



Engineer-Led Design-Build: A Practical Business Plan for Engineers to Lead Design-Build Teams

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Design-Build is by far the fastest growing method of project delivery in the country. According to statistics compiled by the Design Build Institute of America and F.W. Dodge DATALINE¹, from April, 1995 to April, 1996 the number of design build contracts increased 103% over the previous year. Of a total \$212 billion construction market, approximately \$37.2 billion (roughly 18%) was design build. Growth of design-build in large civil projects was between 80-150% depending on the category of construction.

It seems relatively certain that design-build is here to stay. Its popularity is owner-driven, primarily because of shortened project delivery times and the single-point responsibility for project design and construction. The federal government has recently passed new legislation to enable federal agencies to employ design-build project delivery methods², and many states are following suit. Owner satisfaction with design-build has in general been quite high.

Designer-Led Design Build

Historically, construction projects were delivered by design-build with the designer in charge. The engineer (or architect) had overall responsibility for the project, both the design and construction. However, as the legal climate has become more adversarial, engineers have retreated from responsibility for construction, carving out the ever-narrowing niche that they now occupy.

More recently, engineers have been somewhat hostile to design-build. They have feared that it diminishes the design professional's role and the importance of design to the project. There is some validity to these criticisms because design professionals have traditionally played a subservient role to the contractor in design-build projects. Recently, a comprehensive study by the University of Reading (England)³ has corroborated a commonly held opinion of design build in this country: that it receives high marks for shortening project delivery time and providing single point responsibility, but the quality of design suffers. The researchers suggest that designer led design build may be the answer.

Although design-build continues to capture an increasing share of the construction market, the frequency of designer-led design-build is low, performed primarily by the largest EPC firms or by integrated companies that have both design and construction expertise in-house. However, there is no reason why engineering firms of any size cannot be participating in the design-build market, leading their respective teams.

The principals of most engineering firms have a general "feeling" that there exist insurmountable obstacles to designer-led design-build. These feelings are unjustified. When one examines the potential obstacles in detail, it becomes apparent that designer-led design-build is not only plausible but at least as logical and workable as the more common contractor-led design-build.

Structuring the Team

The key to overcoming any obstacles is to structure the design-build team appropriately. The first step is for the engineering firm to create a sister corporation (or limited liability company), owned by the owners of the engineering firm, preferably in the same ratio, to be its construction division. It is usually best if the ownership of the engineering firm and its construction company are identical, both in identity and ratio, so that it does not matter to the owners which company earns the revenues and which company absorbs the costs. The construction company would be a "shell," occupying the same office space and using the same employees, so that owners would not perceive a distinction between the design firm and the construction company. The design firm will enter into contracts for design services with owners, and the construction company will enter into separate contracts with owners for the construction and related construction phase services.

The construction company will perform the construction by subcontracting 100% of it to a general contractor who is the engineer's design-build teammate. All of the duties performed by the construction company would be subcontracted to the general contractor, who would in turn subcontract most of the work. The general contractor would also provide typical preconstruction services. A diagram of the structure is shown in Figure 1.

