Build project delivery option vehicle is the Multiple Award Task Order Contract (MATOC). MATOCs are pools of pre-qualified contractors, already under contract to USACE to deliver broadly specified construction services according to specific technical and contractual standards. Each contractor is asked to submit a proposal to perform a particular construction project. Typically each MATOC contractor pool is comprised of firms qualifying as small disadvantaged businesses (SDB) as defined by the federal Small Business Administration. Air Force Reserve projects are especially targeted to meet SDB execution goals since these projects tend to be less complicated and of a lower dollar value when compared to those of other USACE military customers. Small, disadvantaged contractors are learning to be competitive in the construction contract profession; alternative project delivery methods can be an additional challenge for them.

AFRC has lagged in adopting non-traditional Design-Build facility construction project delivery methods compared to most DOD commands. Yet, in order to keep up with mission demand and military transformation goals, Design-Build must become a viable alternative to long-established Design-Bid-Build delivery. Figure 1 illustrates the typical MILCON execution process from inception planning through Congressional notification and issuance of a field design instruction to the construction agency (COE).

Figure 2 represents an AFRC Design-Build MILCON project delivery process prototype. This method initiates with an Acquisition Strategy Meeting. The decision to use Design-Build delivery would establish an execution process as visualized below.

To provide the anticipated Design-Build bridging Architect/Engineer (A/E) with sufficient information to prepare a cost offer for Request for Proposal (RFP) prep, a Pre-Definition conference is conducted. Attendees at this meeting include representatives from AFRC, Corps of Engineers (COE), facility occupants and the installation's technical staff. At the conclusion of this meeting, and upon subsequent resolution of all questions and concerns, contract negotiations are conducted. A contract for professional A/E services is awarded at the successful completion of contractual discussions. The COE will then issue a Notice to Proceed (NTP) to this bridging A/E to accomplish the RFP. The fundamentally crucial component of the Design-Build method is the RFP. Preparation of these documents typically begins with a face-to-face meeting of all parties: COE, AFRC, installation technical staff and pertinent customers. The AF uses the

expression "charrette" to describe this gathering. The term describes a period, generally one week or less, of intense design exercise characterized by brainstorming and the development of concept design solutions based upon performance requirements contributed by the influential participants. RFP development generally starts with three A/E submissions, 35%, 65% and 95%, each with a subsequent review by contributing parties. When comments and corrections to all requirements have been incorporated into the document and it includes a construction cost estimate, the RFP is declared to be a final document acceptable to all entities. The COE and AFRC will then prepare a source selection plan, a public announcement is made and the RFP is issued for solicitation of construction proposals (U.S. Air Force Project Manager's Guide 2000).

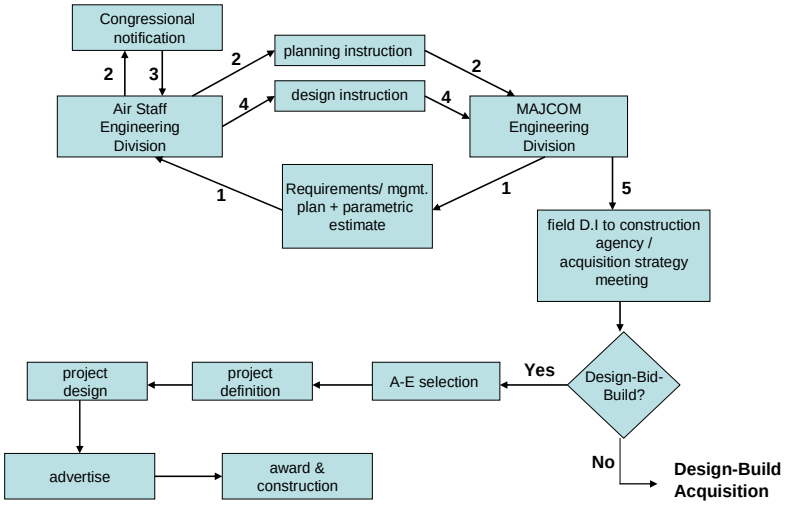

*Figure 1***:** Typical MILCON execution process (United States Air Force 2000)

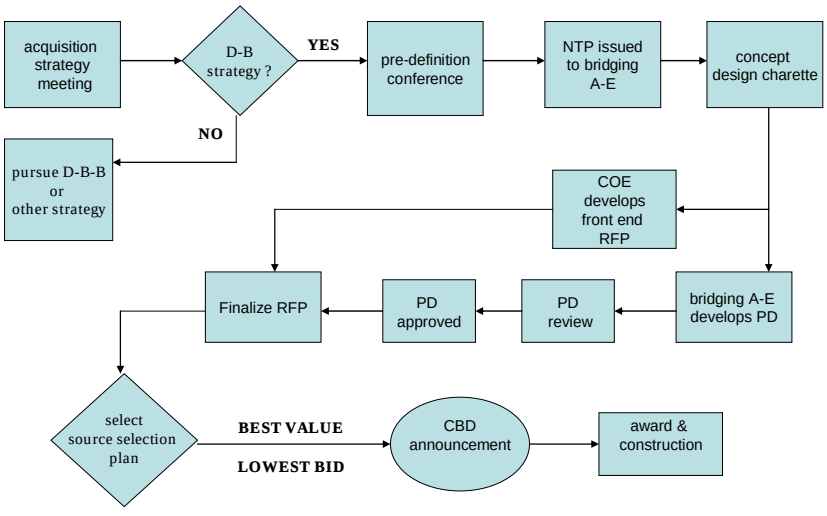

Figure 2: AFRC Design-Build MILCON project delivery process prototype (United States Air Force 2000).

