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## **Ethical Issues in Design-Build**

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# Ethical Issues in Design-Build

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## 1. INTRODUCTION

“Design-Build” is a process for undertaking construction projects that has become increasingly popular. Although used to a substantive degree by private owners for many decades, it was rarely used by public agency owners because competitive bidding laws required separation of the design and construction contracts. Designers (professional engineers and architects) were retained under contract (or employed in-house) by public agencies to prepare definitive drawings and specifications, which were the basis for competitive bidding by construction contractors.

It would be naïve to suggest that construction contractors ever enjoyed obtaining their work by competitive bidding. Indeed, the opposite is the case. And by astute interaction with public policy makers, the construction industry has done an excellent job of changing the laws and regulations in a vast swath of public agencies in the United States. And along with this, construction contractors have convinced more private owners that they are a convenient one-stop source of complete design and construction services. Indeed, few construction contractors today do not have “design-build” painted on the side of their truck.

This situation raises ethical issues for professional engineers (and architects). It also raises ethical issues for public agency managers (many of whom may be professional engineers). And it raises business issues for private owners that they would be wise to consider. This is what we will talk about today.

## 2. WHAT IS DESIGN-BUILD?

“Design-Build”, as we all by now know, is a process whereby an owner contracts with a single entity to both design and construct a project. Nominally this entity could have complete design and construction staff “in-house” (and there are a small number of very large companies that have developed these capabilities in-house), however in practice

projects are still undertaken as they always have been. In design-build one entity contracts with the owner to provide complete design and construction services, and that entity then sub-contracts the majority if not all of the actual work to a variety of sub-contractors. Since the design-build process has become prevalent, the entity contracting with the owner is almost always a construction entity, that is, a “general contractor.” No doubt this pattern will continue in the future because (a) general contractors have demonstrated over many decades that they are better marketers than professional engineers, and (b) state laws provide generally that only a licensed construction contractor can enter into a contract with an owner to provide construction services.

So the situation on the design-build ground is that professional engineers (going forward, the term “architects” will be assumed included within the term “engineers”) are contracted-to/employed-by construction contractors. This is in contrast to the traditional design-bid-build process where the engineer has been contracted-to/employed-by a public/private owner.

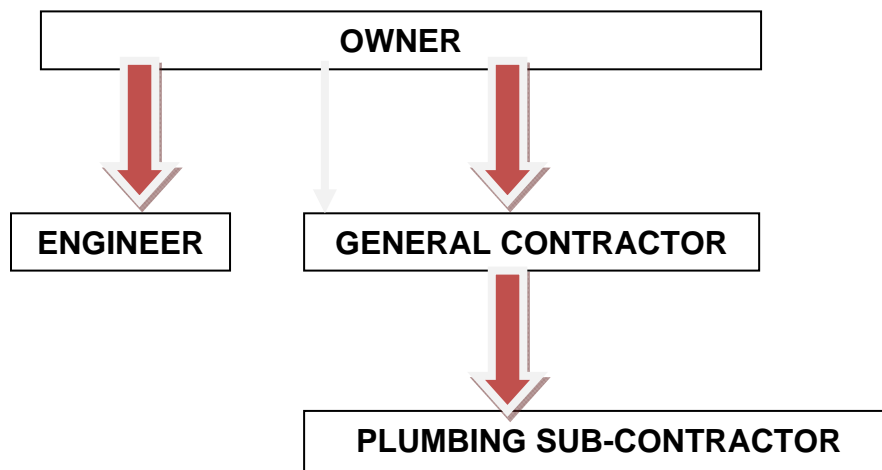
Before going further, let’s frame the discussion. First, let’s understand the difference between a “construction delivery process” and a “construction procurement process.” And then let’s understand how contracts, including design-build contracts, can be awarded using “objective” criteria or using “subjective” criteria.