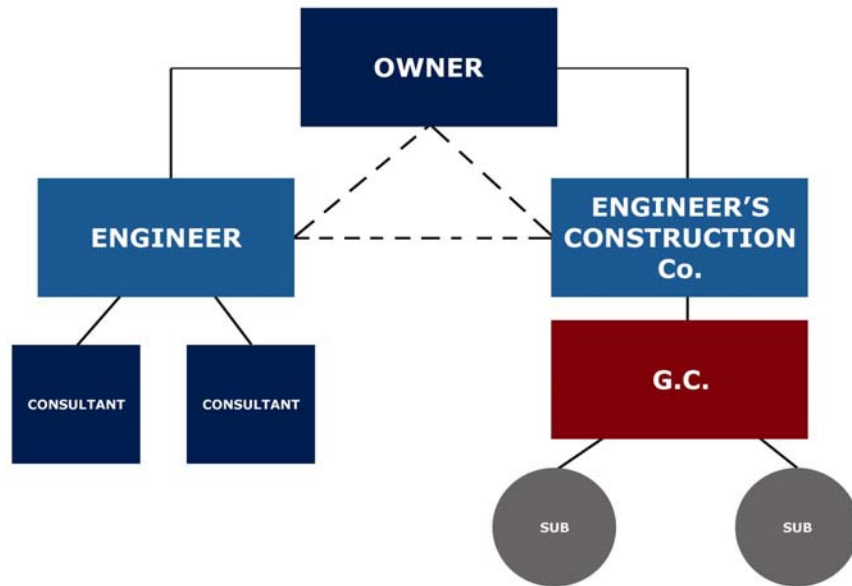


Figure 1

This structure permits the owner to sign sequential contracts, rather than a single design-build contract at the start of the project. The owner may first contract for engineering services, and when the owner is prepared to convert the project to design-build, signs the construction contract with the engineer's construction company. The usual project sequence is set forth below.

The Typical Project

The structure described above should be initiated even before the engineer focuses on a particular project. The first step is for the engineer's construction company to form a strategic alliance with one or more general contractors who would be the engineer's potential design-build teammates. The general contractor should be one that performs high quality work and with whom the engineer is comfortable teaming. Most importantly, the general contractor must be financially sound, well capitalized and/or bonded, so that there is little or no chance of it becoming insolvent as the result of a construction claim. Figure 2 illustrates this first step.

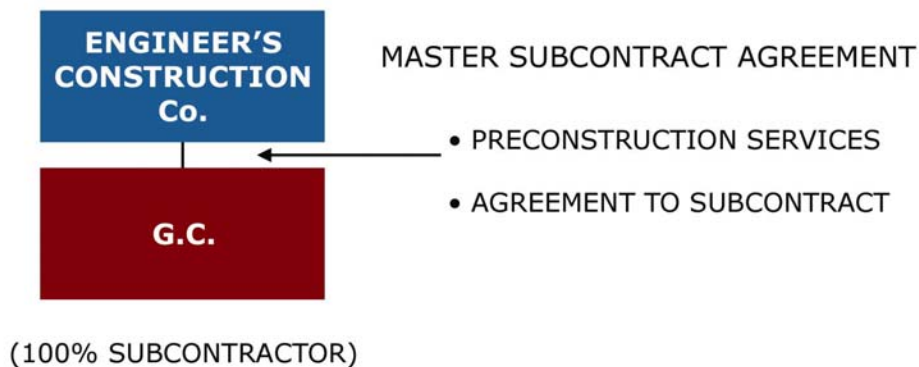


Figure 2

The second step is for the engineer to seek to be awarded a project, using its new design-build capacity as a marketing/sales technique. With its newly acquired construction capacity, the engineer can offer to guarantee the construction cost and completion date, guarantees that other engineers will not be able to make, but which are very attractive to owners. It allows the engineer to revert to the status of Master Builder, not only designing the project, but arranging for its construction within agreed upon budget and schedule constraints. Figure 3 illustrates this second step.

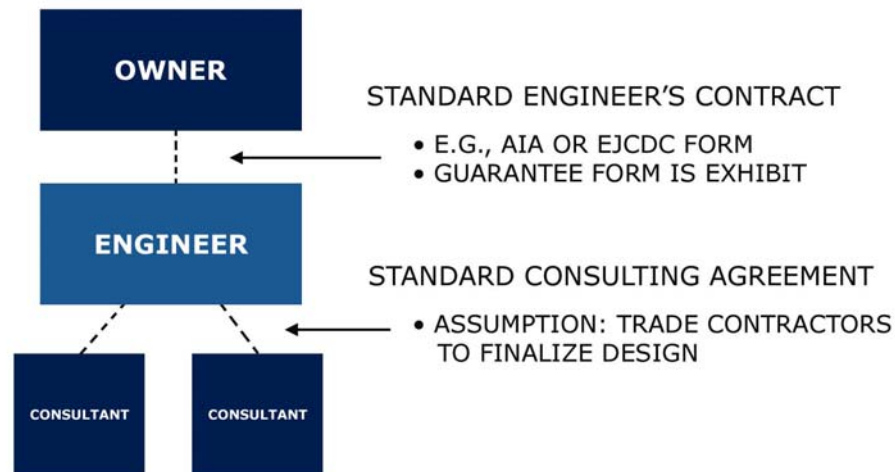


Figure 3

The mechanism for making these guarantees is an exhibit to the contract for engineering services called a Price/Schedule Guarantee. The owner and engineer sign any standard form or similar engineering agreement that contains some additional language providing that if the owner wants to convert the project to design-build, it can do so during the design phase by filling out and entering into the Price/Schedule Guarantee with the engineer and its construction company. The actual guarantees are made by the engineer's construction company, not its design firm.