Past Performance Models

Below are charts and tables that show calculated cost and schedule growth data for active duty Air Force projects between 2002 and 2006 inclusive (ACES 2007).

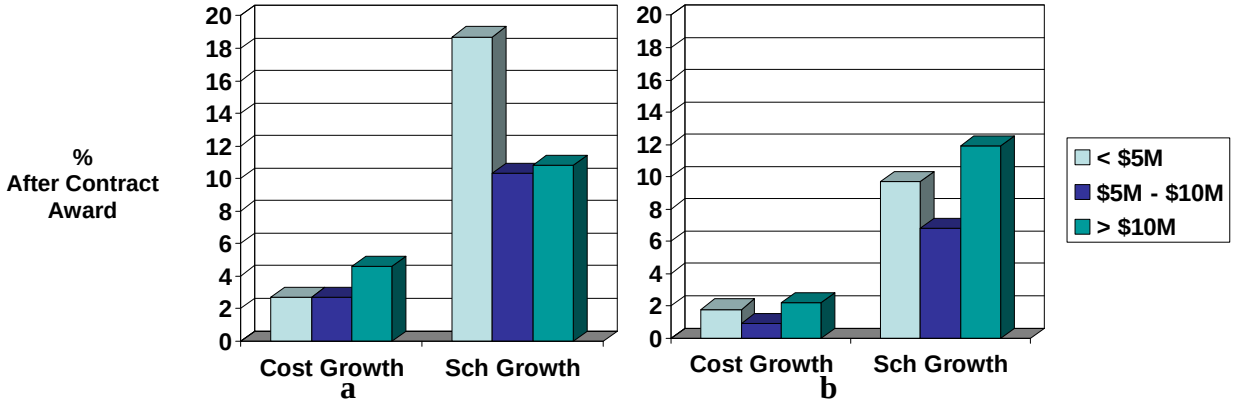

Figure 3: Cost and schedule growth for AF MILCON projects:
a. Other than Design-Build, and b. Design-Build.

Figure 3 shows that for the traditional delivery methods including Design-Bid-Build there is essentially no difference in cost growth for projects less than $5,000,000 and projects between $5,000,000 and $10,000,000. A 4% cost growth is observed for projects over $10,000,000. Schedule growth is most notable in projects under $5,000,000 with a rate of almost 19% while projects valued between $5,000,000 and $10,000,000 and greater than $10,000,000 experienced relatively the same schedule growth of approximately 11%. As indicated in Figure 4, Design-Build significantly reduced the schedule growth by almost 10% for projects with values less than $5,000,000. This reduction is principally the result of the ability to incorporate performance specifications into the RFP. Projects between $5,000,000 and $10,000,000 and greater than $10,000,000 did not exhibit any appreciable schedule growth reduction advantages using Design-Build when compared to traditional methods. This might be explained by the degree of design complexity and difficulty in adequately identifying the customer's requirements using performance specifications in the RFP process as projects become larger and more complex. Cost growth differences between the two methods were minimal. For projects valued at $10,000,000 and less, Design-Build cost growth was slightly less than traditional. For projects worth more than $10,000,000, Design-Build cost growth was approximately 50% less.

A comparison of horizontal and vertical projects reveals larger schedule growths in vertical projects delivered from 2002 to 2006. Vertical projects, primarily facilities and upright structures, generally are expected to require more complex designs than horizontal construction projects. This comparison suggests possibly schedule advantages using Design-Build project delivery for these more complex design projects when customer requirements are adequately defined in the RFP. These schedule advantages do not translate for horizontal construction projects. Analysis of this data clearly shows the potential benefits of choosing Design-Build delivery for projects requiring complex, multifaceted designs when controlling schedule growth is important. RFPs that are lucid, precise and that comprehensively define all performance requirements are essential to success in maintaining the construction schedule.

