

# Fast and Innovative Delivery of High Performance Building: Design-build Delivers with Less Owner Liability

*P. Thomas Gard, PE, Esq., PMP*  
*Dominion Project Management, Inc.*

## ABSTRACT

This article argues that sustainability and high performance design and construction are best delivered through the design-build contracting method.

Sustainability is predicated on innovative design and a life cycle approach to project planning. High performance design and construction requires a systemic approach to design and construction. The design-build method of infrastructure delivery capitalizes on the synergy between the designer and builder, rather than exacerbating the traditional antagonism between designers and builders common with the design-bid-build method. Taken together, sustainability, high performance, and design-build concepts are all founded on the principle of performance specifications.

In further argument for design-build, the owner is no longer at risk for the “implied warranty” for design accuracy and receiving only “substantial” compliance in its delivered facility. The owner is vulnerable to both with design-bid-build.

Thus, in the new sustainable and high performance environment, design-build is the contracting and project delivery method of choice.

## INTRODUCTION

The design-build (D-B) delivery of buildings makes it less expensive and more certain that owners will get high performance and sustainability from their new buildings and renovation projects. With design-build, owner liability is significantly lower, construction change orders diminish, and claims are minor. In design-build, design and construction are fast-tracked and schedules are shorted by as much as one third compared to the traditional methods of construction delivery.

Design-bid-build (D-B-B), the traditional method of design and construction, does not work as well as design-build in the new sustainable environment. Design-bid-build segments and incrementalizes design and construction so that it is sequential rather than systemic in execution. When low initial cost is desired, and little innovation in design is acceptable, design-bid-build is an appropriate choice. But design-bid-build is an antagonistic practice where the designer and builder are legally and practically pitted against each other. When the owner does not fully trust the builder, design-bid-build is a good tool for the designer to use to police the project. However, none of these scenarios describes sustainable design and high performance building goals.

When high performance (in effect, energy efficiency) is coupled with sustainable design criteria, it is imperative that design-build is always considered, if not required, by owners. Design-bid-build does not provide our clients with the optimal mix of design, construction, cost and high performance demanded by owners in the 21<sup>st</sup> century, sustainable environment. In this article, the reader will learn why design-build is often the better procurement choice and how it works in the sustainable, high performance environment.

To be effective, design-build requires a mastery of performance specifications rather than the commonly used design specifications. Thus, sustainable design and energy efficiency must be specified through a performance specification, rather than a detailed design specification. In this article, sources for energy and sustainable criteria and standards will be provided that can be readily adapted to performance specifications. A performance specification-writing tool will be suggested that eases the task of writing performance specifications.

Standard form design-build contracts will be compared. Finally, presenting design-build in conjunction with sustainable design to your clients will conclude this article.

## THE HISTORY OF DESIGN-BUILD AND DESIGN-BID-BUILD

Design-build is not a new method of project delivery. Its roots go back to antiquity. The pyramids were built through design-build. Saint Paul's Cathedral in London was built through design-build. But it fell into disuse in the United States about the time of the Civil War, and gave way to the "new" design-bid-build process through the latter years of the 20<sup>th</sup> century. Now, in the 21<sup>st</sup> century, design-build is on the rise as the "new" delivery method of choice for many owners.

The primary difference between design-build and design-bid-build for an owner is that design-build places responsibility for infrastructure delivery into the hands of one party. That is the way construction was done when the building arts were simpler and a "master builder" managed the process. When design-bid-build arose, design and construction was bifurcated and done under separate contracts by parties that now have dramatically different legal liabilities and antagonistic interests. How did this come about?

The first of two driving forces in the move to design-bid-build was the perceived need for specialization in the design and construction industry. In the beginning of this country's history, construction was completed by master builders just as it had been done in Europe for centuries. But, by the end of the Civil War, it was a common practice for owners to hire separate disciplines for design (engineers and architects) and construction (contractors) as the complexity of building increased.

