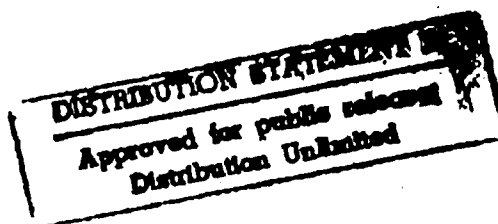


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**A STUDY OF DESIGN-BUILD CONSTRUCTION
AND
ITS PLACE IN PUBLIC CONTRACTS**

By
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**A REPORT TO THE GRADUATE COMMITTEE OF THE DEPARTMENT
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It would be inappropriate for me to undertake any academic endeavor without also paying tribute to my inspiration for higher education, that great philosopher of life, John Wayne. It was the Duke who reminded us:

"Life is tough. Tougher if you're stupid!"

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ABSTRACT

The standard practice in today's construction is what I have termed Traditional Construction. This project delivery system consists of a designer who prepares a design for an owner. The owner then selects a builder, usually through a bidding process, to transform the two-dimensional design into the three-dimensional finished project. While this system has been the norm for many years, owners are beginning to want more from their project delivery system. In this case, more means less: less time, less cost, and less litigation. They need their finished project delivered faster. They want to spend less for it. They are also tired of the mental anguish and 20% cost increase, due to legal disputes, which has also become the norm for Traditional Construction. An increasing number of owners are turning to Design-Build to get these "lesses."

This report takes an in-depth look at the Design-Build process from the public contracts perspective. Current project delivery systems and their relative advantages and disadvantages are discussed. Design-Build is introduced with its advantages and disadvantages from the perspectives of the owner, designer, and builder. A history of Design-Build is provided with past projects, professional influences, and a preview of upcoming projects. The various selection processes

for Design-Build are reviewed and legal issues are examined. The report concludes with recommendations for when public administrators should consider using Design-Build, and what public administrators should do to make Design-Build work.

CHAPTER ONE

INTRODUCTION

HISTORY OF CONSTRUCTION

Design-Build is becoming more popular as a choice of project delivery systems. The idea of hiring a single contractor to both design and build a project is not a new concept however. When man first began paying someone else to build something for him, the builder also did his own designs. Projects were simple then and this arrangement seemed only natural. As projects became more and more complex, the art and science of designing began to emerge into its own field. During the Renaissance, clear divergences began between parties responsible for design and parties responsible for construction. (30 p 4)

The practice of hiring one party to design a project and another party to do the building became an integral part of the construction industry in the United States. This concept of project delivery is what I refer to as Traditional Construction. Americans came to stereotype designers as experts gifted in the art of design, and builders as being skilled in the craft of construction. (30 p 51) There was no merging of the two. In fact, laws developed to insure that designers only designed and builders only built. It is the recent erosion of these laws that has allowed Design-Build to emerge once again as a viable option for construction.

GOALS OF CONSTRUCTION

All construction projects generally have three key players: the owner, the designer, and the builder. Each has the same fundamental goal, to produce a quality project on time and within budget. Quality can relate to beauty, function, or performance. Cost should include initial and long-term life cycle expenses. Time constraints can be "as soon as possible" or by a specific date. Often these goals cannot be mutually exclusive and the three parties must negotiate trade-offs. Each still wants the best quality, the least cost, and the shortest time. As projects become more complex and construction techniques adapt to take advantage of computers and other technical wonders, these three goals still remain the fundamental constants of all construction. (29 p 41-45)

ROLE OF THE DESIGNER IN CONSTRUCTION

In the very early development of our traditional construction, when designs were simple, the design professional played a lesser role in the construction process. Today, his involvement has greatly increased. He can be considered an "adviser, coordinator, synthesizer and creative artist." According to the American Institute of Architects (AIA), "His decisions largely determine the functional and aesthetic, and to some extent, the financial success of a project." (23 p 3) As the construction industry adjusts to the alternate project delivery systems, the role of design

professionals is expanding even more. Designers are learning they can now be as creative about the process of construction as they have been about the product itself. (29 p 41)

ACEC's FIFTEEN-MONTH STUDY OF DESIGN-BUILD

As the popularity of Design-Build grew in the United States, professional organizations began to take a serious look at the concept. An American Consulting Engineers Council (ACEC) task force conducted a fifteen-month study to find out just how serious owners were about Design-Build and why they were not satisfied with the traditional construction system. The task force discovered that many owners were dissatisfied with the long lead times, disputes, and litigation that has come to be associated with traditional project delivery systems. According to Raymond F. Messer, the task force chairman, "A lack of confidence in the perceived ability of the architectural and engineering community to control budgets, meet schedules and properly coordinate documents has led to this position." Owners are looking for a single-source responsibility. Many are finding it in Design-Build.

This growing popularity of Design-Build has some contractors and designers nervous. Because they perceive it as favoring larger contractors, smaller contractors think Design-Build will squeeze them out of business. Some designers claim the low bid competition element undermines the selection of designers on the basis of professional qualifications. Concluding that Design-Build is not going to

go away. Messer recommended to the ACEC. "Rather than fight it, we need to hold contractors [using it] to a professional level of design practice." Joshua Brener, president of Heery Engineering Inc., of Atlanta, agrees that Design-Build will be with us for a while. According to Brener, "Engineering Firms are going to have to get with the program or give up that particular area of their practice." (25 p 9-10)

PRIVATE AND PUBLIC CONSTRUCTION

The private sector is neither owned nor controlled by the government. Private owners can use any type of project delivery system they choose with any type compensation plan they can persuade a contractor to accept. (28 P 429) The public sector is owned by the Federal, state or local government. Public laws place considerable restrictions on the obligation of public funds for construction. Historically, the public has been far less responsive to the Design-Build approach because of licensing, registration and ethical restrictions and public bidding laws. (30 p 87)

Unencumbered by the public restrictions, the private sector began to experiment with Design-Build, producing some very impressive results. With things getting tough all over, even the government began to feel the money squeeze. It became hard for public agencies to ignore the advantages realized by private Design-Build efforts and the restrictive public procurement laws began to relax to the extent that Design-Build was able to get a foothold.

REPORT PREVIEW

There is currently very little information conveniently available on Design-Build. Most of my references came from magazine articles or brief discussions of the subject in books or legal manuals of construction law. I did find one single source which gave me over 25 percent of my collected data. This book, Timothy R. Twomey's Understanding the Legal Aspects of Design/Build, was endorsed by the AIA and had a definite architect tilt. I have tried not to let this heavy architectural perspective dominate this report.

As a public contracting official for the U. S. Navy, I have seen up-close-and-personal some of the shortcomings of our public traditional project delivery system. Since first hearing of its potential, I have become increasingly interested in Design-Build and its place in public construction. My choice of this topic for my report has helped to satisfy that interest.

CHAPTER TWO

PROJECT DELIVERY SYSTEMS

PROJECT DELIVERY SYSTEM ELEMENTS

Traditional construction has a tripartite arrangement with the owner, designer, and builder. The owner contracts with a designer to design a project, and then forms a separate contract with a builder to build the project. There is no contractual relationship between the builder and the designer.

While other contracting strategies offer different relationships between these three key players, most contracts address several common elements. Every contract should, at a minimum, define the relative responsibilities of the designer, owner, and builder, and clearly define the scope of work. It should also establish the contract price, the schedule of work, the method of compensation, the provisions pertaining to subcontracting, and the relative responsibilities for insurance coverage. It is equally important for any contract to delineate either party's right to terminate the contract.

(26 p 85-86)

PAYMENT TYPES

Determining the amount

In our world so heavily influenced by money, perhaps the most important element of any contract is the contract amount. Competitive bidding and negotiating are the most popular

methods of determining this amount. The contract award amount can be based on a firm-fixed price, a unit price, a cost plus, a partial guarantee plus fee, or a maximum guaranteed price. Each has its own advantages and disadvantages and the most appropriate type to be used can depend on the project characteristics.

Firm-fixed price

A firm-fixed price contract, sometimes referred to as stipulated or lump sum, is the total price to be paid, regardless of the amount actually spent by the contractor, unless the contract is modified. To arrive at this fixed price on which the contractor is risking his shirt, he must be provided a complete detailed set of plans and specifications. Defects in these plans or specifications could support any claim the contractor might have for a price increase. (29 p 53)

Firm-fixed price contracts are normally awarded by competitive bid but can be negotiated if they meet government acquisition requirements. According to at least one source, Charles B. Tomsen's CM: Developing, Marketing, and Delivering Construction Management Services, lump sum-competitive bidding is supposed to be the standard because of its economy. This concept is considered a "superstition" because it rarely produces the lowest price. (29 p 58) Supporters of Tomsen's "superstition" theory would have to stand in a long line.