### **3. CONSTRUCTION DELIVERY AND CONSTRUCTION PROCUREMENT PROCESSES**

**3.1 CONSTRUCTION DELIVERY PROCESS.** A construction delivery process defines:

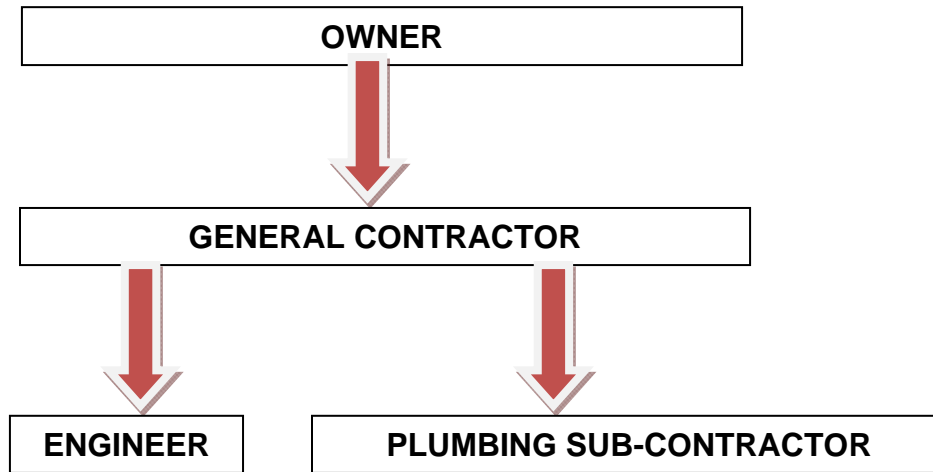
- **Contractual relationships between participants in the project**
- **Authorities, processes and reporting relationships**

For example, in the traditional design-bid-build process (which is actually a combined construction delivery and procurement process), the designer (professional engineer) is under contract to or employed by the owner. The engineer is paid by the owner, takes (non-technical) direction from the owner, reports to the owner, and is responsible for acting in the best interests of the owner. On the other hand, say, a plumbing sub-contractor, is under contract to the general contractor, is paid by the general contractor, takes direction from the general contractor, reports to the general contractor, and is generally bound to comply with the direction of the general contractor.



**DESIGN-BID-BUILD  
CONSTRUCTION DELIVERY PROCESS  
FIGURE 1**

In the design-build process, the engineer's position is different. The engineer is under contract to or employed by, is paid by, reports to, and takes non-technical direction from the general contractor. The engineer is in the same position as any other sub-contractor working for the general contractor on the project.



**DESIGN-BUILD  
CONSTRUCTION DELIVERY PROCESS  
FIGURE 2**

**3.2 CONSTRUCTION PROCUREMENT PROCESS.** A construction procurement process defines:

- **Criteria for award of contract**
- **Process for award of contract**

There are two types of criteria for awarding contracts, including design-build contracts; *subjective* and *objective*. This is true of contracts awarded by private owners as well as public agencies. Depending on the criteria to be used for awarding a contract, different processes may be used.

#### **4. SUBJECTIVE AND OBJECTIVE CRITERIA FOR CONSTRUCTION PROCUREMENT**

There is nothing that prevents the use of the design-build construction *delivery* process with an *objective* construction *procurement* process. Almost every implementation, however, of design-build has been done by altering traditional competitive bidding laws,

regulations, policies and practices to permit contract award to be based on *subjective* criteria.

**4.1 SUBJECTIVE CRITERIA.** Subjective criteria for award of public and private contracts are criteria with which the awarding entity (such as a contract award panel in a public agency) or person (such as a public agency or private company manager) inherently has discretion in deciding to whom to award a contract. When exercising that discretion the awarding entity or manager can use what may be called *overt* criteria, such as:

- **Qualifications**
- **Experience**
- **Best value**

The words used vary, but the nature of criteria that may be enunciated fall into one of these categories. These are the criteria that are typically declared by the owner will be used in making award decisions. The concepts underlying the criteria are laudable: award the contract to the most *qualified* competitor; award the contract to the most *experienced* contractor; award the contract to the competitor who will deliver *best value* to the awarding agency or company. But in making judgments about which competitor is *best qualified*, *most experienced* or will deliver the *best value*, subjective judgments must be made. When subjective judgments are permitted in the award process there is the opportunity for inappropriate *covert* criteria to be used, such as:

- **Political patronage**
- **Exchange of favors (candidly, bribes)**
- **Personal relationships.**

In the case of a private owner or closely held private company there is no reason why use of overt criteria for awarding a contract is inappropriate because the owner is spending his own money. But in the case of larger companies with stockholders, and

certainly in the case of public agencies, the awarding managers are “playing with other people’s money” and awarding contracts based on covert subjective criteria is inappropriate.