These disciplines then organized professional associations to police and protect their standards. Two of the leading societies today were founded for this purpose. In 1852, the American Society of Civil Engineers (ASCE) began, and in 1857 the American Institute of Architects (AIA) was chartered. Schools were endowed to educate entrants into the separate professions. The first engineering school in the United States, the United States Military Academy, was founded in 1802. In 1868, the Massachusetts Institute of Technology (MIT) started its architecture school.

By the early 1900s, the Industrial Revolution provided new building technology, which prompted specialization in skills and accelerated separate educations in building arts and sciences. These technological advances spurred the split among the engineering professions and encouraged specialization among designers and builders. Notable advances that encouraged the specialization in the design and construction industry in-

clude the development of inexpensive steel by Andrew Carnegie, effective transmission of alternating current electricity by George Westinghouse, practical elevators by Elijah Otis, dependable cooling by Willis Carrier, and effective plumbing by the Kohler family of Wisconsin.

The second major force driving the use of design-bid-build was the graft and corruption that flourished during the Civil War and never seemed too far away all the way up to present time. Cheating in building construction was perceived to be easy when one party, the “master builder,” controlled the entire process. Splitting the process and making one party the “watchdog” over the other party seemed to be the right answer. Splitting procurement into two separate actions resulted in design-bid-build. A design contract based on technical merit, and a construction contract based on the lowest bid, was the anti-corruption remedy provided by design-bid-build.

In the design-bid-build system, the “watchdog” is the designer and the contractor is regarded as the “bad guy.” Thus, the antagonism that is considered normal today in many projects was born over 150 years ago. Now this antagonism, which is so destructive to construction budgets and supportive of legal budgets, is ingrained in our way of doing business. Most government entities and virtually all professional societies have codified this split of “watchdog” and “bad guy” in contracts, laws, and procurement regulations. This codified process is known as “design-bid-build” and is based on design specifications and lump sum payment terms.

#### SHORTCOMINGS OF DESIGN-BID-BUILD

By the 1970s, it was clear that design-bid-build was not the panacea that it appeared to be. The first issues were practical ones.

- There was minimal dialogue between the designer and builder during the design phase leading to confusion, conflicts, and cost overruns during construction.
- As the antagonism increased between designers and builders, the owners were looking for responsible parties to shoulder unexpected costs and unreasonable delays. Finger pointing ensued as the designers and builders blamed each other. That finger pointing rose to become a vast body of construction law and cases.

- In response to the evolving law, inefficient designs evolved as designers protected themselves against legal liability through defensive specifications and plans, which resulted in higher costs, delays, and disputes.
- In response to the evolving law and the inefficient designs, builders claimed that increased design errors drove their costs up and delayed their progress, resulting in even more lawsuits.

The greatest shortcoming of design-bid-build for the owner was the incredible liability placed on owners for accuracy of design. Under the implied warranty ruling from the *Spearin Doctrine* (United States Supreme Court, 1918), accuracy of design is the owner's responsibility, *not* the engineer's or architect's.

Under design-bid-build, the designer is only responsible for performing in a *non-negligent* manner as measured by the slippery "standard of care" criteria. Builders only have to "substantially comply" with plans and specifications and have defenses to total compliance such as "economic waste" and "designer's errors."

Thus, under design-bid-build, the party who is least qualified to perform design and construction has the greatest legal and financial liability for the outcome. That party is the owner.

#### FINALLY, DESIGN-BUILD RETURNED

By the early 1990s, it was apparent that a different method of project delivery was needed to place legal, financial, and performance liability in the hands of the design construction professionals. Schedules were too long. Costs were uncertain. Owners were caught in the middle with designers and builders blaming each other. Design-build was the remedy that fulfilled all of these requirements.

In the 1990s, the use of design-build was resurrected as owners came to appreciate the benefits of choosing a single entity for design and construction. Design-build holds both parties, in the design-build entity, jointly and severally responsible for the facility delivery. This joint and several liability concept means that the designer and builder are responsible for their individual contribution to the project, and simultaneously, are each legally and financially responsible for the entire project. Thus,

under design-build, the designer and builder are genuine partners and must cooperate. Design-build became the answer owners were seeking.