Thus, the owner does not have to elect at the outset of the project to have it delivered design/build; instead, the Price/Schedule Guarantee is an option that the owner can exercise at any time during the design phase to convert the project from traditional design-bid-build to design-build. Being able to delay the decision to deliver the project design-build vs. traditionally may be of great benefit to owners who may need time to make their own decisions internally or to get used to and comfortable with working with the engineer.

The third step is the design phase of the project. Initially, the engineer proceeds with the design phase as he would in a traditional project. However, when the engineer learns that the owner is going to want him to guarantee the construction price and/or completion date, he involves his strategically allied general contractor. The contractor provides typical preconstruction services — pricing, value engineering, scheduling, etc. — providing the engineer with the price and timing details that will be the basis for filling out the Price/Schedule Guarantee. Ultimately, the general contractor will expect to be hired to build the project for somewhat less than the guaranteed price that the engineer quotes to the owner, the difference being the engineer's fee for the construction phase. Figure 4 illustrates step 3, the Price/Schedule Guarantee.

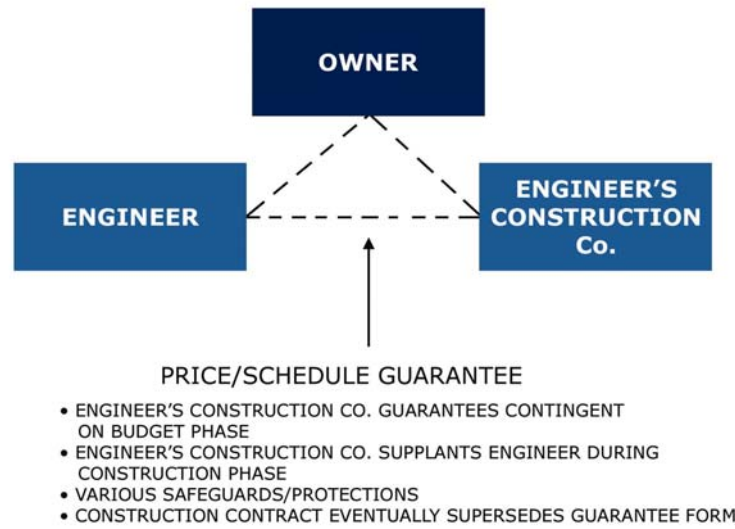


Figure 4

The last step is to complete the design and begin the construction. When the design is far enough along that construction may start, which often is prior to full completion of the contract documents, the owner enters into a construction contract with the engineer's construction company which incorporates the price and schedule terms previously guaranteed. If, after the Price/Schedule Guarantee has been signed, there have been changes to the scope or other details that affect the price or completion date, the revised price and/or completion date are incorporated into the construction contract.

Immediately after signing the construction contract, the engineer's construction company issues a short purchase order to its strategically allied general contractor which has the entire construction contract stapled to and incorporated in it. The purchase order calls for the general contractor to perform for the engineer's construction company all of the services that the engineer's construction company has agreed to perform for the owner. However, the compensation term in the purchase order is for less than the comparable term in the prime contract, the difference representing the engineer's construction company's mark-up on the construction work. Then construction begins, and the project is run similarly to a typical negotiated job except for the fact that the general contractor's client is the engineer's construction company, not the owner directly. Figure 5 illustrates the final step.