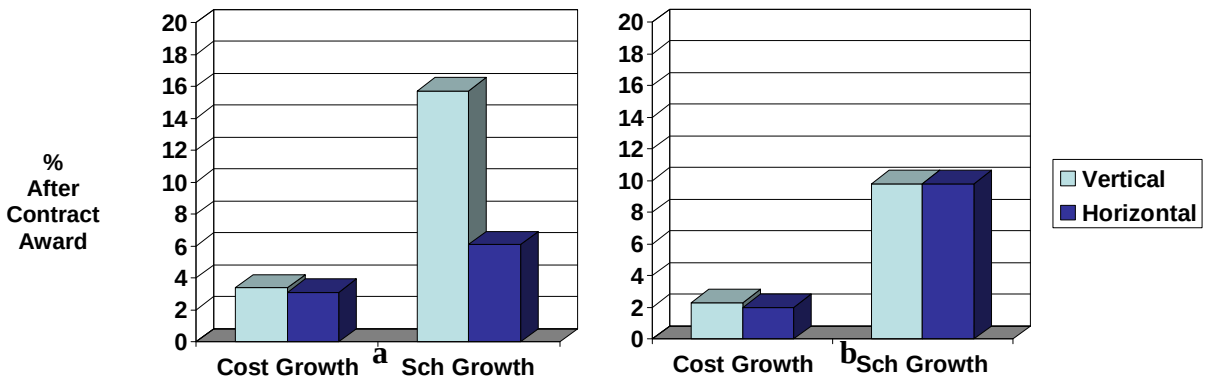

Figure 4: Cost and schedule growth per construction type for AF MILCON projects: a. Other than Design-Build, and b. Design-Build.

The AFRC MILCON program over the six year study period was largely comprised of projects valued at less than $5,000,000. Extrapolated active duty Air Force MILCON data used to construct the charts above show that projects in this dollar value range experience a significant measure of success in reduction of construction schedule growth by using Design-Build project delivery when compared to Design-Bid-Build and other traditional methods.

Schedule growth is due to a several factors: construction changes, unforeseen visits to the installation, weather delays, unexpected heightened security measures, request for technical information from the designer, sub-contractor coordination issues, or failure to perform according to the specifications. Adjustments are made for differing site conditions, availability of existing infrastructure support, inflation and geographic location. The initial contract amount cannot exceed the authorized amount minus statutory, construction agency contingency and supervision and inspection overhead expenses (FAR 2005b). If construction changes cause the cost of a project to exceed the amount appropriated or authorized, savings from other projects must be found to fund the modifications.

AFRC use of the traditional Design-Bid-Build delivery method has resulted in unacceptable schedule growth upwards of 60% for projects worth less than $5,000,000 and 50% schedule growth for projects worth between $5,000,000 and $10,000,000. A unique advantage of using Design-Build project delivery is that a single entity is responsible for both project design and construction. Discussions regarding schedule growth related to design intent and adherence to specification issues are eliminated since the contractor and the designer are under one contract. Table 1 represents the Air Force historical average for design periods. These time intervals are primarily based upon traditional project delivery execution methods. Projects in monetary ranges above $5,000,000 are usually more complex and require twice as long to develop the project definition firmly establishing the project requirements in technical terms. Design-Build delivery with its RFP reduces this time interval to construction award by allowing the Design-Build contractor to complete the development of project requirements during the design phase of his contract.

Table 1: Air Force Historical Average Design Period

Programmed Amount	Time in Days from Design Start to		
	Project Definition	Ready to Advertise	Construction Award
<$5M	60	150	240
$5 - $10M	120	180	270
>$10M	120	210	300

The annual Air Force DIRTKICKER award is presented to the command in each size category that best demonstrates the ability to execute its MILCON program in an efficient manner exhibited by cost and schedule control. A set of metrics used to analyze MILCON execution and provide a fair and balanced approach to determination of the Air Force's best performing commands has been developed and implemented. The criteria embrace the full spectrum of engineering and construction management statistics related to cost and schedule. These activities include design, construction and financial closeout. DIRTKICKER requirements for projects with values under $5,000,000 are especially stringent. The construction contract timeline performance metric for these projects has a target of 365 days. The construction contract performance period for projects valued from $5,000,000 to $20,000,000 is 540 day. Extra points are assessed for the ability to construction award projects in early quarters of the fiscal year of congressional appropriation.

Figure 5 shows total execution time including planning, and comparisons between Design-Bid-Build and Design-Build for projects with values of $5,000,000 and less, between 2002 and 2006 (ACES 2007). The data clearly shows an estimated 138 day reduction (13.7%) in completion time for projects delivered with the Design-Build method.