**4.2 OBJECTIVE CRITERIA.** An objective criterion is one which does not permit the awarding managers to make subjective judgments that will influence the award process. There is only one practical objective criterion:

- **Lowest cost.**

Only with competitive bidding based on lowest cost is the ability of awarding managers to subjectively manipulate the process to deliver the contract to a favored competitor eliminated.

**4.3 OBSERVATIONS.** These are some observations based on experience.

**4.3.1 Best Value.** Although award based on “best value” purports to be objectively based on cost, the reality is that many subjective judgments are inherent in arriving at a number that represents “best value.” For example, subjective assumptions must be made about the useful life and maintenance cost for building components such as roofing and exterior cladding systems. And subjective judgments must be made about such intangibles as aesthetics, occupant comfort, and building efficiency. And the relative value of different criteria requires subjective judgments. For example Figure 3 shows an actual award summary for a major design-build contract awarded by the State of California on the basis of best value. These criteria can only be applied by awarding managers making subjective judgments. The weighting of criteria is subjective. Why is “Building Performance Plan” worth 45 points, instead of 46 or 44 or 50? Why is “Community Outreach” worth 15 points, and not 13 or 21?

**4.3.2 Point Systems.** Commonly managers who wish to exercise subjective judgment in awarding contracts will use a “point system” to give the appearance of objectivity in the award process. Such point systems are not objective because subjective judgments must be made in determining how many points to award each competitor on specific



subjective criterion. For example, judgments that one competitor's building aesthetics are worth "10 points" and another's are worth "8 points", or that one competitor's management team is worth "15" points" and another's is worth "18 points", are inherently subjective. Figures 4, 5 and 6 illustrate using an actual State of California design-build contract how simple it is to manipulate a subjective point system to award a contract to a favored competitor. Figure 4 shows the subjective criteria used and the points awarded to competitors. Why is a "Small and Disabled Veterans Utilization Plan" worth 400 points and a "Life Cycle Cost Analysis Plan" only worth 250? Why was Company A's "Design Impact Plan" worth 107 points....rather than 106 or 108 or 91? Why was Company B's "Design Impact Plan" worth 100 points, instead of 101 or 99 or 108 or 125? As Figure 5 shows a modest shifting of points would result in Company B, not Company A, getting the contract. By merely shifting 4% of the possible points from Company A to Company B, there is this entirely different result. Or as Figure 6 shows, if 10 percent of the maximum possible points were shifted from Company A and 1 percent from Company B to Company C, Company C would have been awarded the contract. The order of the competitors would have been completely reversed; from A-B-C, to C-B-A.

**4.3.3 The Best of Intentions.** All awarding managers avow the best intentions when permitted to exercise subjective judgment in a procurement process. No doubt many sincerely try to remain true to those intentions. There are always those, however, who place self interest above that of their agency or company, and history has shown that bad drives out good. The only way to institutionalize long term integrity of an agency's or company's procurement process is if it is based on the only practicable objective criterion: lowest cost as determined by competitive bidding.