Unit price

A unit price contract, sometimes referred to as quantity survey or indefinite quantity, provides a fixed price for one particular unit as defined by the contract. This type of contracting is used when an exact quantity is not known at the time of contract execution. Government statutes specify requirements of guaranteed minimum and maximum quantities to protect the contractor who must nail down a specific contract price. This price, like firm-fixed price contracts, can be arrived at by competitive bid or negotiation.

Cost plus

Sometimes a realistic fixed price or exact scope of work cannot be clearly established at the time of contract execution. In these cases, a cost plus contract can be established. The contractor is reimbursed for all of his expenses plus given an established profit, either a set amount or a percentage of the final contract cost. Public owners tend to steer clear of this payment type because they have no guarantee of the final price and the contractor has no incentive to control costs. In the case of his "plus" being based on a percentage of his costs, he actually has an incentive to run up the costs (a concept of which nuclear power plant labor union officials were well aware). These types of contracts are usually negotiated.

Partial guarantee plus fee

The partial guarantee plus fee contract establishes some cost control for the cost plus contract. The cost of certain materials and equipment could be negotiated to a fixed price with the remaining uncertainties placed in a cost plus format. (29 p 52)

Guaranteed Maximum Price (GMP)

Public contracting officials feel much more comfortable if they can convince a contractor to commit to a guaranteed not-to-exceed price. This is the concept of the GMP contract. If the contractor goes over this guaranteed maximum amount, he must take the extra costs out of his pocket. If the contractor is able to complete the project at a cost less than the GMP, the distribution of the balance of funds depends on the terms of the contract. If he completes the project for a cost less than the GMP, the balance may be given to the contractor, retained by the owner, or proportioned between the two. This payment type works well with Design-Build contracts which are awarded based on designs that are not yet complete. (4 p 93)

TRADITIONAL CONSTRUCTION

Advantages

To better understand Design-Build and its advantages and disadvantages, we should first look at traditional construction and other project delivery strategies. While this paper concentrates on Design-Build, it should not lead

anyone to believe that it is the perfect strategy for every project. Traditional construction has been with us since the Renaissance for a specific reason - it has its advantages.

Owners can select from a wide range of designers. Inexperienced owners can have independent design professionals act as their agents in monitoring construction. Bids based on completed designs are usually more accurate. Subcontracting promotes skilled specialists. Because it takes less capital for a subcontractor to stay in business, there are more of them and the competition helps control the contract price.

This method of construction has been greatly standardized by the AIA and endorsed by the Associated General Contractor (AGC). AIA documents A101 and A201 establish standard agreements between owners and contractors, helping to develop well understood and accepted practices. (28 p 440-441) These among other advantages are principle reasons why traditional construction will remain traditional.

Disadvantages

Traditional construction is not without its weaknesses. This type of project delivery generally costs more and takes longer than some of its alternatives. Construction cannot begin until well after the design is complete. The contractor cannot save money by forward purchasing materials or equipment in favorable markets or save time by forward purchasing long leadtime items. (28 p 440) Inflation affects

fixed prices and delays encountered while construction waits for a bureaucratic government action can send costs through the roof.

Plans and specifications developed in traditional construction can often suffer from an ailment known as the "isolated design phase." (29 p 57) A designer sits at a desk and designs an entire project without any input from the builder. This builder, who might be more sensitive to labor and material markets, and more knowledgeable of construction techniques with their respective advantages and disadvantages could contribute valuable information. (28 p 440) There is little communication between the designer and the builder about the design's feasibility. This "isolated design phase" can contribute to design errors and omissions. During construction, changes and errors are costly and often bring work to a halt. (11 p 76)

If the owner is not satisfied with the finished product, finger-pointing between the owner, designer, and builder generally leads to lawsuits. (11 p 76) The builder is responsible for defective construction but remains free from liability for design defects. If a design defect impacts the builder, he must go through the owner to get restitution. Because the owner provides the builder with a complete set of plans and specifications on which the builder bases a bid, the owner provides an implied warranty of the plans and specifications. The owner is liable for any damage caused to

the builder due to the builder's reasonable reliance on the plans or specifications which turn out to have errors or omissions. The owner can then go after the responsible designer for reimbursement.

Designers apparently have a powerful lobby group in Washington, D. C., because current laws often impede the owners from collecting what they have paid out for defective designs. The designer's obligation when his errors or omissions are discovered are typically limited to redesigning the project to conform to any contractual limit of construction cost. The designers are not obligated to bear any amount by which actual costs exceed the established limit.

(30 p 18)

ALTERNATE PROJECT STRATEGIES

Fast Track

Developers actually took the lead in breaking away from the traditional project delivery process. Because they often started a development with as little as one percent of the construction cost in the bank, construction time was crucial. They had to find tenants and interim financing. Traditional construction was just too slow. In the late 1960's and early 1970's when interest rates were very high, developers began experimenting with projects that started construction before the design was one hundred percent complete. This project

strategy is called fast track. (29 p 43) Fast track construction involves a greater risk but offers a chance for greater profits.

Fast track is less concerned with the relationships of the various contractual parties than with the sequencing of the construction. (30 p 8) Most project delivery strategies can be fast-tracked. While a Design-Build project can be fast-tracked, the term fast track construction is not interchangeable with Design-Build construction. In Design-Build, a design may be completely finished before construction begins. (28 p 454)

Turnkey

Another project strategy often confused with Design-Build is turnkey. Turnkey construction could be classified as a type of Design-Build in that a single entity is responsible for both designing and building a project, but turnkey involves much more. In addition, a turnkey contractor agrees to identify and procure the construction site, finance the project, obtain regulatory permits, operate and maintain appropriate facilities for a period to determine if various systems are working properly, and train the owner's maintenance team. (30 p 5)

Single-point (A&E - CM)

Single-point contracting involves an owner contracting with one designer to provide the project design and the construction management (CM) during the project construction.

In this strategy, the owner will contract separately with one or more builders, and the designer/CM acts as the owner's agent, monitoring the construction. Some people are uncomfortable with the idea of combining the roles of designer and CM. They fear the potential of a conflict of interest and question the designer's ability to remain unbiased when design deficiencies are discovered. (17 p 67)

DESIGN-BUILD

Four Design-Build relationships

Design-Build, referred to as "package" jobs in the United Kingdom (28 p 454), is simply another method for delivering projects, one that delivers good results, but must be handled carefully (11 p 79). It combines the two roles of the designer and the builder into one Design-Build entity. A partnership is created between the designer and the builder or a venture is formed in which one hires the other. Together, they bid to handle all the work. (11 p 76)

There are four basic organizational forms in which Design-Build services are provided to an owner. In Type A, the designer serves as the prime contractor and hires a builder as a subcontractor. This type is rare because of the relative sizes of most design firms when compared to construction companies. The more common organization is Type B, when the builder serves as the prime and the designer is the subcontractor of the builder. The designer and builder might enter into a Type C organization by forming a

partnership through a joint venture agreement. In this relationship, designer and builder are equally responsible to the owner. The fourth organizational structure, Type D, is a sole proprietor company which has both design and construction capabilities. As Design-Build grows in popularity with owners, the Type D structure becomes more prevalent in the construction industry.

Design-Build award methods

In Design-Build, the contractor's objective is to satisfy the owner's broad performance specifications rather than adhere rigidly to a detailed set of plans and technical specifications. The contractor has much more freedom but is responsible for his own defects or design deficiencies. (26 p 85) This degree of freedom makes the selection of the contractor one of the most important steps in the Design-Build process.

An owner can choose from several methods of awarding a Design-Build contract. A two-step method is often used when interested Design-Build contractors first submit technical proposals in response to owner-furnished performance specifications. The technical proposals, usually 20 to 30 percent designs, are then evaluated and contractors submitting proposals found acceptable are asked to provide a sealed bid for their design. The lowest bidder is awarded the contract. (30 p 88)

A one-step method may also be used to award a Design-Build contract. Interested contractors submit the same type of technical proposals, based on performance specifications, as in the two-step method, but also include a cost proposal with the original submittal. The owner performs a technical evaluation and scores each proposal. The scores are then factored into the cost proposals and the contractor submitting the package with the best overall score is awarded the contract. With this method, a contractor submitting the lowest bid may lose the project to a contractor with a better technical evaluation.

Variations of Design-Build

In this age of enlightened management, many owners seem to be striving for the proverbial "improved project delivery system." As a result of their efforts, several variations of the Design-Build system have evolved. A portion of a project, such as the mechanical or electrical system, can be completed under a Design-Build contract while the rest of the project is completed under traditional methods. Combinations of Design-Build with single point or fast track project strategies are gaining popularity. (30 p 9) With the increasing sophistication of owners and the public's new willingness to experiment to find more efficient ways to build, it is quite likely that other creative project delivery systems may soon be added to the list of owner construction options.