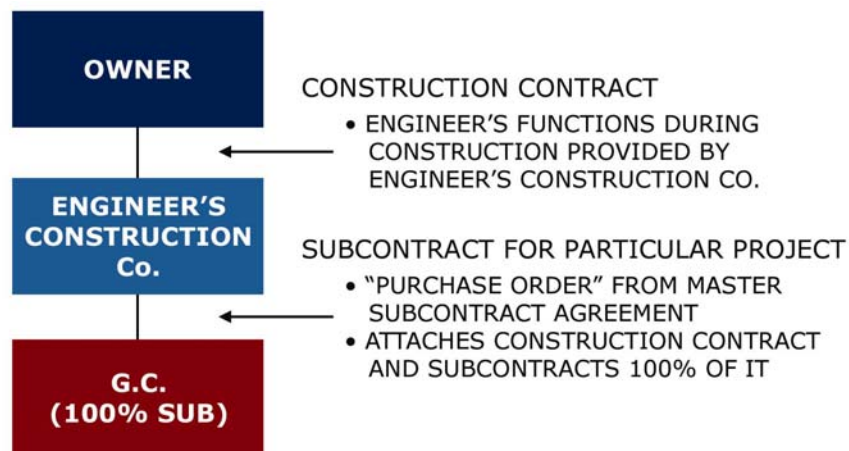


Figure 5

Overcoming the Obstacles

The following are the most frequently expressed reasons why designer-led design-build supposedly is not feasible.

1. Lack of construction experience.

This obstacle is overcome by the structure of the team with an experienced general contractor as the 100% subcontractor. The general contractor provides the construction expertise for the team, even if the engineer lacks it. After all, in more traditional contractor-led design-build, it could just as easily be asserted that the contractor lacks design experience.

2. Lack of financial / bonding capacity.

It is true that design firms rarely have substantial financial capacity, particularly compared to contractors who ordinarily maintain much greater capitalization in order to secure their bonds. However, this obstacle can be overcome by a mechanism that gives the owner direct access to the financial capacity of the general contractor, even though there is no contract directly between them.

One such mechanism is a conditional assignment of the 100% subcontract. Such a document would provide that in the event that the engineer's construction company defaults on the construction contract, the owner would be assigned that company's rights under the 100% subcontract with the general contractor. Thus, in the event that the engineer's construction company could not satisfy the owner's claim, the owner would have direct access to the assets of the general contractor.

Alternatively, the owner could be made a third party beneficiary of the 100% subcontract. In the event of a problem arising out of the construction, the owner would then have a claim directly against the financially well capitalized general contractor in addition to the engineer's construction company.

These mechanisms can work on a bonded project as well. The general contractor would merely be required to name the owner as an additional obligee on the performance bond. This solution is not without precedent: construction managers have long been persuading owners that projects are sufficiently secure if the prime trade contractors are bonded, even if the CM is not.

Furthermore, the bonding market has begun to recognize the growth of designer-led design-build and is responding with new products to simplify the engineer providing a bond to the owner. One such product is a bond which can be purchased even by an engineer's construction company with little or no capitalization of its own because it would be secured primarily by the general contractor's performance bond provided under its 100% subcontract. It would be secured in small part by the engineer's construction company, but only to the extent of any fees or other mark-up paid to the engineer's construction company for the project. Thus, the engineer's construction company's responsibility for indemnification under the bond would be limited to its "fee" for the project in question.

3. Insurance problems.

The team structure described above actually creates less insurance problems than in more common contractor-led design-build projects. By establishing two separate companies, the engineer has separated its professional liability from its non-professional liability. Each company procures the appropriate type of liability insurance and names the other as an additional insured.

Furthermore, the general contractor's liability insurance will cover the engineer's construction company. This results in better liability coverage for the engineer than what is available in a traditionally delivered project. On a traditional project, if there is an accident during construction resulting in bodily injuries or property damage, a third-party claim against the engineer ordinarily will not be covered under the general contractor's general liability policy, even if the engineer is named as an additional insured, because the general liability policy virtually always has an exclusion for professional services. However, under the engineer-led design-build structure described above, the engineer's design firm is performing no services during the construction phase, and the engineer's involvement is solely through its construction company; when a claim for the construction accident is made against the engineer's construction company, the general contractor's general liability insurer cannot use the professional liability exclusion to deny coverage because the engineer's construction company is not considered a professional.

4. Construction risks.

This is a major concern expressed by design professionals, but the structure above virtually eliminates these risks. There are numerous possible construction risks: subcontractor default, defective work, delays, mechanic's liens, etc. It is true that the

engineer's construction company would be liable to the owner for all of these problems. However, the general contractor would have identical liability to the engineer's construction company.