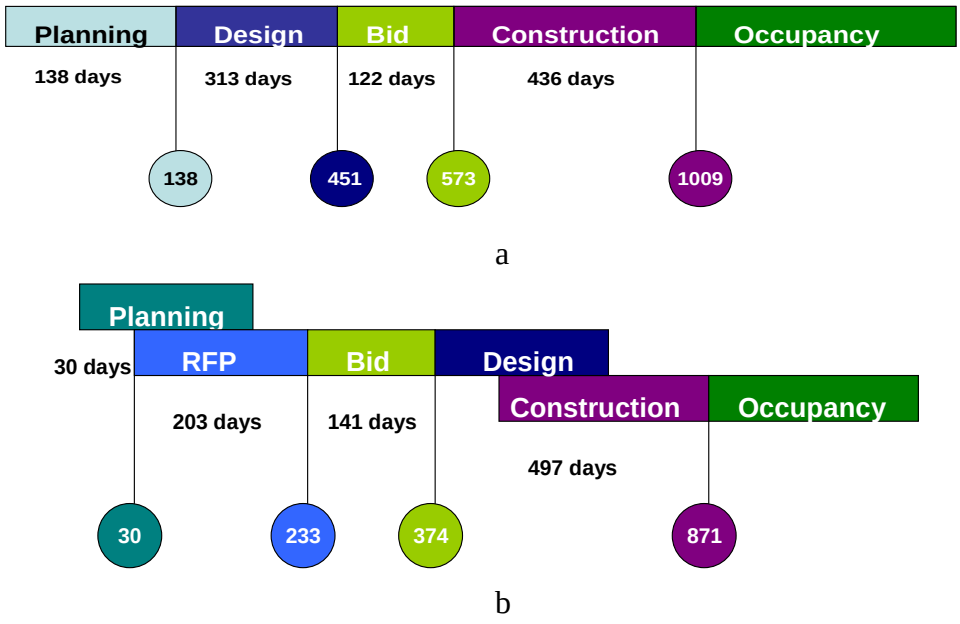

Figure 5: Total execution time: a. Design-Bid-Build, and b. Design-Build.

Design-Build Advantages and Disadvantages

Since this construction procurement procedure appears to offer so many advantages for AFRC and its customers, it is reasonable to ask why this method is used so infrequently as an alternative to the more traditional Design-Bid-Build method. A comparison of the advantages and disadvantages of Design-Build delivery is listed below.

Design-Build Advantages

- Early project completion and occupancy
- Excellent information interchange between design and construction personnel
- Ideal method for projects requiring construction phasing
- One contract for both design and construction – reduced paperwork
- Contractor is responsible for construction changes that are a result of design deficiencies
- Project can be fast-tracked because the schedule is controlled by one entity

Design-Build Disadvantages

- Payment of upfront cost for RFP preparations can be perceived as "paying for the design twice".
- Loss of a significant degree of design and construction control by the construction agency, AFRC and customers.
- When low bid or fixed price is the Design-Build selection method, the amount of front end project program information required is considerable.
- Unique execution challenges for small disadvantaged contractors still learning to perform in the military construction environment.

The disadvantages listed above hinder the Design-Build project delivery as the execution method of choice. Perhaps the greatest anxiety is the fear that, in the final analysis, price will force the selection of the contractor with the lowest cost proposal. This concern is magnified with the increasingly volatile construction price environment resulting from natural and man-made calamities. When price is the only selection criterion, contractual performance at the lowest contractually acceptable stratum is assured. Alternately stated, when firm fixed price is a factor in the selection process, competing contractors sense the award will be based upon the lowest qualified bid and will not labor to produce higher quality technical proposals and management plans in an effort to trump the competition. Under these circumstances the probability of failure to meet the customer's construction quality standards or requirements is high. Additionally, because the contractor is committed to deliver the project at a predetermined fixed price, the construction agency has less control over the entire Design-Build construction delivery process.

Design-Build for Federal Procurement

The Clinger-Cohen Act of 1996 provides guidelines for federal Design-Build procurement. The Act describes the Two Phase selection procedure and the concept of "efficient competition" (Heisse 2002). However, the statutes and regulations supply only a procedure for using best

value as a procurement method; they do not require construction agencies to use it. The traditional Design-Bid-Build method does not allow the government to solicit contractor bids with factors other than price. Elements such as management plans, critical paths which show the ability to complete the project in a shorter time, evidence of similar project experience and referrals from owners and architects on previous jobs could dramatically change the results of the selection process. The federal government and AFRC do not currently have specific legal guidance pertaining to RFP content. The AIA/AGC suggests the following parameters should be included in the scope of work for all public projects (AIA/AGC 1995): Program statements for the facility that describe space needs, design goals and objectives, equipment requirements, other pertinent criteria (accommodations for future expansion, etc), site information, including site survey and soil boring reports, any minority, women or other disadvantaged group enterprise business requirements, an outline of specifications, budget parameters, and project schedule.

Pertinent FAR clauses divulge the following Two Phase operational procedure: Phase One narrows the list of bidders down to four or five contractors. Evaluation factors could include specialized experience and technical competence, past performance and other appropriate factors. Price associated factors are not permitted in Phase One. During Phase One the government can review the proposal without concern that the competitors are trying to out bid one another (Heisse 2002). Phase Two requires submission of technical and price proposals. FAR Part 15 allows the government to negotiate with bidders to achieve "best value". In negotiations each bidder has the opportunity to revise his/her proposal and to submit a "final revised proposal". This best value procurement method allows the government to use a trade-off analysis technique in evaluating technical and price proposals. The objective is to select the offer that will provide the best product for the dollars available. Figure 6 shows the decision matrix for Source Selection Best Value Design-Build Acquisitions.