CHAPTER THREE **ADVANTAGES AND DISADVANTAGES** **OF** **DESIGN-BUILD**

THE OWNER'S POINT OF VIEW

Advantages

In many respects, Design-Build is a win-win-win situation. There are many advantages for the owner with this delivery system, but most do not come at the expense of the designer or builder. There are advantages over traditional construction that are common to the owner, designer, and builder.

One of the advantages most attractive to the owner is the time saved by Design-Build. There are countless examples of this time saving. GSA Administrator, Richard G. Austin noted, "... it was a shock to realize that if we did it ourselves it [took] an average of 7 to 15 years from start to occupancy." Their first Design-Build project, a new 27-story, 600,000-square foot building in Chicago, needed a little more than three years, start to occupancy. Austin admits, "We are still reeling from that concept." (17 p 31) The procurement time for a Navy child development center took just 29 months, inception through occupancy (a remarkable achievement by Navy standards). This project required no increased level of effort from the government, and was completed within budget and without sacrificing quality. (5 p 21)

The ability to fast track is one reason for the speed of Design-Build. Another is the minimal requirement for time consuming, government chain-of-command approvals. Design errors or omissions can often be corrected on the construction site without costly work stoppage.

Besides the obvious time-is-money and earlier project acquisition advantages, public owners benefit from the faster obligation of construction funds. (5 p 21) Public funds for construction are becoming scarce and if not obligated by fiscal deadlines, can be taken away and reappropriated. The anxiety level of public procurement offices definitely peaks as the end of a fiscal period approaches.

Project cost is another major advantage of Design-Build. It is not just the lower contract award amounts that save money for owners. Design-Build contracts have a much better track record of being completed within budget and without costly change orders and legal disputes. Jack Brown of Washington State General Administration Department admits the owner "has to be careful and keep an eye on the process to see the benefits, but ultimately, Design-Build guarantees that you will get a building for that amount of money, with a fighting chance of meeting your budget." (11 p 79) According to Jim Bradburn of Fentres Bradburn, a Design-Build designer, "the process isolates the contractor from the owner and puts a fair degree of restraint on the owner and architect, but that's how you end up with a project that's within budget." (11 p 78)

Initial construction and avoided legal costs are not the only savings an owner can realize with Design-Build. A design benefitting from builder and maintenance crew input, and free from the burden of conforming to outdated specifications can produce a building with a much lower life cycle cost. The initial cost of a building with a 40-year life is only one-seventh of its life cycle cost. (23 p 9) If an improved design can reduce the life cycle cost by even a small percent, the owner's savings can be substantial.

Dealing with one entity, solely responsible for all aspect of the project can also be a great advantage for an owner. The single source of responsibility reduces the project management required from the owner and reduces his liability. There are fewer questions of who is to blame so there are fewer disputes. The owner also enjoys the reduction in paperwork and the single payment source.

Disadvantages

While it is true Design-Build offers the owner many advantages, it is not without its disadvantages. The loss of the designer as an agent, limited opportunities for design reviews, reduced control of the construction process, hidden costs, and lack of Design-Build standardization are the main negative aspects that an owner should consider before deciding to use Design-Build for his project.

In traditional construction the designer can be retained to review construction schedules and verify builder compliance, certify pay requests, establish dates of substantial completion, and inform the owner about any defects and deficiencies in the builder's work. The designer in Design-Build is under no such obligation. (26 p 86) In many Design-Build organizations, the designer is a subcontractor of the builder, making it difficult for him to put the interests of the owner above those of his employer, the builder. (28 p 245) It has been questioned whether a designer with a financial interest in the construction can fairly advise an owner. (30 p 44)

Many times a Design-Build contract will allow the contractor to start building before the design is complete. This limits the extent of public input to the project. At the time of award and commitment of public funds, the design may be little more than a concept. (11 p 78) Feasibility studies and project modeling are reduced to initial design phases only. The owner may not end up with the exact finished product he was expecting.

The cost of Design-Build is generally considered one of its strong points, but the process does have its cost related risks. Complex proposal evaluations and nonstandardized selection processes make it difficult to determine if the true low cost is really obtained. The owner risks obligating a lot of front end money on a design that is still in its early

phases. Bid miscalculations can tempt the contractor to pit project quality against his guaranteed maximum price. Owner-requested changes after a contract is signed is never cost effective for the owner in any type of construction. This can be especially true for Design-Build contracts where once the contract is signed, the owner's control is greatly limited. (21 p 5-9)

A lack of Design-Build standardization is another drawback. Contractors can be reluctant to bid for a project when they are unfamiliar with the criteria used in the selection process, especially when the cost of preparing a Design-Build proposal can be so high. When the owner does receive enough proposals to satisfy public competition statutes, selecting the contractor who is both the lowest bidder and highest qualified can be a very subjective process. (26 p 89)

Every project offers its own unique set of advantages and disadvantages. While an owner might find great success with Design-Build for one construction effort, Design-Build could be inappropriate for another. The owner must take each of these advantages and disadvantages into account before deciding that the Design-Build process is best for his project.

THE DESIGNER'S POINT OF VIEW

Advantages

In Design-Build, many owner advantages are also designer advantages. The time saved from implementing more efficient construction techniques can translate into greater profits and allow the designer to "clear the drawing board" sooner and move on to another project. The contractually-established clear lines of responsibility eliminate many disputes of design liability between the owner and the designer. This allows the designer to concentrate more on solving the problem than on determining who is to blame.

The designer has a more direct control of the quality of the project. He is less restricted by outdated government specifications and is bound by fewer government approvals. Many designers get more job satisfaction from this type of designing. Their expanded role in Design-Build can increase their marketability and expand their firm's client base. (30 p 68)

The opportunity to work directly with the project builder before construction begins is a big advantage to the designer. This designer-builder collaboration produces a better design. Working directly with the builder, with a common interest in the profit of the project, the designer gains valuable field experience, enhancing his designing ability and improving the constructability of his designs. This close working relationship also reduces misunderstanding and legal disputes

between the designer and builder. A field-trained designer offers his firm a keener understanding of the construction industry which translates into advantages for the owner and builder as well. (30 p 70)

The close coordination of designer and builder, working towards a common goal (and a common profit) can produce inventive design solutions when construction problems surface. Roy Williams, the very successful basketball coach of the University of Kansas basketball team, put a sign up in his locker room that said, "It's amazing what can be accomplished when no one cares who gets the credit." This sign seems quite appropriate for a man whose teams have been consistently ranked at the top of collage basketball poles during his five years as a head coach, yet last year no William's-coached Jayhawks were on the starting rosters in the NBA.

The inventive design solutions of Design-Build can be greatly attributed to the designers and builders adapting Coach William's philosophy with one modification: It's amazing what can be accomplished when no one cares who gets the **BLAME**. Less energy is put into determining if the problem was caused by a faulty design or poor construction, and more energy can be applied toward resolving the problem.

Disadvantages

Design-Build has some elements that are advantages to the owner, but in some circumstances, can be disadvantages to the designer. The clearer lines of responsibility was listed as

an advantage for both owner and designer. This clearer line reduces disputes when questions of design liability are involved. Anything that reduces litigation has to be an advantage for everyone but the lawyers. This can however, be considered a disadvantage to the designer who now must take accountability for impacts caused by his errors or omissions.

In traditional construction the designer is shielded by various legal doctrines which indemnify him from any obligation in excess of correcting his errors. (30 p 124) The Betterment Rule leaves the owner responsible for the costs that he would have incurred had the design been originally correct. (30 p 116) The designer has also taken great efforts to insure that what he provides for the owner is a service and not a product. This relieves the designer from strict liabilities, the legal principle which makes the producer of a product liable to third parties who might use the product and be injured because of its deficiency. Recent courts have ruled that the designer gives up these shields when he designs under a Design-Build contract. (21 p 7)

When the designer serves as an agent for the owner, inspecting the builder's work and giving direction, he is protected from litigation from the owner because the designer was "acting in the best interests of the owner." (30 p 39) When an owner awards a construction project, based on a designers design, to a builder through a contract separate from the design contract, it is the owner who is liable to the

builder for the implied warranty of the design. The builder is "not in privity" with the designer and must go through the owner for any damages he was caused due to design discrepancies.

There are disadvantages to the owner that are also disadvantages to the designer. The evolving, sometimes inconsistent selection process, makes many designers reluctant to submit costly proposals. They see it as too much of a gamble. If a designer does win an award, there is still no guarantee that his high front end costs will pay off because the owner sometimes has a "bail out" clause written into the contract, allowing the owner to terminate the contract before construction begins if he is not satisfied with the direction the final design is taking. When this clause is invoked, both the owner and designer have lost valuable time and money.