Essentially, the engineer's construction company is in a pass-through position. Since it has subcontracted 100% of its construction responsibilities, the general contractor is liable to it for any construction liability that it incurs to the owner. It is perfectly feasible to require the general contractor to indemnify the engineer's construction company against such risks.

The only real risk to the engineer's construction company is that the general contractor may become insolvent. That risk may be overcome by carefully choosing a financially sound general contractor or by requiring a performance bond.

It is also possible that construction liability may result from a design error or omission. In that event, however, the engineer's professional liability insurance is available to satisfy the claim. Furthermore, liability for design errors and omissions exists regardless of whether the engineer leads the design-build team or whether the project is delivered by design-build.

5. Licensing obstacles.

Designer-led design-build is less likely to encounter licensing obstacles than traditional contractor-led design-build. All states license design professionals; only some states license general contractors. In jurisdictions where contractors must be licensed, the engineer should simply arrange to have its construction company obtain a license.

6. Owner reluctance.

This is the only real obstacle to designer-led design-build, and it is attitudinal rather than structural. Designer-led design-build is rare, and owners who have been told of the obstacles listed above are often skeptical. This obstacle will diminish as the construction marketplace's experience with designer-led design-build increases.

The Rewards

There are tremendous rewards to be earned by design professionals who lead design-build projects:

1. Profit.

Designer-led design-build enables the engineer to participate in construction profits, which dwarf the profits from the design phase. Informal research among design firms that take the lead in design-build projects indicates that the ratio of construction profits to design profits easily exceeds 4:1. There is a potential for even greater profits from construction savings when the prime construction contract is for a lump sum and the 100% subcontract is cost-plus with a guaranteed maximum price, although the engineer would be well advised to share these savings with the general contractor in an appropriate ratio.

Another source of profit is the labor saved from not having to "defensively detail" the construction documents, since within a design-build team, design intent can be more effectively communicated less formally, such as by sketches, minutes of meetings, and oral communications. These labor savings are well documented in more common contractor-led design-build projects, although the savings usually accrue to the contractor who leads the team and has negotiated down the engineer's fee.

2. Marketing.

The engineer will be able to outmarket other engineers by having the ability to guarantee the construction cost and completion date during the design phase. Design professionals who have been successfully marketing and using designer-led design-build are able to make the following kinds of representations when trying to persuade an owner to hire their firm for a project: *"We are so confident in the quality and cost-effectiveness of our work, that we are prepared to guarantee to you that this project will come in on time and on budget. Moreover, we are willing to put that guarantee in writing and sign it as part of our contract — provided, of course, that you hire us to build the project as well, because we can guarantee our own construction work, but not anyone else's."* Needless to say, this kind of "put your money where your mouth is" approach is extremely attractive to owners and is only possible because of the engineer's design-build capacity.

The engineer can outmarket other design-builders because the owner does not need to commit to a design-build method of project delivery until well into the design phase and because the designer is leading the design-build team to ensure that the quality of design does not suffer. Most other design-build teams are led by contractors. There has been a great deal of controversy over whether, including some statistical support for the proposition, that design quality suffers when a contractor leads the design-build team. (See the University of Reading study referred to above.) Furthermore, a contractor-led design-build

team cannot offer an owner the same flexibility that a designer-led team can because the contractor cannot reasonably allow the owner the option of doing the project in a traditional design-bid-build manner.

3. Control.

The engineer who has contracted directly with the owner can control the quality of design and can ensure that the construction properly implements the design. When the contractor contracts directly with the owner, they may agree to make “penny-wise pound-foolish” decisions to change the design, such as by cheapening the cost of the mechanical systems at the expense of longer range lifecycle considerations — which the engineer may object to but cannot prevent. When the engineer leads the design-build team, communications to the owner pass through the engineer and no such change can be suggested, much less agreed to, without the engineer’s approval. Alternatively, if the engineer desires to change the design or allow a substitution during the construction phase, the change can be made quietly and cooperatively, without rancor on the project.