Future Outlook for AFRC

In May 2007 the Air Force Center for Environmental Excellence (AFCEE) issued a draft execution management plan for all AF MILCON projects. The purpose of this plan is to outline new procedures for executing MILCON and BRAC projects. The AF is seeking to select the most time and cost efficient delivery method for each project. The target goal is to use Design-Build as the delivery method for a minimum of 75% of each year's program. Unless otherwise stated, projects such as dormitories, family housing, general administrative and any standardized designs will be executed using this method. One objective the AF is eager to achieve is a "controlled approach" to construction that will mitigate the increasing construction costs and customer occupancy delays that continue to impact the delivery of MILCON projects. The policy will establish guidelines for awarding projects within the authorized monetary budget or Programmed Amounts (PAs) and within acceptable construction periods based upon those PAs. Design and construction are to be executed in accordance with the metrics established in the MILCON Program Management Plan (PMP). The Construction Cost Limitation (CCL) for all MILCON and BRAC projects will now cap base bid design construction cost estimates at 80% of the authorized PA regardless of programmed scope. Additional scope requirements up to the PA are to be designed as bid options. After allotting 5.7% and 5% of the total project PA respectively for construction agent supervision, inspection and overhead (SIOH) and

contingency, the AF Headquarters engineering staff will set aside the remaining 9.3% of the PA in a general pool to be used to fund bid overages on other MILCON projects, essential bid options, and necessary unforeseen site condition changes (Air Force Center for Environmental Excellence 2007).

The Design-Build method is effective in controlling project cost. Errors and omissions in the design are resolved between the A/E and the contractor; both under the same contract, and seldom, if ever, require the construction agency to negotiate a change. Design-Build is also most effective in meeting fast track project schedules. The overlap of design and construction phases allows the design-builder to begin construction prior to completion of all drawings. The synergism of the relationship virtually assures develop of the design at a pace that meets the construction team's needs. This relationship also helps ensure the design-builder avoids schedule delays resulting from failure to identify and properly plan for long lead items.

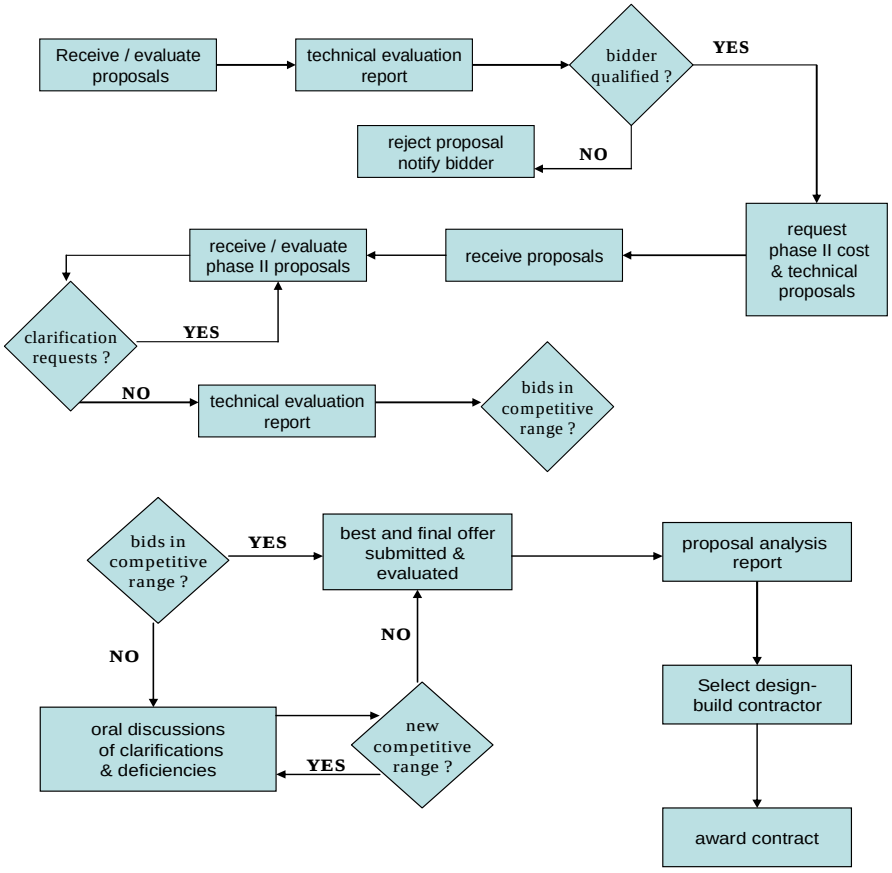

Figure 6: Selection process diagram for Two Phase Best Value Design-Build Acquisitions (United States Air Force 2000)