#### THE DESIGN-BUILD PROCESS

Under design-build, the owner specifies the performance characteristics and criteria of the building during procurement (the proposal stage). Several competing designer-builders propose to meet those criteria with their unique designs that capitalize on the synergy and innovativeness of their design-build team. When the design-build contract is signed, the designer-builder becomes responsible for the measurable standards (e.g., performance specifications) it agreed. The designer-builder then writes the design plans and specifications that it will use to meet the performance specifications. The owner is off the hook for the implied warranty for accuracy of design.

Because the designer is, in effect, giving the design to itself (the design-builder) and is now agreeing to performance rather than specific details, design liability is squarely on the shoulders of the design-build team. Similarly, the builder is no longer in a position to say the design is wrong, compliance is impossible, or more costly, or more time consuming. The design-build team is now totally responsible for meeting the owner's performance goals and the owner is responsible for paying. Design-build is the answer owners were seeking.

Adoption of design-build was rapid throughout the federal government during the 1990s. Congress authorized *all* federal contracting officers to use design-build by the turn of the century. States and local governments were close behind. Design-build is now approved for public agency procurement in over three-quarters of the 55 jurisdictions of the United States. Today, most large private owners recognize the value of design-build, and use it widely.

#### SUSTAINABILITY AND DESIGN-BUILD

Design-build, sustainability, and high performance project delivery come together through performance specifications.

- The design-build process is premised on performance specifications. Design-build assures that a facility is built that *performs* per

performance specifications as opposed to design-bid-build that delivers projects that comply with design specifications.

- Similarly, sustainability demands a systemic approach to construction requiring the owner, designer, and builder to cooperate in a life cycle of *performance*.
- High performance is guaranteed when specifications for energy efficiency are specific, numerical, and time-oriented.

Thus, the three concepts of design-build, sustainability, and high performance are based on performance specifications.

Performance specifications are measurable (i.e., numerical) requirements for what a building must do, rather than what its components are or what it must look like. When using performance specifications in a sustainable environment, the owner's in-house designer describes maximum energy use, allowable environment impact, re-cycling parameters, and all other infrastructure and operations requirements of the building. These performance specifications are advertised in a request for proposal for design-build services. Design-build and performance specifications place responsibility for the detailed specifications and construction responsibilities on the party most able to perform—the designer-builder.

**BUT, WHY NOT USE DESIGN SPECIFICATIONS?  
DOES NOT THE OWNER LOSE CONTROL OVER  
THE PROJECT WITH PERFORMANCE SPECIFICATIONS?**

In contrast to design-build's approach to facility delivery with integrated services, design-bid-build was established to deliver separated and incremental design and construction so that the owner's designer could exercise project control. Design specifications are the key to a successful design-bid-build project because they deliberately limit innovation by any party other than the owner's designer and place tight controls on construction. Design specifications are the basis for containing and controlling design and construction during the design-bid-build process.

Using design specifications, the designer specifies the exact appearance of the facility, its components, its assembly, and the standards

for testing. Then the builder must build the facility in substantial compliance with the plans and design specifications.

There are no guarantees that the owner will get what he wanted with design specifications. The concept of *negligence* in design-bid-build and detailed design specifications allows the designer to step away from the final responsibility – does the building perform? Obviously, with a builder in the process, the designer will complain that any non-performance is due to builder errors.

With design-bid-build and detailed design specifications, the builder only has to *substantially comply* with the design specifications and give the owner what was intended. The concept of “economic waste” will prevent the owner from getting what he really wanted as long as it’s “close enough” and the cost to come to strict compliance is too high. Thus, the owner gets “close” to what he procured through design-bid-build (as subjectively interpreted by a jury in the final analysis), rather than performance that can be measured.

Further, design specifications are often used because they allow the owner to choose a builder based only on lowest costs. In theory, detailed design specifications allow all contractors to compete on exactly the same deliverable during the bid phase. Thus, it is commonly thought, with more detail in specifications and less variance in the parameters, costs can be precisely compared and controlled. Sadly, these assumptions have not proved to be true in practice.