<b>EXAMPLE OF SUBJECTIVE CRITERIA: Used by the California Department of General Services (DGS) to Evaluate Design-Build Contractors for a \$500 Million Office Complex</b>		
<b>Category</b>	<b>Criteria</b>	<b>Maximum Points</b>
<b>Management Organization/ Communication/ Authority</b>	Clarity and completeness in addressing roles, responsibilities, and authorities of design/build (D/B) team. Addresses D/B expectations of the state's project team. Effectiveness of proposed communications and job procedures; electronic communications; job site communications, meetings, conferences. Conflict/problem identification and resolution.	45
<b>Design Schedule</b>	Clarity and completeness of the proposed design schedule in defining the overall approach of the design builder. Does the schedule correspond to the major elements of the management plan as well as the milestone schedule provided? Effectiveness of the recovery strategy.	30
<b>Interaction of Project Team</b>	Demonstrates an understanding of the roles, responsibilities and authorities of the project team. Identification of processes for exchange of information, clarifications, and instructions. Proposed strategy for promoting interaction and cooperation.	30
<b>Quality Assurance/ Quality Control Plan</b>	Clarity and completeness. Proactive and comprehensive in defining policy, procedures, goals and responsibilities. Assurances for quality work. Effectiveness of QA/QC manager. Transition from criteria documents to contract documents to construction.	30
<b>Safety Plan</b>	Clarity and completeness of process and procedures for initiating, maintaining, and supervising precautions and programs. Qualifications and experience of designated safety officer. Coordination with the [state's] requirements.	30
<b>Waste Management Plan</b>	Clarity and completeness. Conformance to diversion rate requirements. Does the plan address plan distribution, site instructions, meetings, separation facilities, handling procedures, etc.	45
<b>Building Performance Plan</b>	Clarity and completeness of process of identification, documentation and tracking of performance objectives, diagnostics, maintenance and training.	45
<b>Community Outreach</b>	Clarity and effectiveness of process and procedures for on-going neighborhood outreach. Conflict resolution and complaint handling process. Proactive strategies. Procedures to minimize effects on neighbors.	15
<b>Other factors deemed relevant</b>		6
<b>Total Points</b>		186

**FIGURE 3**

<b>EXAMPLE OF SUBJECTIVE CRITERIA: California DGS Award of Points in Process of Selecting Design-Build Contractor for \$126 Million Office Building</b>				
<b>Criteria</b>	<b>Maximum Possible Points</b>	<b>Company A</b>	<b>Company B</b>	<b>Company C</b>
<b>Designation of Sub- Contractors</b>	400	262	297	189
<b>Design of New Building</b>	1600	1229	868	938
<b>Sustainable Design and Waste Management Plan</b>	500	313	252	176
<b>Art in Public Places</b>	400	331	240	301
<b>Life Cycle Cost Analysis Plan</b>	250	113	125	75
<b>Project Management Plan</b>	1000	634	774	457
<b>Small and Disabled Veterans Utilization Plan</b>	400	237	274	153
<b>Design Impact Plan</b>	200	107	100	73
<b>Totals</b>	<b>4750</b>	<b>3226</b>	<b>2930</b>	<b>2362</b>

**FIGURE 4**

<b>EXAMPLE OF SUBJECTIVE CRITERIA: \$126 Million Office Building for Caltrans Effect of Shifting 4 percent of Maximum Possible Points From Company A to Company B</b>				
<b>Criteria</b>	<b>Maximum Possible Points</b>	<b>Company A</b>	<b>Company B</b>	<b>Company C</b>
Designation of Sub-Contractors	400	246	313	189
Design of New Building	1600	1165	932	938
Sustainable Design and Waste Management Plan	500	293	272	176
Art in Public Places	400	315	256	301
Life Cycle Cost Analysis Plan	250	103	135	75
Project Management Plan	1000	594	814	457
Small and Disabled Veterans Utilization Plan	400	221	290	153
Design Impact Plan	200	99	108	73
<b>Totals</b>	<b>4750</b>	<b>3036</b>	<b>3120</b>	<b>2362</b>

**FIGURE 5**

<b>EXAMPLE OF SUBJECTIVE CRITERIA: \$126 Million Office Building for Caltrans in Effect of Shifting 10 percent of Maximum Possible Points From Company A to Company C and 1 Percent from Company B to Company C</b>				
<b>Criteria</b>	<b>Maximum Possible Points</b>	<b>Company A</b>	<b>Company B</b>	<b>Company C</b>
Designation of Sub-Contractors	400	222	293	233
Design of New Building	1600	1069	852	1114
Sustainable Design and Waste Management Plan	500	263	247	231
Art in Public Places	400	291	236	345
Life Cycle Cost Analysis Plan	250	88	123	103
Project Management Plan	1000	534	764	567
Small and Disabled Veterans Utilization Plan	400	197	270	197
Design Impact Plan	200	87	98	95
<b>Totals</b>	<b>4750</b>	<b>2751</b>	<b>2883</b>	<b>2885</b>