4. Reduced Liability.

During the construction phase, the contractor would not be entitled to change orders for many kinds of errors or omissions in the construction documents because it participated in creating or failing to notice them while providing preconstruction services. When providing preconstruction services, the general contractor performs a more detailed and careful takeoff of the construction documents than at the engineer and bears the majority of the responsibility for overlooking obvious design errors or omissions, such as a door left off a door schedule, the omission of a water line or conduit running to the appropriate fixture, etc. However, the general contractor does not assume responsibility for the kinds of design errors that it would not ordinarily be expected to detect during its preconstruction services, such as a non-obvious code violation, an error in structural calculations, etc.

The engineer-contractor relationship is non-adversarial, with the contractor assisting the engineer in correcting unanticipated design problems, and the engineer assisting the contractor by flexible interpretation of the design, allowance of substitutions, etc. If a design error does result in liability, the magnitude of the claim is likely to be smaller than in traditional projects because the contractor has an incentive to keep the consequences to a minimum, rather than to maximize the size of the change order, because the contractor wants similar consideration as well as future business from the engineer. In addition, as discussed above, construction accident claims would no longer be defended under the engineer’s professional liability policy, with its large deductibles, because the engineer’s liability is as a contractor, covered under its own or the general contractor’s general liability policy.

Why It Works

This structure for designer-led design-build works because the engineer’s construction company hires a general contractor to be a 100% subcontractor, rather than hiring multiple prime trades. The engineer stands to realize the following benefits from hiring a general contractor:

- Construction risks are virtually eliminated if the general contractor is financially sound.
- The general contractor’s presence as a team member may assist the engineer in obtaining the project.
- To maintain the relationship, the general contractor is likely to refer business to the engineer.
- The engineer will not be perceived as competing with general contractors.
- The general contractor may be the source of financial security for the owner.
- The general contractor may be an additional source of management expertise.
- The general contractor will likely earn additional profits for the design-build team by negotiating better deals with subcontractors and material suppliers.

But designer-led design-build only works if the design-build team is truly a team. Within the constraints of professional integrity to the project, the engineer must make it his business to help the general contractor maximize its profit for the project. Similarly, the general contractor must affirmatively try to anticipate and resolve engineering problems rather than using them as an excuse for change orders.

When the engineer and contractor are working as a team, design-build generates a great deal of synergy, which results both in extra profits for the contractor and in the engineer’s construction phase “fee” (really a mark-up). For contractor-led teams, this synergy has been proved to the satisfaction of the participants and the marketplace, which accounts for the increasing popularity

of design-build. To date, it has been unusual and rare in the construction industry for an engineer to retain a general contractor and lead the design-build team, but the efficiencies to be gained from this approach appear to be even greater.

It must be noted, however, that the designer-led design-build structure described in this paper is not fully consistent with most public procurement laws. However, most of these obstacles can be overcome by structuring the engineer's construction company as a construction manager rather than as a general contractor. The engineer's construction company forms a joint venture with the strategically allied general contractor. The joint venture becomes the at-risk construction manager, rather than the general contractor for the project, although within the joint venture the responsibility for performance of the actual construction management services is solely the general contractor's. The trade contracts are competitively bid, and the joint venture guarantees the construction price and completion date, just as in the private sector structure, in exchange for a negotiated fee. This structure complies in general with public procurement laws because construction management contracts are generally deemed to be for professional services, exempt from public bidding requirements. Figure 6 illustrates the business structure for public projects.