First, design specifications have major shortcomings with regard to modern construction practices, especially in high performance and sustainability. There is little, if any, innovation allowed. It follows that as details in design increase, innovation is defeated. Innovation is a key-stone to high performance and sustainable design.

Second, with detailed specifications and the design-bid-build delivery method, the owner is required to guarantee the accuracy of the design to the builder (the *Spearin Doctrine*). While not widely understood, this is the law of the land. It is disappointing that the owner gets a lesser design guarantee from the designer, who only has *not to be negligent*.

Third, the builder must build the facility exactly as designed or face the potential for breach of contract. Ironically, this situation plays into the unscrupulous builder’s hands. What design can be perfect the first time? This is a fallacy. Thus, as the inevitable changes and inevitable errors are found during construction, the builder obtains numerous



change orders and profits when the design omissions and errors are found and corrected. The owner has no choice but to pay.

Finally, when this process is complete, the owner only gets what the completed design specifications require. Typically, design specifications state what components must be in the building and how the building must look. While manufacturer warranties are granted for individual pieces of equipment, there is no assurance that building will deliver what the owner intended—performance. That was never specified.

Two major themes arise with design specifications and design-bid-build. Design specifications and design-bid-build promise to control costs, but at the expense of innovation, extra time, and change orders. Design specifications and design-bid-build place the greatest liability on the party least able to perform – the owner.

To avoid these issues that are inherent in design-bid-build and design specifications, it becomes clear that design-build and performance specifications are the better option for the owner in a sustainable, high performance environment.

#### PERFORMANCE SPECIFICATIONS SET THE PARAMETERS FOR THE SUSTAINABLE, HIGH PERFORMANCE PROJECT

With performance standards, the owner instructs the design-builder as to what the building *must do* as opposed to what it is *made of* or should *look like*. Design control is *not* lost as is commonly thought by the naysayers. The owner can tell the designer-builder what he does *not* want the building to look like or what he does *not* want in the building.

Because the designer-builder agrees to meet performance specifications, it additionally assumes the liability for final design and performance characteristics of the building. Thus, liability for design accuracy shifts from the owner to the design-builder through the use of performance specifications.

#### USING PERFORMANCE SPECIFICATIONS

Using performance specifications is not easy, initially. The greatest impediment to using performance specifications is that designers have

not been trained to write them.

First, virtually all engineers and architects were trained how to write and use detailed design specifications. Second, manufacturers make design specifications readily available to the designer. That is because there is either a direct, or indirect, requirement to use their product that is imbedded in that specification. And last, the traditional and well-known method of design-bid-build depends on familiar design specifications.

Thus, to become sustainable design practitioners, engineers and architects must overcome many years of traditional practice and learn the new art of specifying performance.

#### SOURCES OF PERFORMANCE SPECIFICATIONS CRITERIA AND DEVELOPMENT SOFTWARE

Many performance standards and criteria have been established to measure success for sustainability and high performance. These standards and criteria are the basis for the design-build performance specifications that engineers and architects must use.

Five such high performance and sustainable criteria systems are now widely used to develop the performance specifications.

The first such system is the Leadership in Energy and Environmental Design (LEED) program, which was developed by the United States Green Building Council (USGBC). It defines performance ratings from bronze to platinum, based on meeting sustainability and high performance design and construction criteria. Guidance for performance specifications is provided in five major design and construction areas.

The Green Building Challenge is an international effort to develop a sustainable building assessment tool that will be available soon.

The Army SPIRIT Program is similar to the LEED program, but expands on LEED's performance criteria with military specific standards for additional features unique to military installations.

The "Sustainable Facility Guide," prepared by John Barrie Associates Architects, Inc. and the United States Air Force Air Combat Command, is based on the Construction Specifications Institute (CSI) 16 Division format for specifications. It is quite "user friendly" for the new sustainable designer.

There are local systems that are useful for a sustainable design

effort that are based on local economies and climates. The Austin, Texas, "Green Builder" rating system is one of the better known.