The AIA and AGC have greatly standardized the traditional construction relationships between owner, designer, and builder. This co-indorsed standardization has not yet happened in Design-Build. The AIA and AGC seem to still have different objectives. The main differences in philosophy center around designer's loyalties and duties toward the owner and to the good of the public. To protect the integrity of their profession, designers still hold themselves to a high standard of ethics which requires them to report any construction deficiencies to the owner. Builders have not yet

bought into this ethical requirement, especially when the designer is working for the builder as a subcontractor. (28 p 441)

In addition to the risks already mentioned, the Design-Build designer assumes other risks he would not normally assume in traditional construction. This increases his liability insurance costs. Some designers are finding it difficult to get the extra liability coverage because of court rulings that these designers are now vendors of products and not providers of a service. (29 p 64) The designer must rely more on the bonding ability of the builder, which is one of the reasons why there are fewer designers serving as prime contractors. (11 p 79)

According to the ACEC fifteen-month study of Design-Build, the builders tend to dominate the Design-Build team because of their bonding capacity and willingness to accept risk. "The designers are generally relegated to lesser, supporting roles." (25 p 10) The status of the Design-Build designers can further decline if they lose their image of upholding the public trust because they now have a financial interest in the construction phase of the project. It is the designers desire to hold on to the confidence of the public that prevents them from compromising their high code of ethics. (30 p 75)

Bidding on Design-Build is an expensive process. Firms can be required to complete as much as 30% of the design. In

one extreme case, a Design-Build firm spent \$500,000 preparing a bid for a \$58 million project for the Army Corp of Engineers (C.O.E.) and did not win the contract award. (11 p 79) The average cost of submitting proposals for Florida Department of Transportation's eleven-project Design-Build program was estimated to be between \$50,000 and \$80,000. (20) Some owners offer an honoraria to unsuccessful bidders to help offset their expenses in preparing the proposals, but the honoraria amount seldom comes close to covering the actual costs. (11 p 79)

Designers entering the Design-Build world face a large start-up cost with the high risk of bidding. Firms working on public contracts are only allowed fixed percentages of the contract for their overhead and profit. Thorough audits of these firms are standard, and the cost of finding new business is not an allowable expense. (11 p 79) The chief executive officer of a prominent Design-Build firm, William G. Thomas of Michael Baker Corp., Beaver, PA, states that because of the high cost of bidding Design-Build, "some firms are changing the way they do business." He adds, "You have to increase your kill ratio - jobs bid to jobs closed." (11 p 79)

Design-Build is becoming more popular, but there are fifteen angry bidders who have been left a little bitter towards the system after their competition for a C.O.E. job. The project, a \$58.4 million, 600,000-square foot Sparkman Center for Missile Excellence building in Huntsville, Alabama.

attracted sixteen serious bidders. The project was the largest ever done by the C.O.E., in a project delivery system in which their selection process is still evolving. In the opinion of at least fifteen angry people, the C.O.E. should have let it evolve a little more before they tried it out on a project of this magnitude.

Several lessons were learned from this project. Administrative inefficiencies and the C.O.E.'s lack of consideration for the bidders contributed to the unsuccessful bidders' resentment. The request for proposal specified the award amount of \$58.4 million and asked the designers to design the most space into the office buildings they could for the price. Specific design completion requirements and evaluation criteria were omitted from the bidding instructions. The C.O.E. considered short-listing the firms but did not because they feared protests from eliminated bidders. The subjectivity in the selection and the C.O.E.'s lack of explanation of why the losers did not win left fifteen firms bitter and wary of bidding future Design-Build jobs.

Together the bidding teams spent in excess of \$4 million pursuing the project with each averaging \$250,000 to \$500,000. There was no compensation to the losers. John Knutison, senior project manager for Harbert Construction Co. of Birmingham, said, "Nobody knows what made the winning proposal win. For all the money we spent, we could at least get that." Ennis Parker, president of Rosser Fabrad Inc. of Atlanta,

adds. "It's just too costly. We've bid two GSA projects and this one and they all have been unsatisfactory experiences. We never say never, but we're certainly soured on the process." (24 p 2-9)

THE BUILDER'S POINT OF VIEW

Advantages

Many of the advantages Design-Build offers to owners, also benefits the builder. The time saved can mean quicker profits. Less government approval points reduces the stop and re-start delays. The more dependable budget allows the builder to better manage his cash flow. Reduced disputes because of clearer lines of responsibility allow the builder to concentrate on what he does best, build.

Designer advantages in Design-Build can also be builder advantages. The minimal owner interference gives the builder greater control of the construction and improves job satisfaction. A faster construction schedule means faster progress payments and a reduced cost of financing. The designer's equitable interest in profit promotes a spirit of cooperation resulting in inventive design solutions. Together, the designer and builder work together towards a common goal, to their mutual benefit.

Changes in a Design-Build contract are much more efficient than in traditional construction. A traditional change order involves:

1. *A change being proposed by a proponent.*
2. *A designer review and recommendation.*
3. *An owner approval.*
4. *A cost of change estimate.*
5. *An owner request for additional public funds.*
6. *An owner request for builder proposal.*
7. *Negotiations.*
8. *Owner requests for additional funds.*
9. *Re-negotiation.*
10. *A formal signed contract modification.*

Each of these elements takes time. Public statutes prevent work being done on the issue of the modification until each of these steps is completed and documented (in triplicate).

A Design-Build change does not require the elaborate hoop-jumping. The designer and builder work together to resolve any problems. Their solution may not even require owner approval. Should owner approval be required, the documentation is much less formal and can often be prepared while the change is being implemented. (30 p 37)

One owner disadvantage that can be an advantage to the builder is the lack of Design-Builders bidding on some public jobs. If fewer competitors are bidding against a builder, he will win more contracts and will not have to "sharpen his pencil to such a fine point." With the growing popularity of Design-Build however, this builder advantage is quickly disappearing.

A disadvantage to the designer can be an advantage to the builder in a Design-Build organization. Builders as prime contractors, with the designer as a subcontractor, can find themselves in a sort of role-reversal. It is not the designer looking over the builder's shoulder during construction. The designer must now be loyal to the builder who signs his checks. Most builders seem to prefer this relationship.

Perhaps the greatest Design-Build advantage enjoyed by the builder is the opportunity to influence designs. The builder has early input on basic design decisions. The designer is able to design to the builder's strengths. (11 p 76) The builder can work with familiar methods, materials, and equipment. The builder's close connection to fluctuating markets can help to develop a more cost efficient design, taking advantage of more cost effective materials and equipment.

According to Dr. Zohar Herbsman, the impact a designer alone can have on the total construction cost is minimal. The difference between a good design and an excellent design can translate to only a few percent ("five percent at the most") of the total construction cost. The impact the builder can have on the same cost can be considerably greater. A more efficient building technique can reduce the overall construction cost by as much as fifty percent. (16)

Working closely with the designer early in the design phase can also increase the builder's understanding of some of

the issues that concern the designer. With this increased understanding, the builder is more likely to follow specific design criteria in the field and offer more realistic solutions when conflicts arise. (11 p 79) This understanding of each others strengths and interests reduces the number of designer-builder disputes and generally improves the overall quality of the design and the finished project.

Disadvantages

Design-Build is not without its disadvantages for the builder. Some advantages for the owner turn out to be disadvantages for the builder. Clearer lines of responsibility can mean fewer disputes and fewer dollars going into the pockets of the lawyers. That is the good news. The bad news from the builders perspective is that there are fewer disputes, because the builder must take more of the blame. The builder must share the designer's new found implied warranty of design. The Design-Build team share a joint responsibility for the correctness and constructability of the plans and specifications.

Owner disadvantages can also be builder disadvantages. The lack of a standardization of Design-Build contracting procedure, accepted by owners, designers, and builders, works to everyone's disadvantage. A good working relationship between designer and builder can be strained by the difference in philosophies between the AIA and AGC on a designer's obligation to the owner and to the public. The AIA's code of

ethics obligates the designer to act in the best interest of public health and safety. (11 p 79) In the AGC philosophy, the designer should act in the best interest of the designer-builder team. It would be nice if the two interests could be one in the same.

The builder, like his partner the designer, shares additional disadvantages with the owner. Together, they furnish front end costs of design for a contract which a dissatisfied owner could terminate. Their credibility within public organizations can be damaged if the finished project does not live up to the expectations of the owner. This is a disadvantage most strongly realized during the selection process of their next project.