**FIGURE 6**

## 5. ETHICAL ISSUES

These are ethical issues raised when the design-build process is employed:

### 5.1 CONFLICTING OWNER AND GENERAL CONTRACTOR OBJECTIVES.

In a typical design-build construction delivery process the engineer is being paid by a general contractor. The general contractor in many cases will have obtained the design-build contract by competitive bidding and is understandably concerned about reducing costs in order to maximize profit on the project. The general contractor reasonably will encourage those he has hired to work on the project, such as a professional engineer or a plumbing sub-contractor, to reduce costs as much as possible. This economic pressure with which the engineer is faced conflicts with the duty he would have under traditional design-bid-build to exercise his knowledge and skills to the benefit of the company/agency that will own the building (or other infrastructure project). This conflict does not occur with design-bid-build.

The ethical dilemma faced by the professional engineer in a design-build process is:

**CONFLICTING OWNER AND  
GENERAL CONTRACTOR OBJECTIVES**

**Where is the dividing line between the engineer's  
responsibility to the economic interests of the general  
contractor and the cost, quality and serviceability interests  
of the building owner?**

**5.2 INTEGRITY OF PROCUREMENT PROCESS.** The integrity of the procurement process is important when “playing with other peoples’ money.” This is important in public agency procurement because it is taxpayers’ money that is being spent and taxpayers, it is fair to say, have generally not surrendered their money with a high degree of willingness. It is also important in the private sector where stockholders’

money is spent and corporate management has a duty to expend corporate funds wisely and without waste. The ethical issue this raises is:

### **INTEGRITY OF PROCUREMENT PROCESS**

**Design-build contracts should not be awarded based on subjective criteria that can be manipulated by managers in order to award contracts to inappropriately favored contractors.**

There is nothing inherent in the design-build construction delivery process that necessitates awarding design-build contracts based on subjective criteria. That the practice of doing so has developed and is widely employed is unfortunate. All of the real benefits of the design-build construction delivery process can be realized for the benefit of the owner using a construction procurement process that utilizes objective criteria for award of the design-build contract and thereby protects the integrity of the procurement process. This is true for both public agency and private sector contracts.

## **6. RESOLVING THE ETHICAL ISSUES**

**6.1 CONFLICTING OWNER AND GENERAL CONTRACTOR OBJECTIVES.** This is not an easy issue to resolve. The owner, whether a public agency or private company, rightly wants to obtain the highest quality facility at the lowest possible price. The general contractor, quite reasonably, wants to maximize his profit on a job. Under the traditional design-bid-build process the engineer was not caught between these conflicting objectives. The engineer was paid by the owner and the engineer exerted his best efforts on behalf of the owner's interests. He did this by preparing working drawings and specifications that would provide the owner with a facility of the highest quality and serviceability within the owner's budget, and then undertook to assure that is what the owner received by inspecting the contractor's work.

Here, then, are some measures that are needed to rationalize the engineer's risk in a design-build construction delivery process. Some can be implemented by individual

engineers in their business practices but others will require efforts by engineering societies, including efforts to influence public policy makers to change existing laws, regulations, policies and practices.

#### **6.1.1 Recognize Engineer is Not Operating in a Professional Capacity.**

Engineers, engineering societies, owners and the legal community need to recognize and accept that in a design-build construction delivery process the engineer is not operating in a “professional” capacity, that is, with ethical responsibilities to the owner and society at large. This professional burden has been imposed on engineers over decades with the active encouragement of engineering societies; as well as by the legal community in its efforts to spread the net of liability as broadly as possible. This burden cannot possibly be carried by the engineer in a design-build construction delivery process because his customer/employer is a general contractor. For economic reasons a general contractor may direct the engineer to employ design features that result in cost savings for the general contractor but may not be in the best interest of the owner and the public. A general contractor will also want to minimize his cost for an engineering sub-contractor and therefore be unwilling to pay the engineering sub-contractor for the additional engineering time needed to analyze and evaluate alternative design features in order to deliver an optimal facility in terms of quality and serviceability to the owner. The economic relationship in which the engineer is employed in the design-build construction delivery process makes it impossible for the engineer to fulfill lofty responsibilities to the owner and society when the general contractor directs to the contrary for economic reasons.