And finally, the CSI now provides a software program through their on-line bookstore that leads designers and building professionals through the performance-specifying task with ease and thoroughness. The program, also available in trial version, is titled "Perspective®."

## STANDARD FORM CONTRACTS

To obtain design-build services and reach agreement on sustainable performance specifications, a contract must be formed between the owner and designer-builder. For owners and designer-builders, contracts are often a challenge because they are written in a language that non-lawyers do not understand and appears to be threatening. In our American culture, we tend to fear contracts because there is the ever-present potential of litigation.

In response to this lack of understanding and threat of litigation, engineers and architects tend to choose standard form contracts that are sponsored by their respective professional associations. While these contracts can be easier to understand and have been favorably tested in court, they also favor the constituents of the society that wrote them. And for design-build contracts, the standard forms promulgated by the established societies are "cut and pasted" from other types of contracts with gaps and oversights. Thus, there is a need to use these contracts with caution and understanding. Following is a critique of each of the commonly available standard forms.

### **AIA Standard Design-Build Contract Forms**

With the AIA design-build contract forms, please be aware of the following.

Among the shortcomings, the AIA forms:

- Lack a set of comprehensive general conditions, that is, the A201 form.
- Split compensation into two amounts.
- Split the design-build tasks into phases.

- Heighten risk in litigation because the venue and choice of law clauses are unclear.
- Cut off the Phase One (designer) agreements from Phase Two (builder) through a poorly positioned integration clause.
- Must be used as a family of documents to include the AIA A191, A491 and B901 forms.
- Provide for payout at the end of Phase One, allowing the architect to be paid and the builder to be left empty-handed.

#### **NSPE Standard Design-Build Contract Forms**

The National Society of Professional Engineers is a key organization in the Engineers Joint Contract Documents Committee (EJCDC) that developed the engineer's version of a design-build contract. The EJCDC contract also has shortcomings.

Among those shortcomings, it:

- Lacks a set of comprehensive general conditions.
- Assumes compensation to be lump sum rather than incentive-based.
- Omits a non-assignment clause.
- Lacks a "no integration" clause cutting off previous agreements.

Among its better features, the EJCDC contract;

- Assumes the builder is prime.
- Uses only NSPE 2802, thus providing a single document for contracting.
- Does not assume a two-phase process.

#### **Association of General Contractors Standard Design-build Contract Forms**

The Associated General Contractors (AGC) set of design-build forms needs the most caution of all.

Among the cautions:

- One must use AGC 400, 410, 415, 420, 430, 450, and 450.1 documents, which are not well coordinated.

- These documents are rigid about the builder leading the team as the prime, and the designer as a subcontractor.
- These documents are rigid that the builder controls the process.
- These forms lack a set of comprehensive general conditions.
- There is confusion among the documents on guaranteed maximum price, lump sum, and negotiation of price based on design changes.
- There is confusion among the documents in the role of the designers.
- There is confusion among the documents in the contract general conditions.

### **Design Build Institute of American Standard Design-Build Contract Forms**

The Design Build Institute of America (DBIA), founded in 1994, promotes, sets standards for, and supports the design-build industry. Its forms are considered the optimal ones for design-build and sustainability. DBIA forms tend to be the most widely accepted among contract professionals because they best balance the risks and needs among the parties in the design-build process.

Among their attributes:

- DBIA forms have addressed the shortcomings of the other families of forms.
- Just like AIA, EJCDC and AGC forms, the DBIA documents come with explanatory notes and guides for the non-lawyer.
- DBIA documents allow the most flexibility in design-build team formation, compensation methods, and project performance.
- DBIA provides a wide assortment of forms covering virtually all types of design-build agreements except for international design-build.

### **SELLING SUSTAINABILITY AND DESIGN BUILD**

Owner-clients need to see the bottom-line advantage of sustainability and design-build for engineers and architects to win business. The moral imperatives of sustainment and shift in legal liability with design-build are appealing, but not compelling. It still comes down to dollars and cents in the final analysis. How is sustainment and de-

sign-build presented to the client to win business? Here is a six-step process.