The builder must share several other disadvantages with the designer. The Design-Build team's unfamiliarity with an evolving selection process inhibits their chances of winning a contract even if they may offer the best proposal. When the builder joins forces with the designer, he also buys into the responsibility for acts and omissions of the design. The Design-Build may require the builder to purchase insurance to cover property damage due to a defective design. (21 p 8) The builder practicing Design-Build construction can expect his bonding costs to increase by 50% for the same amount of coverage. (11 p 76)

A builder can run into difficulty trying to find subcontractors to bid on a project that is not yet completely

designed. Subcontractors like to have full documentation before committing to a bid. With Design-Build, they get concepts. It makes them reluctant to bid if they do not know what will surround their work and how it will be affected. (11 p 76)

As Design-Build continues to gain wide acceptance, many of the disadvantages for the owner, designer, and builder will diminish. Some disadvantages will always remain. Design-Build is not the perfect delivery system for every project. The owners must carefully consider each of the advantages and disadvantages as they pertain to their specific project. More owners are deciding that the advantages outweigh the disadvantages and turn to Design-Build for their construction needs. The successes realized by these pioneers are convincing other public owners to follow suit. As the demand for Design-Build grows, more Design-Build organizations will naturally develop to fill this demand.

CHAPTER FOUR

HISTORY OF DESIGN-BUILD

PAST USE OF DESIGN-BUILD CONTRACTS

Development in industrial markets

During the early 1980's, financial crunches forced many industries to downsize their engineering staffs. They now had to contract for design work they were once able to accomplish in-house. In industry it became quite common to combine a contract to design a product with a contract to build that product. Industry began to adapt this contracting strategy to meet their construction requirements. The success of these construction projects contributed to the spread of Design-Build to the rest of the construction industry.

According to a Bureau of Building Marketing Research, by 1983 approximately 14 percent of all construction in the United States employed Design-Build. (30 p 83) Interestingly enough, in an August 1991 Engineering News Review article, Steven Setzer wrote that currently "Design-Build accounts for less than five percent of all construction in the United States." (25 p 9) Both sources assert that Design-Build is on the rise.

This apparent disparity in numbers of Design-Build construction efforts typifies the inconsistency of available information and lack of standardization of the whole Design-Build industry. The name "Design-Build" is not even

consistently used. Bidders (and owners) are confused by the erratic award strategies and degree of owner involvement. There is, however, one common thread in all the data on the subject. The use of Design-Build contracting is on the rise and will be with us for a long time.

Department of Defense (DOD) program for Design-Build

In the DOD, construction procurement offices sanctioned a two-step procedure for awarding a Design-Build contract. A Design-Build team would submit a technical proposal conforming to government-furnished performance specifications. The submittals would be evaluated according to a pre-established criteria and teams whose designs were found acceptable were asked to submit a sealed bid to construct their design. This selection process conformed to statutory requirements of the Brooks Act for selecting designers based on merit, and met the competitive bidding requirements of construction contracts. It was, however, administratively burdensome and time consuming. (30 p 88)

In 1986, Congress authorized the Army, Navy, and Air Force to use one-step, fixed-price Design-Build contracts on three projects per year until October 1, 1990. The government would provide to each bidder: contractual and technical requirements, floor plan layouts, site plans, site data, existing conditions, and detailed performance specifications. The project would be awarded to the most qualified bidder based on predetermined evaluation criteria. A technical score

would be factored into the bid amount with the highest score determining the "most qualified bidder." Future Congressional authorization of the one-step Design-Build process was to depend on the success of these experimental projects. (30 p 88) In July 1992, Congress authorized unlimited DOD use of one-step Design-Build contracting. (11 p 79)

Early municipal and state use of Design-Build

In the late 1960's and early 1970's communities in Indiana and Colorado began awarding Design-Build contracts for construction of schools. News of the success of these programs spread and soon many other schools followed suit. Portland, Oregon found great success using a Design-Build national competition to award a Public Services Building. The project won several awards in professional design journals. (30 p 90) The state of Washington became a leader in using Design-Build for public projects. Their list of Design-Build accomplishments includes urban parking garages, libraries and a state prison. Cost savings over traditional construction methods for these projects was estimated to be between 15 to 25 percent. (11 p 78)

Florida State Program

The Florida Department of Transportation (FDOT) had a project delivery program requiring five to seven years from "concept to concrete." When they were told to cut the delivery time in half, they turned to Design-Build. The State Legislature authorized a \$50 million test program in 1987 for

eleven Design-Build projects from these categories: bridges, new or rebuilt highways, resurfacing, and parking garages. (20 p 21)

The test program was considered a great success, saving FDOT 10 to 48 percent in acquisition time with little additional cost to the department. One project, the \$12 million, mile long bridge over Ochlockonee Bay received much national attention. (11 p 76) Since adopting their Design-Build program, FDOT has reduced their highway resurfacing project delivery time from 310 days to an average of 93 days. (11 p 78) FDOT has decided, that for them, Design-Build is definitely the way to go.

ROLE OF PROFESSIONAL ORGANIZATIONS ON DESIGN-BUILD

American Consulting Engineers Council (ACEC)

To investigate Design-Build's rapid growth in popularity, ACEC formed a task force headed by Raymond Messer. They realized Design-Build's potential disadvantages and impacts and took steps to protect the integrity of their profession. ACEC was convinced from their study that Design-Build was not just a passing fad, and they were going to have to embrace the ethical issues. Messer noted, "It is a hot issue. Design-Build is being looked at favorably by [owners] all over the country." Messer concluded, "Rather than fight it, we need to hold [Design-Build] firms using it to a professional level of design practice." (25 p 9)

National Society of Professional Engineers (NSPE)

The NSPE did not initially embrace the idea of Design-Build with open arms. A strict code of ethics prohibited members from "bidding their services." They drew support for this ethical stance from the Brooks Act which required public design services to be award based on technical merit and not competitive bidding. NSPE's hard line position greatly limited its members from participating in most forms of Design-Build. Fortunately, from the Design-Build movement's point of view, there was another law known as the Sherman Anti-Trust Act.

In the late 1970's, the United States Supreme Court ruled that NSPE's prevention of its members from bidding their services was a violation of the anti-trust provisions of the Sherman Act. (30 p 156) NSPE rewrote their code of ethics and designers' reluctance to take part in Design-Build contracts was reduced. In 1977, a standard form NSPE-2802-1 was published to define an agreement between the owner and the engineer-contractor for design and construction services. (30 p 171)

American Institute of Architects (AIA)

The AIA, well known for their AIA Documents which helped standardize traditional construction, has also published AIA Documents pertaining to Design-Build. Each of this family of three interrelated Design-Build documents contains a set of two agreements: a Part 1 agreement governing preliminary

design and pre-construction matters, and a Part 2 agreement governing final design and construction. (30 p 162) The three documents are:

AIA Document A191. Standard Form of Agreements Between Owner and Design/Builder (1985 Edition)

AIA Document A491. Standard Form of Agreements Between Design/Builder and Contractor (1985 Edition)

AIA Document B901. Standard Form of Agreements Between Design/Builder and Architect (1985 Edition)

Associated General Contractors (AGC)

AGC, the largest representative organization of contractors in the United States, endorses the AIA Documents used in traditional construction, but because of ideological differences, decided to publish their own Design-Build standard forms. These seven documents are listed below: (30 p 176)

AGC Document No. 400. Preliminary Design-Build Agreement (1980 Edition)

AGC Document No. 410. Standard Form of Design-Build Agreement and General Conditions Between Owner and Contractor (1982 Edition)

AGC Document No. 415. Standard Form of Design-Build Agreement and General Conditions Between Owner and Contractor (1986 Edition)

AGC Document No. 420. Standard Form of Agreement Between Contractor and Architect (1985 Edition)

AGC Document No. 430. Conditions Between Contractor and Subcontractor for Design-Build (1982 Edition)

AGC Document No. 450. Standard Design-Build Subcontract Agreement with Subcontractor Not Providing Design (1983 Edition)

AGC Document No. 450-1. Standard Design-Build Subcontract Agreement with Subcontractor Providing Design (1983 Edition)

FOUR SUCCESS STORIES

Olympia Natural Resources Building

The state of Washington's Department of Agriculture, Fisheries and Natural Resources recently completed a \$73 million, 240,000-square foot office building in Olympia using a Design-Build contract. The completed project included a 410,000-square foot underground parking area, built-in furniture, good indoor air quality, plus a maximum distance of 60 feet to a window from anywhere in the building.