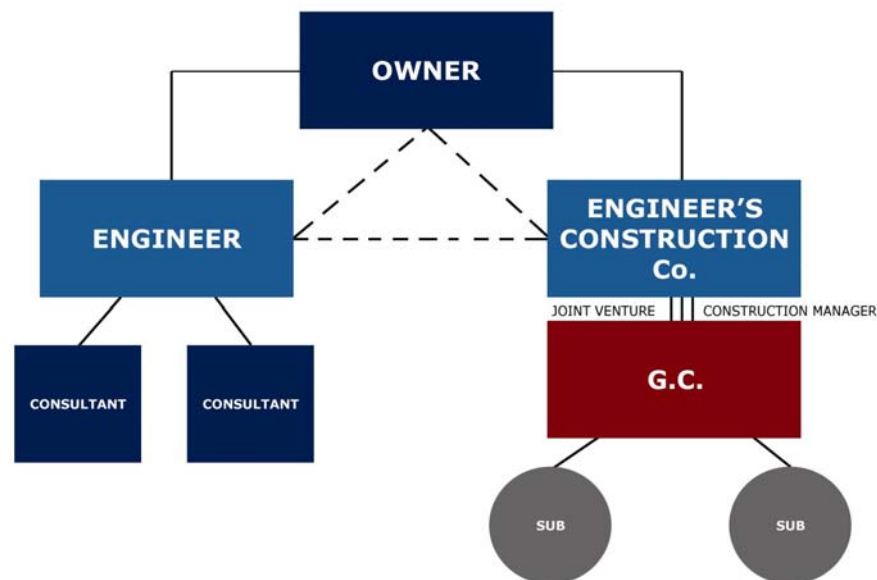


Figure 6

Frequently Asked Questions About Designer-Led Design Build

1. Engineer's entitlement to construction "fee."

Q. Why should the engineer's construction company be entitled to share in the construction revenues when it delegates all of the construction risks to a general contractor?

A. The "fee" that the engineer's construction company earns is really a mark-up of the construction cost and has nothing to do with the construction risks. It is more like a "finder's fee" that a general contractor may award to an agent or broker who secured it a project. By guaranteeing the price and agreeing to build a project, the engineer's construction company obtains the right to award the construction contract(s), which is a valuable asset that engineers ordinarily cede to the owner. Designer-led design-build is profitable for engineers because the engineer obtains the right to build the project, and therefore to benefit from this right, in exchange for guaranteeing the price and completion date.

2. Source of engineer's construction "fee".

Q. If the engineer earns a construction fee, doesn't that just add to the owner's cost of the project?

A. No, the fee comes from the synergy and efficiency of the designer-led design-build structure and does not simply increase the cost to the owner of the project. The savings come from several sources:

- No marketing/sales expenses for contractor
- No risk of uncompensated estimating
- Minimized contingency for pricing/estimating
- Minimized contingency due to non-adversarial administration

The marketplace has proved that contractors are usually able to pay a "finder's fee" in the vicinity of 5% without impact to the owner under this designer-led design-build structure.

3. Owner's security for the construction obligations.

Q. Since the engineer's construction company is a "paper shell," what source of financial security does the owner have if the construction company defaults on its obligations?

A. The general contractor is the source of the owner's financial security, even though it does not contract directly with the owner. Various types of legal documents can give the owner direct access to the general contractor's assets, such as the conditional assignment or third party beneficiary status described earlier. The fallacy in current design-build practice is believing that since the general contractor is the source of financial security for the construction obligations, it must contract directly with the owner; there are numerous legal devices by which the owner can have access to the general contractor's assets or bond without a direct contract between them.

4. Engineer's risks.

Q. What additional risks does an engineer have when practicing designer-led design-build?

A. There are remarkably few risks. The engineer continues to bear the risk of improper design — although less risk than in traditional design-bid-build construction since the general contractor who is the 100% subcontractor is responsible for pointing out obvious design errors and omissions during the design phase and will cooperate with the engineer during the construction phase to minimize the consequences of any other design problems. As for construction risks, although the engineer's construction company bears liability to the owner, all of these risks — without exception — are delegated to the general contractor who must indemnify the engineer from claims pertaining to these risks. The only real risk to the engineer is of the general contractor's insolvency. Even the risk of financial loss from construction accidents is reduced or eliminated since such claims will be insured by the general contractor rather than by the engineer and its professional liability carrier.

5. Incentives for the general contractor.

Q. Why would any general contractor agree to be an engineer's subcontractor in this designer-led design-build arrangement and have to pay the engineer a fee in exchange for being awarded the construction contract?

A. Because the general contractor probably would not have been awarded the project otherwise! Contractors are always trying to establish relationships with design firms who can refer projects to them. Designer-led design-build establishes this kind of relationship formally, by contract. From the contractor's point of view, the project is a normal, negotiated deal in which it provides typical pre-construction services during the design phase, followed (sometimes fast-tracked) by construction of the project — except that its client is the engineer's construction company, not the owner. The marketplace has shown that numerous contractors, from ENR top fifty in size down to small remodeling contractors, are willing and eager to pay a fee of approximately 5% to the engineer in exchange for being handed the project on a silver platter, without any marketing or sales expenses and with the knowledge that it would be cooperatively administered.