First, learn the details of sustainable design and the process of design-build. Even experienced engineers and architects must have professional, hard-hitting, and effective training in these subjects to beat the competition.

Second, when in front of the client, be prepared to answer the fundamental question every client poses: What is this going to cost me? The normal client measures design and construction costs in traditional paradigms. A client will be looking for either “best value,” if a forward thinker, or “lowest cost,” if a conservative thinker. Instead of these traditional methods of costing, show the client that life cycle costs overwhelmingly favor sustainability and high performance design. Then show that design-build saves procurement costs and financial carrying costs. It is accepted that design-build normally saves at least 6 percent of the facility procurement costs required by design-bid-build for corresponding projects.

Third, be prepared to show your client that design-build saves a valuable commodity in addition to money—time. Authoritative studies have shown that design-build saves 33 percent of the time required by design-bid-build for corresponding projects.

Fourth, in addition to the money and time issues, clients are normally civic-minded and socially responsible. Show them the data regarding the moral imperatives for sustainability. Most clients do not know where to obtain sustainable information because it is not part of their core business. It is the designer’s opportunity to assist them to meet their legal, environmental and social obligations to society by educating them as to their sustainable responsibilities.

Fifth, most clients do not know of the significant legal liability that flows from design-bid-build construction. Most do not know that changes and claim submittals drop to almost 10 percent of that in traditional construction when design-build is used. Few know that design-build claim awards are a fraction of those experienced in design-bid-build.

Finally, to be most credible, the designer-builder needs to know the specific sources of sustainable and design-build tools, so that these can be cited and produced for the client.

Upon mastering these six steps, the designer-builder will readily get the client’s “yes” to a sustainable, high performance proposal.

## SUMMARIZING SUSTAINABILITY, HIGH PERFORMANCE, AND DESIGN-BUILD

In summary, sustainability, high performance buildings, and the design-build method are a natural fit. This combination of moral imperatives, intelligent use of energy, and forward thinking design and construction is the combination necessary for responsible and economical building in the 21st century.

To be effective in this new marketplace, today's designers and builders must have these tools:

- Know the requirements for sustainability when presenting to government clients.
- Know the USGBC benefits of sustainability when presenting to private clients.
- Know the liability shift, change control, and claims advantages of design-build.
- Know the sources of sustainability performance specifications, sustainable products, and design-build contract forms that suit the client.

As these tools are added to the practitioner's skill set, these paradigm shifts must be learned and become part of the practitioner's ethics and integrity.

- Sustainability is the moral and economic choice for building as our national and global resources diminish.
- High performance in terms of energy efficiency, re-use of resources and life cycle costing is the cornerstone of sustainability.
- Design-build provides the only fully innovative and cost-effective process for delivering sustainability where the designer, builder, and owner are a genuine team.

Designers and builders are the catalysts that make sustainability and high performance happen. Therefore, designers and builders must

learn more about these concepts and how to execute them for success in the 21st century.

The bottom line is bold and crisp. Sustainability, high performance and design-build are a triple win for the owner, designer, and builder alike.

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#### ABOUT THE AUTHOR

**P. Thomas (Tom) Gard, PE, Esq. PMP**, is a registered professional engineer with experience in energy engineering, an experienced litigator in construction and design, and a project manager with over thirty years experience in government and private industry. He holds engineering degrees from Michigan State University and Purdue University, a Master's in business administration from Northern Michigan University, and a Juris Doctor from The Catholic University of America. He founded Dominion Project Management, Inc. in 1997 to provide training in project management and construction law; consulting in design-build, sustainable design and energy efficiency projects; and, quality assurance and quality for high performance and sustainable design projects. He resides in Northern Virginia with his family and beloved classic sports car.

*For more information, contact Tom Gard at [Tom@Dominion-Project.com](mailto:Tom@Dominion-Project.com); or write to:*

*Dominion Project Management, Inc.  
26 H Plaza Street  
Leesburg, VA 20176  
(703) 443-2600*