According to program director Jack Brown, the project was completed a year earlier and for \$5 million less than a comparable Design-Bid-Build project. Brown boasts, "I believe we've gotten more for our money, better architecture, and delivery a year earlier. We've been getting complaints that this building looks too nice." (11 p 77)

Ochlockonee Bay Bridge

The Ochlockonee Bay Bridge project, showcase of FDOT's Design-Build test program, posed some unique difficulties for potential bidders. The 5,854 feet of bridge spanned 1,800

feet of environmentally sensitive shallow tidal area. This eliminated the possibility of placing fill for construction and later removing it. These areas, 1,000 feet on one end and 800 feet on the other, were too shallow for construction barges. Because this was a Design-Build contract, the designer, LoBuono, Armstrong & Associates of Tallahassee, FL was able to design to the strengths of its prime contractor, Misener Marine Construction Inc., of Tampa.

Misener, a strong pile driving contractor, had a temporary working platform from a previously completed job. Working as a team, designer and builder developed a design taking advantage of the platform and Mosemer's pile driving capabilities. The bridge was built with 78 foot spans, six span continuous units erected over 77 bents. The advantage of continuous spans allowed one bent in six to carry the majority of the longitudinal load. It also reduced the number of expansion joints. All piles could be driven plumb except four of the five on every sixth bent. This combined with the replacement of anchor bolts and soleplate with cast-in-place concrete saved time, effort, and money.

The completed bridge was delivered a year earlier than expected, and within budget. The environmental impact was minimal. The reduced number of expansion joints not only saved construction costs, but will also reduce the long-term life cycle maintenance costs. (18 p 40)

Harold Washington Library Center

The \$145 million Harold Washington Library Center was completed in Chicago in October, 1991. This Design-Build project was 757,000 square feet and ten stories high. In the words of the City of Chicago's Library Commissioner John B. Duff, this finished center "vindicates city officials who were criticized for choosing a Design-Build approach for the construction." Everyone was happy with the outcome of this project.

Every requirement of the city's performance specifications was met or exceeded. An example of the inventive design developed by the Joint Venture of Schall-Mortenson and Sebus Construction, was the replacement of the initial design's transfer girder system with a monolithic concrete wall. According to project manager David Crowell, this new approach was less expensive, easier to engineer, quicker to install and it provided an excellent backup system for the applied granite.

They were able to save so much from the innovative construction-oriented design, the interior features were upgraded "considerably over the minimum requirements." Ornamental railing, elaborate lighting fixtures, marble wall cladding and spacious reading carrels were added. Duff remarks, "Change orders were kept to a minimum, it opened when we announced and it is a magnificent building." Equally as important, the project was completed within budget. (9 p 32)

Navy Child Development Center

The Naval Air Station, Brunswick, Maine found Design-Build to be a viable alternative with the completion of their new Child Development Center. Using a system they called Newport Design Build (NBD), a performance specification based Invitation for Bid (IFB) was issued to obtain a lump sum competitive award. The administration of this project was divided into three stages. In the first stage, performance specifications and thirty percent drawings were developed in-house to define the IFB. After award of the Design-Build contract, stage two, the completion of the design, was accomplished by the award winner. The construction of the government-approved design was completed in stage three.

The stage one IFB package was developed in sufficient detail to be enforceable, but not so specific as to eliminate the contractor's flexibility of choice. It addressed all potential problems and products associated with the special use facility but allowed the contractor to use familiar methods and material. Included were a schematic floor plan, partial door schedule, complete site drawing, performance specifications for major building systems, and prescriptive specifications for site work items. The proper development of performance specifications was the key to the success of this Design-Build project. Performance requirements for safety, fire protection and aesthetics were written in to guarantee compatibility with Navy practices and customer needs.

During stage two, the contractor had to meet a deadline of 105 days for a Conformance Review Submission. The contractor was also given progress review at day 45. These reviews were "strictly checks," not technical reviews. If the government had determined the design satisfied the performance specification, aesthetic, and functional requirements, the contractor would have been paid the predetermined price for design and allowed to begin stage three. The design, however, needed some minor revisions and was returned for resubmittal.

The contract provided the government a "bail out" option at this point. If the government had not been happy with the direction the design was headed, the contractor could have been paid 2.5 percent of the total contract amount and the contract would have been terminated. Had the design still not been in compliance with the performance specifications after an additional 45 days following their return for resubmission, the government had an option of terminating the contract with no payment owed to the contractor. Fortunately, the initial deficiencies were quickly corrected, neither of these options were used, and the project was completed.

The facility is now occupied and functioning well. The contractor's receptiveness to this NBD contracting strategy and exceptional conscientiousness greatly contributed to the Navy receiving a top quality facility ahead of schedule. Other elements the Navy considered key were the careful development of the IFB package and the design approval

requirement before the contractor was able to move on to the construction stage. This three-stage system offered the Navy many of the advantages of Design-Build contraction, yet still left it comfortably in control of the outcome. (5 p 21-24)

FUTURE PUBLIC DESIGN-BUILD CONSTRUCTION PROJECTS

Design-Build contractors

According to Engineering News Review (ENR) figures, Design-Build work being done among the 400 top domestic contractors doubled between 1987 and 1990. (25 p 9) In 1990, the top fifty U. S. contractors did \$57.3 billion worth of Design-Build construction, foreign and domestic. (15 p 68) A large contributor to this astonishing growth is the amount of Design-Build work now being accomplished by U. S. contractors overseas. According to ENR figures of the top 200 U.S. international design firms' foreign billings, Design-Build firms accounted for 42 percent of the \$7.4 billion posted. (22 p 46) The heavy representation of Design-Build firms in ENR's list of top twenty designers presents a promising future for Design-Build contracting. (3 p 29)

General Services Administration

The recent extensive construction effort being undertaken by GSA has been compared to the awakening of a quiet giant. GSA is in the middle of a \$3 billion building effort. Despite Federal budget pressure, GSA won \$1.5 billion in new construction appropriation in 1991 plus \$790 million for repairs and alterations. This is the "largest building

program in the history of Federal Government." It includes dozens of new offices, courthouses, and border stations from "Boston to Skagway, Alaska." All this comes at a time when Design-Build is becoming the project delivery system of choice for GSA. (17 p 31)

Department of Defense

Design-Build contracting continues to gain strength with the military. The Navy is in the middle of a \$1.75 billion per year, 300-project Design-Build program. (14 p 12) Current Design-Build projects with the Air Force include a \$19 billion office building at Scott Air Force Base in Illinois and an \$800,000 Munitions Equipment Storage Facility at Dyess Air Force Base in Texas. The Army is completing an \$18 million medical clinic in Albuquerque and has plans for a physical fitness center, and several commissaries, fire stations, warehouses and administrative buildings. (30 p 89)

Other Federal departments

Most other Federal departments with construction obligations are also turning to Design-Build. The State Department just completed a \$50 million embassy in San'a, the capital of the Yemen Arab Republic and they plan to do several other Design-build projects with their \$70 million per year construction budget. (30 p 88) The Postal Service feels they have the natural set-up for Design-Build since each postal facility contains the same five areas. Much of their \$60 million per year will be used on these type of Design-Build

projects. (14 p 12) The Forest Service will use a \$650,000 Design-Build contract for the 6.4 mile Owl Creek Road Project in Colorado. The Veterans Administration is beginning to use Design-Build on selected office buildings and warehouse projects with their \$10 million per year construction budget. (30 p 89)

In the past 25 years, Design-Build has made an incredible comeback. Even those who were initially pessimistic about this type of project delivery system are now being won over by the well documented success Design-Build is finding in every facet of public construction. In a period of time when construction dollars are becoming scarce, Design-Build continues to grow.

CHAPTER FIVE

SELECTION PROCESS

PREPARING THE BID PACKAGE

Public statutes

The selection of project designers and builders has become quite standardized in traditional construction. Well established procedures and guidelines are generally used in the private sector. In the public sector, very specific statutory requirements govern the selection of designers and builders.

Public laws specifically exclude design procurement from competitive bidding requirements. The fears of not getting the lowest price for a design are outweighed by other more important public concerns. The public sector building projects involve public health and safety considerations. Procurement officials are responsible to taxpayers for providing the best designed project. A competitive bid requires a very complete and specific set of specifications, but at the beginning of a design contract, the exact project scope is not yet clearly defined. Intangibles such as technical knowledge, esthetics judgement, and decision-making skills cannot be evaluated on the basis of a competitive bid.

(23 p 8)

While various public agencies may be guided by slightly different design procurement requirements, each has standard

steps that must be followed to insure the selection process is carried out fairly and that all interested and qualified designers receive consideration for agency work. A public announcement gives designers an opportunity to express their interest in competing for the design award. Applications are submitted on standardized forms such as GSA's SF 254 and SF 255. Qualified procurement officials, usually professional engineers or registered architects, then evaluate the submittals based on preestablished criteria.