Best Value Procedures for Evaluation

In order to achieve the optimum value in the use of Design-Build project selection, best value procedures and techniques should be incorporated into the selection process to the maximum extent possible. Many of the best management practices in the construction industry are

management based, inefficient, lack accountability, and have not led to increased construction performance. Best value selection assures identification of the contractors best suited for the particular solicited project and then provides them with an efficient environment to allow them to deliver the highest value at the lowest price. Best value practices transfer project control and risk to those best qualified to control and minimize them. This procedure increasing efficiency by minimizing the effort required to deliver construction. These control and risk responsibilities should reside with those charges with the actual deliver of the project and not the client or client's management representatives. The FAR allows for performance contracting and best value procurement in the federal government. However, the concept of transferring risk and control to the contractor represents a colossal paradigm shift both in the COE contracting and Air Force facility construction management communities (Kashiwagi 2008). At present the incorporation of technical merit into the selection process along with fixed price is the best that can be achieved.

The purpose of a best value selection is to allow the owner to make a conscious tradeoff between price and quality considerations (Chinowsky and Kraft 2005). In a best value selection the owner may select a construction firm that proposes to perform the work at a higher price than other offerors if that firm tenders the superior technical solution. Alternately, the owner has the ability to select a firm whose technical proposal is evaluated lower after deciding that the offer with the highest evaluation is too expensive.

Typically the owner will request Design-Build proposals from several competing firms. Air Force Reserve construction contracts must meet Small Business Administration goals. For projects valued at $5,000,000 and below the competing firms are nearly always limited to those qualifying as small, disadvantaged firms in the Small Business Administration Program. Because of this requirement, proof of this qualification along with past performance in utilization of Small Business Concern subcontractors is generally always one of the selection criteria. This criterion is usually rated as "go" or "no go" and should not vary by scale in rating the various submitting firms. Best value selection criteria are generally segregated into two major categories:

1. Design-technical and performance capability.
2. Price and pro forma information, such as proof of financial ability, bonds, insurance, etc.

Design-technical and performance capability can be sub-divided into up to five sections. These are: experience, past performance, technical proposal information, management, and subcontracting narrative. Experience as a selection rating factor is applicable to both the prime construction contractor and the design team and can include the major subcontractors on the project. The offerors generally are asked to submit descriptions of projects similar in size, scope, and dollar value, complete or substantially complete within the last 5 years, for which they were responsible. Evidence of projects in which the prime construction contractor and design team have accomplished together is encouraged. Past performance refers to the quality of recent construction project experience from the owner's perspective. Offerors provide customer references, company affiliation and current phone numbers on specific project experience sheets. Technical proposal information generally consists of color renderings or sketches depicting the overall appearance of the project to be constructed along with design drawings sufficient to show

facility function, aesthetics, and site layout. This technical proposal should also include a design narrative describing the major systems proposed for the project or facility. The purpose of the subcontracting narrative is for the offeror to demonstrate that a targeted percentage of the first tier subcontracting work will be accomplished by US Small Businesses. The evaluation of this criterion is rated either yes or no. Price and pro forma information is submitted by the offeror in a separate sealed envelope. It is evaluated for reasonableness and realism using cost/price analysis and positive bank references and acceptable sureties.

Upon receipt of all offers, an evaluation board comprised of representatives of the Corps of Engineers, Air Force Reserve program manager, the customer, the contracting officer, and other required personnel will convene and evaluate the proposals. The evaluation process consists of four parts:

1. Proposal compliance review to insure that all necessary forms and certifications are complete.
2. Design-technical and performance capability evaluation.
3. Price evaluation.
4. Cost/technical trade-off analysis.

After listing each proposals strengths, weaknesses and deficiencies, the board will assign an adjective rating of “Unsatisfactory”, “Marginal”, “Satisfactory”, “Good”, or “Excellent” to each factor except those rated as yes/no or go/no-go. The adjectival ratings are as follows:

- Excellent: The proposal demonstrates excellent understanding of the requirements and the approach significantly exceeds performance or capability standards; contains no significant weaknesses or deficiencies and presents very low risk that it will not be successful.
- Good: The proposal demonstrates a good understanding of the requirements and the approach exceeds performance or capability standards; has one of more strong points and any weaknesses noted are minor and should not seriously affect the offeror’s performance; presents a low risk that it will not be successful.
- Satisfactory: The proposal demonstrates an acceptable understanding of the requirements and the approach meets performance or capability standards; acceptable solution. The approach may include both strengths and weaknesses of substance, where strengths are not outweighed by weaknesses. Collectively, strengths and weaknesses are likely to result in acceptable performance.
- Marginal: The proposal demonstrates shallow understanding of requirements and the approach only marginally meets performance or capability standards necessary for minimal, but acceptable contract performance. The offeror may satisfactorily complete the proposed tasks, but there is a high risk that it will not be successful.
- Unsatisfactory: The proposal fails to meet performance or capability standards. Requirements can only be met with major change to the proposal. The risk of unsuccessful performance is very high as the proposal contains solutions which are not feasible and do not meet the solicitation requirements (Louisville District Corps of Engineers 2007).