6. Owner acceptance of designer-led design-build.

Q. Why would any owner be interested in hiring an engineer's construction company, with its 100% subcontractor, to build a project, rather than just hiring the contractor directly?

A. For most owners, the two riskiest parts of a construction project are waiting to see whether the bids will come in within budget and having to hire a possibly unknown contractor whose interests may be adverse to those of the owner. Many owners would jump at the opportunity to hire the engineer not only to design but to build the project. The owner usually has trust and confidence in the designer, whom he perceives as attempting to carry out his program and further his interests. By hiring the engineer both to design and build the project, the owner benefits from the engineer's "single point responsibility," and avoids the distasteful problem of the engineer and contractor each blaming the other for problems that may develop in the project.

7. Reactions of insurers.

Q. Will professional liability insurers have any problems with designer-led design-build? Will it affect insurance coverage?

A. Not all insurers understand designer-led design-build, but when they do, they have no problems with coverage. The key is the establishment of the engineer's construction company as a separate legal entity which signs a separate construction contract. All of the professional services are performed by the design firm, and all of the general (non-professional) services are performed by the construction company. This simplifies, rather than complicates, liability insurance coverage. At least one major professional liability insurer accommodates its A/E insureds who employ this structure of designer-led design-build by naming the A/E's construction company as an additional insured on the professional liability policy.

8. Personnel and expertise of engineer's construction company.

Q. What kinds of employees does the engineer's construction company need to have, and what expertise must they possess?

A. An engineer does not need any special expertise, beyond what he already possesses, to practice designer-led design-build, and its construction company needn't have any of its own employees. The construction company "borrows" employees from the design firm, who simply add a suffix to the project numbers on their timesheets to indicate that they are billing their time through the construction company. They do not need to have any specialized construction knowledge, such as labor union practices or critical path scheduling; the general contractor who is the 100% subcontractor provides that expertise.

9. Source of the guarantees.

Q. How can an engineer guarantee the construction price or completion date? Guarantees aren't insurable.

A. It is correct that the guarantees are not covered by an engineer's professional liability insurance. That is why they are not made by the design firm. The engineer's guarantees of price and completion date are made by its construction company. Contractors routinely give these types of guarantees. They are not insurable, but the engineer's construction company delegates these risks to the general contractor who was the original source of this information via its pre-construction services.

10. Getting started.

Q. What steps does an engineer have to take to adopt the business structure suggested in this monograph and to begin to practice as a design-builder?

A. The first step is to locate one or more general contractors and to form a strategic alliance with them along the principles described in this monograph. The second step is to develop contract documents that implement the legal relationships that the business structure establishes. These contracts should be drafted with a great deal of care and thoroughness in order to make sure that the engineer is in a position to obtain all of the benefits of the business structure without the risks that the structure is designed to minimize. Additional documentation may be required to memorialize any agreements between the engineer's two companies with regard to accounting, tax and employee

benefits issues. The third step is for the engineer to train its key employees and consultants how to operate and maximize the benefits from the business structure. Then, the engineer should market its newly acquired newly acquired design-build capacity and seek to establish a foothold in the rapidly growing design-build market.

Conclusion

The increasing popularity of design-build has led construction industry participants to examine the structures of design-build teams. Despite its current rarity, designer-led design-build may be the most logical team structure. It is likely to be very popular with owners, whose initial relationship is usually with the engineer rather than the contractor and who often would be more than happy to let the engineer run the entire project and bring it to completion.

Engineer-led design-build returns the engineer to the status of Master Builder, responsible not only for designing projects but for procuring their construction. It permits the engineer a greater sense of responsibility for and satisfaction with the project, with considerable financial and related benefits. Moreover, the business structure described above is relatively safe, minimizing the engineer's risk for the construction of the project.

About the Author

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Endnotes

¹ DBIA “Dateline,” Vol. III, No. 3, May-June 1996.

² Federal Acquisition Reform Act of 1996, § 4001 et seq.

³ John Bennett, Ellen Potheary and Graham Robinson, University of Reading Design and Build Forum Report “Designing and Building A World Class Industry,” June 12, 1996.