**6.1.2 Engineer’s Burden Limited to Safety and Technical Competence.** Because of the economic relationships inherent in the design-build construction delivery process the engineer’s responsibilities should be the same as those for any other sub-contractor: (a) to perform the work so the completed project is safe for use by the owner and the public, and (b) to perform the work in a technically competent manner. This standard should be enunciated by engineers in their contractual and employment agreements with clients and employers; by engineering societies in their pronouncements on responsibilities of engineers; by public agencies in their laws,



regulations, policies and practices; and by the legal community in case law. Obtaining these pronouncements, of course, will be a hefty undertaking.

**6.1.3 Utilize Hold-Harmless Provisions.** In the design-build construction delivery process the general contractor holds himself out as the master designer. With this assertion must come responsibility on the part of the general contractor. This is often not the case in practice on design-build projects. When things go awry on a project the frequent if not universal reaction of general contractors is to say “I relied on the \_\_\_\_\_ sub-contractor to do that work. He is responsible for it and you must seek your relief from him.” This is not an uncommon reaction when engineering issues are questioned. General contractors are known to attempt to avoid responsibility for design issues by alleging that they “relied on the engineer.” This is unacceptable in a design-build construction delivery process. The engineer is only one of many participants in the design and construction activity and the engineer does not control the other participants. Only the general contractor controls all of the participants, and that is because they are sub-contractors to him and are paid by him. If general contractors are going to hold themselves out to the public as master designers and builders, they must accept the responsibility that comes with these assertions. To have a design-build construction delivery process that is reasonable, engineers need to employ “hold harmless” provisions in their contractual and employment agreements with general contractors that provide the general contractor will indemnify and hold harmless the engineer from all liability other than that for technical negligence. Corresponding provisions need to be incorporated into relevant law, regulations, policies and practices. Engineering societies need to incorporate such provisions into their standard contract documents for engineering services provided to a general contractor in a design-build environment.

**6.1.4 Restatements by Engineering Societies.** If this ethical issue is to be resolved in a fair and reasonable manner engineering societies must take the lead. In particular they need to restate their lofty statements of professional responsibility to recognize that in a typical design-build construction delivery process the engineer does not have the legal, economic and managerial tools to fulfill these commitments. Engineering societies have a responsibility to their members to enunciate statements about their

members' responsibilities and liabilities that are fair and reasonable to their members, as well as in the public interest.

**6.2 INTEGRITY OF PROCUREMENT PROCESS.** The integrity of procurement processes is of fundamental importance to public agencies because it is the taxpayers' money that is being spent. No one would argue publicly that government employees do not have a fiduciary responsibility to manage public funds in a prudent and ethical manner. Indeed, the same can be said of managers employed by private corporations where stockholders' money is managed.