The designers are scored in areas of relevant experience and expertise, previous performance, experience of the consultant team, availability of key personnel, and the projected work loads affecting the performance on this design. Usually a short-listed group of designers are interviewed and the finalist are ranked. The number one ranked designer is then invited to negotiate a contract to provide the desired public design. (23 p 4)

Interestingly, these same public concerns seem to get thrown out the window in favor of the lowest cost when it comes time to build the project. Public bidding statutes traditionally require competitive bidding for construction awards. In all of my research, I have not been able to find a truly passable justification for this difference in public procurement philosophy. Apparently designers have a better lobbyist group than the builders.

Design-Build, because it combines designers who are not supposed to bid and builders who are required to bid, initially provided public procurement officials with some interesting dilemmas. In recent years, however, Federal, state and local governments have become more flexible in their approach to Design-Build contracting. With the success the private sector was experiencing with this project delivery system, the public adoption of Design-Build became a decision of economics. (30 p 87)

Performance specifications

Putting together an effective Design-Build bid package requires an intense effort, but allows an owner to spell out all the details in advance and control the project price. Many owner decision points are required during the execution of a Design-Build project. The following list describes some of the major actions the owner should take: (28 p 153)

Provide structural loads for owner-furnished equipment.

Furnish electrical and mechanical loads.

Resolve allowance items.

Select finish schedule.

Provide floor plan layouts.

Select paint type and colors for all products.

Approve designs for special signage and graphics.

Sign off on design plans.

Participate in contractor-provided instructions of building systems.

Conduct final acceptance inspections and close out the contract.

Owners must offer a specific list of needs that a Design-Build project must satisfy. This is typically accomplished through a performance specification. It should include a reference number and date, award procedures and evaluation criteria, a clear statement of work, a detailed set of design parameters, and specific equipment required. (13 p 1041) The performance specification should identify the project goals, ideas for future expansion, and a realistic budget range. (4 p 251) To insure they are providing a complete specification, owners can follow a check list similar to the one listed below. (13 p 1041)

Administrative elements:

Required completion date.

Submission requirement of the proposed schedule.

Terms of payment.

Guarantee requirements.

The percent of overhead and profit that will be charged for any extra work.

The owner's retainage policy.

The interest the owner will pay for late payments.

The liquidated damages to be collected by the owner for late work.

The owner approval points.

Technical elements:

Pre-design site data.

Topographic and soil boring information.

Regulatory permit procurement responsibility.

Specific design performance criteria.

The performance specifications should provide clear concise information and be as detailed as the elements the owner expects to receive. If owners do not specifically say what they want in these specifications, they must be willing to accept what they get.

EVALUATION

Lack of standardization

As mentioned earlier, a major disadvantage with Design-Build today is the lack of standardization in the selection process. Contractors are reluctant to invest the time and money to bid a project when they perceive the awardee being subjectively determined based on some mysterious evaluation criteria. If they lose a bid, they need to know why so they

can do better next time. The public Design-Build proposal evaluation program is still in its infancy stage, but it is "growing up." (24 p 8)

Pre-Qualifications

"Short-listing" is one action an owner could take to reduce the expense of the Design-Build bidding process. In many instances the owner can narrow the field of potentially successful bidders for their project to three or four from bidder application files. This can be done before expensive futile design work is undertaken by Design-Build firms with little chance of ever winning out in the proposal evaluation phase. This procedure allows owners to direct bidders toward lower risk projects and reduces the overall cost of procuring Design-Build work.

Of the thirteen Design-Build contractors expressing interest in the Ochlockonee Bay Bridge project, three were short listed. That project's selection team understood this concept. (20 p 21) As fifteen angry bidders will not hesitate to admit, the selection team of the Center for Missile Excellence project did not. (24 p 9)

After the number of bidders to be allowed to continue with the bidding process has been determined, these bidders should be invited for an interview with the selection team. They should be given as much information as possible about the project scope, size and makeup of the interviewing panel, and the division of time between the formal presentation and the

question and answer period. To avoid the appearance of a biased selection, the public owner has to be careful not to allow interviewing opportunities to one bidder that are not offered to all remaining bidders. (23 p 5)

Technical evaluation

Many Design-Build bid procedures involve a two-envelope system. One "envelope" contains the actual bid portion of the proposal, the amount the owner will have to pay that bidder to furnish the finished project. It does not take much evaluation skill to determine the best bid of this portion of the proposal. The difficulty is in comparing the "other envelopes" which contain the technical portion of the proposal. Many different versions of making this comparison of non-monetary proposal elements have been tried. Some have been well received by the Design-Build community. Others have not been.

One version which was well thought of was the technical evaluation for the Ochlockonee Bay Bridge adopted by the Florida DOT. (20 p 21) They evaluated each proposal in three basic categories. A proposal could receive a maximum of 50 points for its technical score, 30 points for its management score, and 20 points for its total project schedule score. The proposal's total score was divided into its price bid. The higher the score, the greater the overall "theoretical merit bid" would be reduced.

The Design-Build team submitting the lowest merit bid was awarded the contract and paid the amount of their bid. (In this case it was actually the second low bid, because the low bid was unable to acquire sufficient bonding.) Four of the eleven projects FDOT awarded using this procedure were to contractors who did not submit the lowest bid. This simple procedure combined the best of the low bid philosophy and the merit selection philosophy.

Another interesting evaluation procedure was the size-as-a-bid selection. In this example, the bidders were all told the dollar amount for which the contract would be awarded so there was no need to submit the first envelope. They were given basic performance criteria and told to furnish the "most building for the buck." (11 p 78) While this type of selection is looked upon favorably by many owners, the subjectivity of the "most building" will probably keep it from becoming a standard procedure.

Dealing with high bidding costs

Although some bidders may find it hard to accept, owners understand the high cost of bidding Design-Build work is bad for the industry. It reduces competition as contractors become more reluctant to bid. Owners end up paying more for the contracts they award because they are paying for overhead from their contractor's previously unsuccessful bids. Several philosophies are being discussed that could help to reduce the cost of bidding.

Standardizing the short list procedure is one such philosophy. Another is the concept of honoraria, the payment for the efforts of the unsuccessful bidders. Some experiments of this concept have been attempted, but bidders claim the honoraria amount does not begin to cover the true cost of preparing a Design-Build proposal. Many owners do not support a concept they consider "paying someone to fail." A more standardized controlled testing of this practice will have to be made before any real evaluation of its success can be made.

LEGAL ISSUES

Role of lawyers

As the California Bar recently pointed out, there are too many people who take great pleasure in "lawyer-bashing." Of course I am one of these people. Years of defending the government against ridiculous lawyer-induced construction claims may have slightly tarnished my objectivity when considering the lawyer's contribution to the construction industry. Putting my personal feelings aside, I did take a serious look at legal issues of construction and their influence on Design-Build.

Nowhere has there been a more active interpretation of contract provisions than in the construction field. The courts are reluctant to allow one or two harsh contractual clauses to cause a wronged party to forfeit thousands of dollars. (16 p 472) This seems only just. This justice.

however, has come at a high price. It is estimated that litigation costs on a national average has increased the actual cost of building by about twenty percent. (19 p 6)

According to an Albert Knott's article appearing in Civil Engineering (19 p 6), there are three phases in modern construction: design, build, and sue. "Our nation is staggering under the weight of litigation." Knott goes on to add, "Despite efforts of state legislators and professional groups such as ASCE, ACEC and NSPE, modern design and construction is apparently, and will remain - intensely adversarial. Litigation is guaranteed."

Knott contends that it is not the fault of lawyers that our nation has become so litigious (although there are those who dispute his theory). "Lawyers are the result of our system, not the cause of it." The article suggests that part of the blame must rest with the owners expectations of mistake-free construction. "Human nature is to expect perfection and ask for the least price." Knott correctly points out that the least cost does not appear to come from low bids. He humorously defines the low bidder as "that poor fellow who has the least amount of money to spend on quality and the least amount of money left over when the dust settles to pay for his mistakes."

One of the great attractions of the Design-Build approach is its tendency to minimize the number of legal disputes. This is not to say the Design-Build industry is free from

legal issues. Anytime there is a contract, there is the chance of a contract dispute. When Design-Build issues do arise, the legal conclusions can bring up more questions than they answer. There is a lack of case history to support the legal issues in this recently revitalized project delivery system. The law often lags behind emerging world philosophies. (28 p 441) As the courts resolve more disputes, the fuzzy lines of Design-Build law will begin to clear.

Implied warranty of design

Historically, contract participants can be placed into two general categories, a vendor or an agent. The vendor sells a product for a price. The buyer cares about the product and price more than the vendor's qualifications. The agent acts in the interest of the party paying his fee. In the case of the agent, the party being represented cares about his agent's experience, qualifications and integrity. (29 p 50)

With construction contracts, designers and builders placed great efforts in being classified as agents providing a design or construction service, instead of providing a product. The reason for their efforts is liability. Strict liability laws apply to vendors, making them responsible for their products, even to parties with whom they are not bonded by contract. (30 p 111) The construction industry was already taking a big enough slice of the legal pie. It did not need to worry about being sued by some third party years after the construction contract was closed and filed.