Past performance risk ratings assess the risks associated with each offeror's likelihood of success in performing the requirements stated in the RFP based on the offeror's demonstrated performance in recent contracts. These adjectival ratings are as follows:

- Unknown Risk: No relevant performance record is identifiable upon which to base a meaningful performance risk prediction. This is neither a negative or positive assessment.
- Low Risk: Based on the offeror's past performance record essentially no doubt exists that the offeror will successfully perform the required effort.
- Moderate Risk: Based on the offeror's past performance record some doubt exists that the offeror will successfully perform the required effort.
- High Risk: Based on the offeror's past performance record extreme doubt exists that the offeror will successfully perform the required effort (Louisville District Corps of Engineers 2007).

The current best value solicitation selection criteria recommended for use by AFRC are: technical solution, experience, past performance, management plan, firm fixed price and subcontracting narrative. A trade off analysis is allowed. If a firm is rated high in all selection factors but does not offer the lowest price, the process allows AFRC to select the contractor that provides "best value" to the government (Louisville District Corps of Engineers 2006). A survey of owners of public and private projects disclosed the consensus opinion that Design-Build reduces a project's delivery time when compared to traditional methods. Other reasons cited for implementing Design-Build, in order of importance, include establishing costs before design is complete, reducing project costs, increased constructability, innovation, and reduced claims (Gransberg and Barton, 2007). The analysis provided in this paper for Air Force projects over the last five years supports these owners' opinion concerning reduced project delivery time. One of the reasons cited for schedule growth in Design-Bid-Build delivery is the inherent checks and balances between the designer and contractors, both under separate contract to the owner, that can create strained relationships and hinder the coordination process. Another reason mentioned for the differences in schedule growth between the two methods is the sequential nature of the Design-Bid-Build delivery process. This method does not offer the opportunities to expedite construction phases. Conversely, Design-Build project delivery brings the designer and contractor together early in the process and they work as a team (Tennant 1998). On the other hand, project quality standards can encourage a conflict of interest when using Design-Build project delivery. The designer is no longer an independent advisor. A tendency to cut corners is likely to occur because the design-builder performs the dual function of interpreting design needs and attempting to control cost. This may result in selection of the lowest cost alternative while sacrificing the owner's definition of a quality project.

Design-Build project delivery provides significant advantages in reduced administrative burden. A consistent complaint of Air Force Reserve contractors, both design and construction, is the volume of administrative forms, plans, and documentations that must be maintained and submitted. This administrative workload often necessitates hiring additional employees simply to process and coordinate paperwork. Since administrative overhead increases with the number of contracts, Design-Build delivery, where the owner holds only one contract for both design and construction, has a decided advantage over Design-Bid-Build with its traditional two contracts. Construction professionals note a significant difference in public owner involvement in the design, procurement, and construction phases of projects when comparing Design-Build and

Design-Bid-Build delivery methods. Design and construction owners and representatives are more likely to allocate minimal weekly hourly to contract oversight of Design-Build projects. For projects with undeveloped programs, multiple stakeholders, and those employing in-house design and construction staff resources, the Air Force Reserve may be best served by selecting Design-Bid-Build project delivery. This method allows various interest groups more time to discuss options because of the longer design period. Conversely, Design-Build requires speedy decisions from Air Force Reserve design and construction staff and the need for more experience in the use of alternative delivery methods. To succeed with Design-Build delivery it is imperative that the project program be well developed prior to initiating RFP preparation.

FAR Limitations

In Section 16.3 of the FAR alternatives to the "firm fixed price" solution are addressed in following contracts:

- Cost-sharing contract which is a cost-reimbursement contract in which the contractor receives no fee and is reimbursed only for an agreed-upon portion of its allowable costs.
- Cost-plus-incentive-fee contract which is a cost-reimbursement that provides for an initially negotiated fee to be adjusted later by a formula base on the relationship of total allowable costs to total target costs.
- Cost-plus-award-fee contract which is a cost-reimbursement contract that provides for a fee consisting of a base amount, which may be zero, fixed at inception of the contract and an award amount, based upon a judgmental evaluation by the government, sufficient to provide motivation for excellence in contract performance.
- Cost-plus-fixed-fee contract is a cost-reimbursement contract that provides for payment to the contractor of a negotiated fee that is fixed at the inception of the contract. The fixed fee does not vary with actual cost, but may be adjusted as a result of changes in the work to be performed under the contract.

The annual congressional Military Construction appropriations acts passed by Congress restrict the use of cost-plus-fixed-fee contracts (FAR 2005b). A waiver to the requirement for a firm fixed price must be approved by the Secretary of Defense on a project by project basis. Research has not revealed whether this authority has been delegated down to an agency working level sufficient for waiver application. In DOD the DFAR is the superseding regulation. Until the authority to use cost-plus-fixed-fee contracts is granted to construction agencies, best value selection that excludes low fixed price will remain unavailable to AFRC and other military commands. The FAR continues to reflect traditional roles, responsibilities and lessons learned from the long used Design-Bid-Build approach to A/E and construction contracting.