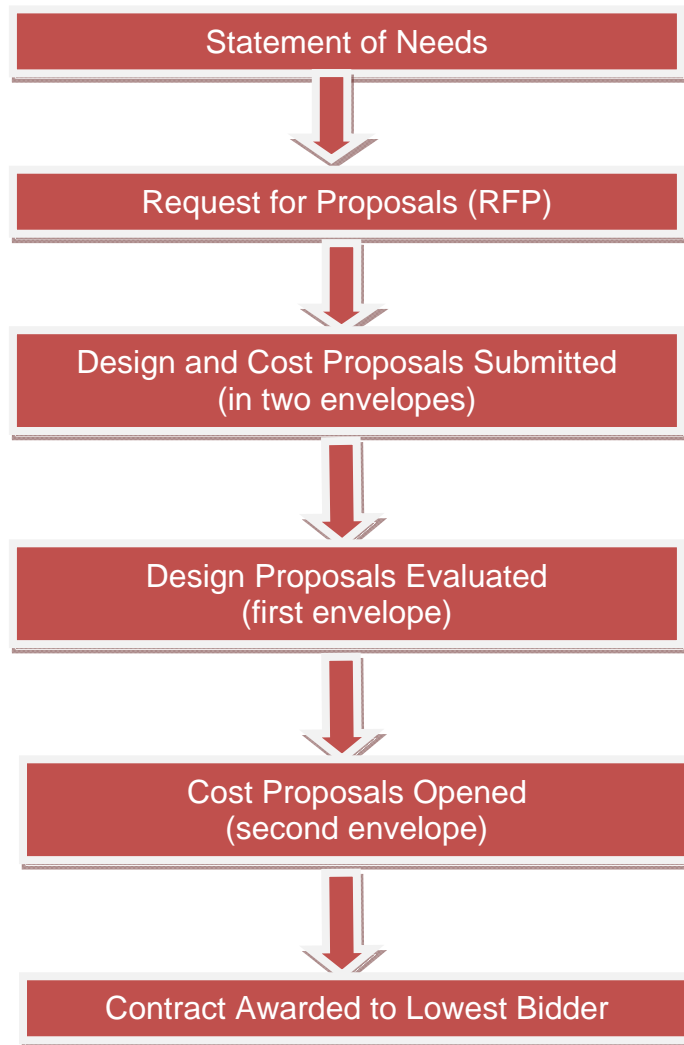
The issue of maintaining the integrity of procurement processes does not arise because of anything intrinsic to the design-build construction *delivery* process. The issue of integrity of construction *procurement* processes arises because proponents of design-build have found it convenient to define the design-build process as inherently requiring procurement processes based on *subjective* criteria. This is not surprising.

Construction contractors have overwhelmingly been the advocates for the design-build process. From the inception of competitive bidding for construction contracts over a century ago, construction contractors have disliked if not detested it. Construction contractors much prefer to obtain work based on *subjective* criteria than the *objective* criterion of lowest cost to the owner. By bundling subjective procurement into the design-build concept, design-build's proponents have been very successful in changing laws, regulations, policies and practices of public agencies and private companies to allow and even require use of the design-build process *including* procurement based on subjective criteria.

The use of subjective criteria to award design-build contracts is not in the public interest and, indeed, is not necessary. The benefits of the design-build construction delivery process (and there are some, although not nearly as significant as the "greatest-thing-since-sliced-bread" claims of its proponents) can be provided to public and private owners while maintaining the integrity of their procurement processes. There are two

proven procurement processes that maintain the integrity of the procurement process and can be employed to award design-build contracts. These are:

**6.2.1 Two-Envelopes.** The two-envelopes procurement process is proven to be objective while still allowing competitors the flexibility which proponents of design-build claim is essential to its implementation. It has been used for decades by public agencies, most notably in defense industry procurements. It has rarely been used in construction procurement because of the proven efficacy of the traditional design-bid-build process. Here are its fundamental steps:



**TWO ENVELOPES  
FIGURE 7**

- **Statement of Needs.** The owner prepares a statement of what it requires (i.e. “50,000 sf building, two stories”, etc.). For a construction project this would typically consist of concept drawings (about 5%) and outline specifications.
- **Request for Proposals (RFP).** The owner issues an RFP for design and construction of the project. Design proposals to be submitted in one envelope and cost proposals in a second.
- **Design and Cost Proposals Submitted.** Competitors submit their design proposals (i.e. “one proposes a steel frame, another concrete masonry”, etc.) in one envelope and their cost proposals in a second.
- **Design Proposals Evaluated.** The owner reviews all design proposals and approves all of those that satisfy its statement of needs.
- **Cost Proposals Opened.** The envelopes containing the costs proposals of all competitors whose design proposals were determined to satisfy the owner’s state of needs are opened.
- **Contract Awarded to Lowest Bidder.** The contract is awarded to the lowest bidder whose design proposal was determined to satisfy the owner’s statement of needs.

This construction procurement process allows for the design flexibility that is purported to be a great advantage of the design-build construction delivery process, while at the same time maintaining the integrity of the procurement process. Competitors are allowed flexibility in their design proposals and the owner’s managers are allowed flexibility in preparation of the statement of needs and evaluation of design proposals. The integrity of the procurement process is maintained because the final decision as to which competitor will be awarded the design-build contract is based on the objective criterion of lowest cost.