The AIA and NSPE cautiously word their publications to reflect their status as providers of services. In NSPE's standard form for Design-Build documentation, NSPE 2802-1 is described as a "standard form of agreement between owner and engineer-contractor for design and contract *SERVICES*". (30 p 171) In an AIA guide for local, state, and Federal officials, "Selecting Architects for Public Projects," one of the public agencies primary objectives should be "to see that taxpayers get the best available design *SERVICES* for their money." (23 p 4)

This concept of service has also helped the designer avoid liability for design errors and omissions. Because designers "serve" as agents for the owner in traditional construction, it is the owner who holds the implied warranty to the builder for the design. The owner warrants that the design being furnished is free from deficiencies and the owner is held accountable to the builder for injuries the builder may suffer from correctly relying on a design fault. Courts are currently ruling that the designers lose such a shield when they choose to participate in Design-Build.

Ethics

The AIA defends the stance of professional design organizations in restricting its members from participating in competitive bidding. "Architects do not oppose competition. The architectural profession is extremely competitive. To serve the needs of clients, [architects] must compete on the

basis of their skills, experience and ability to perform the services required - not on the illusory 'economy' that a low-bid may seem to provide." (23 p 9)

Until the late 1970's, this stance also received support from state statutes. It was then anti-trust actions were filed by the U.S. Department of Justice against several professional associations. (30 p 45) The case went to the U.S. Supreme Court. In the decision of *National Society of Professional Engineers v. U.S.*, 435 U.S. 679, 1978, the Supreme Court determined the NSPE's prohibition against competitive bidding violated the anti-trust provisions of the Sherman Act. In the same year, the AIA suspended its prohibition on its members' participation as a contractor on construction projects. (30 p 156)

Professional design organizations realized this Supreme Court decision would open the way for its members to take part in Design-Build. To maintain the integrity of their profession and keep the faith of the public, these organizations revised their codes of ethics to address potential conflicts of interest. The current edition of the NSPE Code of Ethics (January 1987) states: (30 p 156)

Engineers shall disclose all known or potential conflicts of interest to their employers or clients by promptly informing them of any business association, interest, or other circumstance which could influence or appear to influence their judgment or the quality of their services.

The current AIA Ethical Standard 3.2 Code of Ethics and Professional Conduct (1987) states: (30 p 156)

Conflicts of Interest: Members should disclose to clients or owners significant circumstances that could be construed as conflicts of interest and should ensure that such conflicts do not compromise those interests.

Designers wishing to participate in Design-Build construction faced other obstacles. New York State feared that the designer's partnership with the builder "might be a conflict of interest [leading to] rampant cutting of corners and the delivery of buildings that do not satisfy the owner." The state also expressed concern of designer's "unlawful delegation of design responsibility" to builders. In a memo signed by Henry Fernandez, the head of the Department of Education in New York, designers engaging in delegating design to unlicensed firms could be charged with professional misconduct of the commission of a Class E felony. (11 p 78) This New York position seemed to say it was illegal for any contractor to retain a design professional as a subcontractor.

In New York, it was the state's opposition to builders acting as designers that restricted the growth of Design-Build. In Texas, it was the state's opposition to designers acting as builders. Texas State Law specifically requires all state construction material and labor to be provided by competitive bidding. It also requires professional services to be subject to the process of qualifications and restricts

designers from bidding their services. As late as 1989, the Texas Attorney General ruled that Design-Build could not be used on public projects. (11 p 79)

No explanation was offered for the Texas Attorney General's apparent disregard of the 1978 Supreme Court ruling. None of my research indicated any change in the Texas opposition to Design-Build. As Design-Build use grows everywhere else, there is no doubt that the Texas position will be challenged. The U.S. Postal Service, despite the New York resistance to the system, awarded a Design-Build contract for a new \$172 million General Mail Facility in New York City on July of 1992. (11 p 78) This and the mounting legal challenges from New York designers will go a long way toward convincing the state of New York to join the other 48 states and accept the benefits of doing Design-Build construction.

CHAPTER SIX

CONCLUSION

SUMMARY OF ADVANTAGES

Factors affecting advantages

In our age of ever-expanding technology, our choices in every facet of life continue to increase. The construction industry is no exception. The sophisticated owner no longer has to be limited to the traditional project delivery system of contracting with a designer for a design, and then forming a separate contract with a builder to have the designed project constructed. The owners choices are now numerous. One system being chosen by an increasing number of owners, both private and public, is Design-Build.

The specific advantages offered to an owner choosing to use Design-Build as a project delivery system can be affected by many influences. These may include the sophistication of the owner's ability to control the design and construction process, the type of project, and the skill of the Design-Build contractor. (21 p 4) The location of the project, skill and availability of the local construction force, contemplated number of potential changes, factors pertinent to the economic climate, and the availability of competition are additional factors an owner must strongly consider before deciding on any construction strategy. (3 p 30)

Specific advantages

The appropriate selection of Design-Build for a construction project can be a win-win-win situation. The owner, designer, and builder can each benefit from the advantages of this system. The three major advantages enjoyed by each are the time saved, the cost saved, and the disputes reduced when dealing with a situation in which the design and the building are both done by one entity.

Owners can end up getting a better product, faster, and within budget, luxuries not commonly found with traditional construction. Designers have more control of the whole process, receive a greater job satisfaction, and benefit from working directly with the builder in the field. Builders can directly influence the design of the project, work with a design that has been built around their strengths, and gain a better understanding of the design requirements. On the right project, Design-Build can be good for everyone.

Successful types of public Design-Build projects

There seems to be several opinions as to which public projects are best for Design-Build. One source states it is best used when projects are too small to retain an engineering consultant, too rushed for traditional methods, or too critical for the low bidder. (13 p 10) Most public Design-Build projects have been simple, repetitive type office buildings, warehouses, and uncomplicated residential construction. (28 p 454)

While many content that Design-Build should only be used for the simplest projects, there are others who claim that certain complex construction efforts should only be done by Design-Build. Some buildings themselves are an integral part of the technology of the operation. Nuclear power plants, hydroelectric generating stations, sewer treatment plants, higher automated assembly lines and food processing facilities are considered excellent candidates for Design-Build contracts. (30 p 90)

SUMMARY OF DISADVANTAGES

Factors affecting disadvantages

Design-Build is not without its disadvantages. The disadvantages in using Design-Build also depend on the individual owner, the type of project and the skill of the Design-build contractor. There may be some disadvantages that we have not yet discovered. The full scale modern use of this project delivery system is still in its infancy. According to Elbert Ray, president of Proctor Davis Ray Engineers Inc. of Lexington, Kentucky, Design-Build is very popular now, but "the pendulum will probably swing back as the negatives reveal themselves. The owners won't see the negatives until they've used the building for four or five years." (25 p 9)

Specific disadvantages

Some owners remain skeptical of Design-Build. One owner asks, "After all, aren't we putting the proverbial fox in

charge of the hen house by awarding a low bid contract where the contractor's design will be heavily influenced by the bid amount?" (5 p 21) Other owners are just more comfortable when they have a tighter "hands-on" control of the entire process. The ability of designers to handle the new ethical issues and added accountability for their designs have some professional still a bit wary. Furthermore, many contractors distrust the inconsistent selection process. Some contractors believe that Design-Build favors the very big or the very small and fear its growth in the public market will hurt the middle sized contractors. (11 p 78)

Public projects that should avoid Design-Build

Opinions vary on the best projects for Design-Build. There are also many opinions on which projects should not be used. The more complex and original projects are seldom found using Design-Build. The public sector does not like to get into procurement procedures that are subject to interpretation.

Few public works projects are awarded to Design-Build contractors. Chuck Pennoni, the president of ASCE and head of Pennoni & Associates, believes that "In public works projects, the owner's interests are better served with an engineer doing a detailed design and going through the bidding process." (11 p 77) As the process becomes more standardized and sophisticated, however, this reluctance to use Design-Build for public works type projects will most likely decline.

RECOMMENDATION

Design-Build is a viable option for public construction projects and can be used to everyone's benefit. Many of the disadvantages still associated with this system stem from its infancy and lack of standardization. A few poorly planned "experiments" have tainted the opinions of its victims. Most people however, have nothing but good things to say about Design-Build. It can save time, money, and litigation. Most importantly, we do not have to give up project quality to achieve these gains. Design-Build has been embraced by the construction industry and it is not going away soon. Public procurement officials should definitely take advantage of what this project delivery system has to offer.

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