Conclusions

When a public construction project misses its schedule goal and is over budget, it attracts undesirable attention in the public sector as elsewhere. AFRC is looking for new ways to meet these schedule and budgetary requirements by selecting the best delivery methods available. The

most attractive characteristics of alternative methods like Design-Build are that they can save money, reduce time and can be expected to reduce construction change orders, contractor claims and decrease administrative costs and burden.
Based on an analysis of 287 Military Construction Projects between 2002 and 2006, this research shows significant advantages to AFRC in the use of Design-Build facility project delivery particularly regarding the ability to meet schedule commitments. Further research assessing the possible advantages of Design-Build delivery in reducing construction contract claims and follow-on facility operations and maintenance will complement the findings of this paper. Additional research should address operations and maintenance costs of DB vs. traditional bid facilities during their respective life cycles. User satisfaction surveys spanning six months, one year, three years and five years after beneficial occupancy for DB and traditionally procured projects should be studied. Follow-on remodeling, additions and upgrade projects should also be tracked and compared for the two project delivery methods as a barometer of the ability to meet all customer requirements in the initial project.

The Defense Federal Acquisition Regulations compels the basis of compensation to be firm fixed price. This directive probably negates the cost advantages that could be garnered with the Design-Build method. Contractor price uncertainties concerning requirements and specifications into their proposals as protection against unknowns later revealed while under contract. The Design-Build approach assumes that a substantial number of requirements have not yet been sufficiently addressed to proceed to construction. Asking the contractor to submit firm prices for these undeveloped requirements may appear to be a bit presumptuous. Until AFRC can establish standard requirements for each mission's facility needs, the current Two Phase selection method is the best technique available upon which to evaluation contractor proposals using factors other than simply the lowest priced offered. It is suggested to further this research by comparing bridging documents prepared by in-house Corps of Engineers designers compared to those prepared by outside architect-engineering firms for DB procurement.

References

ACES (2007, June 25). *Automated Civil Engineering System* [WWW document]. URL http://www.defenselink.mil/dbt/products/March_2007_BEA_ETP/etp/App_E/QuadCharts/ACES_Chart.html

Air Force Center for Environmental Excellence (2007). *Air Force Execution Management Plan (Draft),* May 2007.

Allen, L. N. (2001). *Comparison of Design-Build to Design-Bid-Build as a project delivery method,* Unpublished master's thesis. Naval Postgraduate School, Monterey, USA.

American Institute of Architects/Associated General Contractors of America (1995). *AIA/AGC recommended guidelines for procurement of Design-Build projects in the public sector,* Washington D.C., January, pp 1-13.

Chinowsky, P. and Kraft, E. (2005). Organization performance in best-value procurement, *CIB W92/T23/W107 International Symposium on Procurement Systems*, 8-10, February 2005, pp. 173-180.

Federal Acquisition Regulation System (2005a). *Part 2- Definitions of Words and Terms* [WWW document]. URL http://www.arnet.gov/far/2005

Federal Acquisition Regulation System (2005a). *Part 16-Types of Contracts, Subpart 16.3- Cost* Reimbursement Contracts [WWW document]. URL http://www.arnet.gov/far/2005

Federal Acquisition Regulation System (2005b). *Part 36 –Construction and Architect-Engineer Contracts, Subpart 36.3 Two Phase Design-Build Selection Procedures* [WWW document]. URL http://www.arnet.gov/far/2005

Gransberg, D. D. and Barton, R. F. (2007). Analysis of federal design-build request for proposal evaluation criteria**,** *Journal of Management in Engineering*, ASCE, April 2007, pp. 105-111.

Heisse, J. R. (2002, April 29). *Best value procurement: how the federal and state governments are changing the bidding* process [WWW document], URL http://www.constructionweblinks.com/Resources/Industry_Reports__Newsletters/April_29_2002/best_value_procurement.htm

Kashiwagi, Dean T. (2008). *Best Value Procurement, Second Edition,* pp. 7-1,3;11-18.

Louisville District Corps of Engineers. (2006). *Army Reserve Design/Build RFP Instruction Manual*, 12 September 2006 version.

Louisville District Corps of Engineers. (2007). *Louisville District's Source Selection Plan.*

Tennant, T. R. (1998). *Advanced project delivery systems: Design-Build and design delegation insurance issues* [WWW document]. Paper presented at the American Bar Association Forum on the Construction Industry and Section of Public Contract Law, Chicago, USA. October 16-17, 1998, URL http://www.c-risk.com/Articles/trt_design-build_pds_01.htm

United States Air Force (2000). *Project Manager's Guide for Design and Construction,* June 2000.

Webster, A. L. (1997). *The performance of the Design-Build alternative delivery approach in military construction*. Unpublished master's thesis, University of Illinois, Urbana, USA.