### **6.2.2 Construction Management, with competitive bidding of trade sub-contracts.**

“Construction management” is a widely used construction delivery process, however it can be employed in different ways, which may act either to the benefit or detriment of the owner. For example, the construction manager may have committed to a fixed price or budget, competitively bid the trade sub-contracts, and the cost savings resulting from

competitive bidding of the trade sub-contracts accrues to the construction manager rather than the owner. Construction management can, however, be employed in a process wherein the benefits of competitive bidding accrue to the owner. Here are its fundamental steps:



**CONSTRUCTION MANAGEMENT**  
**With competitive bidding of trade sub-contracts**  
**FIGURE 8**

- **Request for Qualifications (RFQ).** The owner issues an RFQ for construction management services, to include engineering services.
- **Qualifications Evaluated.** The owner evaluates statements of qualifications (SOQ) based on subjective criteria such as qualifications and experience.
- **Construction Management (CM) Contract Awarded.** Based on its subjective evaluation, the owner awards the construction management contract to the competitor it deems best qualified and most experienced. The construction management contract includes engineering services. CM fee is negotiated (usually fixed price, but can be time-and-materials).
- **Trade Sub-Contract Bid Packages Prepared.** Under the non-technical direction of the owner, bid packages are prepared by the construction manager. Examples of trade sub-contracts would be “structural steel fabrication and erection”, “plumbing”, “interior electrical work” etc. Bid packages consist of definitive working drawings and specifications.
- **Trade Sub-Contract Bids Solicited and Received.** Trade bidders submit bids for trade sub-contracts.
- **Trade Sub-Contracts Awarded to Lowest Bidders.** Trade sub-contracts are awarded to lowest bidders. Cost benefit of the competitive bidding flows to the owner, not the construction manager, because construction manager’s compensation is a negotiated fee.
- **Construction Manager Provides Construction Phase Services.** The construction manager provides construction phase services such as scheduling; processing submittals, change orders and requests-for-information; inspection; and payment processing.

This construction procurement process allows a somewhat larger percentage of the total project cost to be awarded based on subjective criteria, but the largest portion is procured using the objective criterion of lowest cost based on competitive bidding. For example, in a traditional design-bid-build process about 5 to 10 percent of the project cost is awarded to an engineering firm based on subjective criteria such as experience and qualifications and the remaining 90 to 95 percent is procured based on the

objective criterion of lowest cost based on competitive bidding. With the construction management (with competitive bidding of trade sub-contracts) process about 15 to 25 percent of the project cost is awarded to a construction management firm based on subjective criteria such as experience and qualifications and the remaining 75 to 85 percent is procured based on the objective criterion of lowest cost based on competitive bidding. Allowing this increased project cost to be awarded based on subjective criteria is a reasonable compromise to obtain the benefits of the design-build construction delivery process, some of which are realistic.

## 7. THE ROAD FORWARD

Addressing these issues will not be easy because it requires adjustments in laws, regulations, policies and practices in the public (and to a lesser extent, private) sector. The forces that will oppose changes have proven to be very effective in the public policy arena, have very significant vested interests in maintaining the design-build status quo, and engineers have a long history of non-existent or at best ineffectual involvement in shaping public policy. Left unchanged, the probable course of events will be the same as that which led to adoption of competitive bidding as the law-of-the-land over century ago. Corruption in award of public (and private) contracts can be concealed from the public for only so long. Sooner or later it comes to light. And when it does the public will demand re-institution of competitive bidding in public agency (and to a lesser extent, private company) procurements and design-bid-build will again be the law-of-the-land.

Those who believe the design-build construction *delivery* process has merit would be wise to move for laws, regulations, policies and practices that institutionalize design-build construction *procurement* processes that are based on the objective criterion of lowest cost based on competitive bidding, such as the two suggested here. Otherwise the public is going to throw out the design-build construction delivery process “baby” along with the current design-build construction procurement “bath water” of awarding contracts based on subjective criteria.