

A.2 Design Build

What is it?

Design build (D-B) is the second most commonly used delivery method for roadway projects, but it is used less frequently as D-B-B. The STA contracts with one single entity to design and construct the project based on very limited design details and selection criteria developed by the STA (1, 2). This delivery method combines the design and construction phases of a project into a single contract for the STA to manage (2, 3). D-B allows for greater private sector involvement, but does not allocate any of the risks of financing, operating and/or maintaining a facility to the design-builder (4).

Why use it?

The D-B method is the most used alternative to the traditional design-bid-build (D-B-B) method. Its main benefit is that it allows overlapping of the design and construction phases often reducing project completion time. Other advantages of this method are that it (5, 6, 7):

- Allows for greater innovation in selecting design, materials, and construction methods,
- Reduces claims due to design errors,
- Accelerates response time and dispute resolution through a team effort,
- Single contract that addresses quality, costs, and schedule from design through construction,
- Shortened project delivery time can reduce user costs,
- Risk are transferred to the design-builder,
- Can use various procurement options (i.e. short-listing, low bid, best value selections, A+B/Lane Rental Provisions, Fixed Price Variable Scope, etc),
- Offers price certainty as construction cost is known and fixed during design, and
- Requires less STA expertise and resources.

What does it do?

Under the D-B delivery method, the STA develops detailed procurement documents that communicate the expectations about the project's physical components, basic configuration, operational requirements, and performance (1). Upon completion of these documents, the STA procures and awards the project to a design-builder firm, which then bases the design and construction of the project on the procurement documents (e.g. Request for Proposals). During design and construction, the STA acts in an oversight role. It performs "over-the-shoulder" design reviews, and oversees the construction process. It should be

noted that while the STA can enforce the D-B contract requirements, the STA should refrain from directing, completing, or actively controlling the design-builder's engineering and design efforts (1).

How to use it?

The California Department of Transportation (Caltrans) *Alternative Procurement Guide (1)* provides a process chart for D-B procurement. The following are the steps included on this chart:

1. **Define Project Scope** – Things to consider are project size and complexity as well as type and location. In addition, any unique or special conditions, schedule requirements, and traffic maintenance requirements should be identified. The purpose of this stage is to develop a preliminary project scope definition.
2. **Identify Project Goals/Objectives** – Here, some of the principal project goals and objectives should be identified such as cost control, public relations, accelerated delivery, promote innovation, or enhance quality. These should be goals and objectives essential to project success.
3. **Preliminary Project Development** – During this stage, some things to consider are the level of design and development required for a D-B project, permitting requirements, right of way acquisition, environmental clearance, utility relocation, and any other third party project-related issues. Some of the data to be collected and investigated should be geotechnical conditions, drainage conditions, and traffic studies.
4. **Identify and Allocate Project Risks** – Some of these risks are usually related to environmental clearance, right-of-way acquisition, third party issues, construction phase risks (i.e. differing site conditions, traffic maintenance, and schedule), public questions, security, and the procurement method (low-bid or best-value).
5. **Preliminary Project Design** - During this stage, the purpose is select the best design option available. Different tasks for STAs to perform are design alternative identification and evaluation, cost/benefit analysis, and the alternative selection process. The factor to consider should be traffic, alignment, geotechnical, survey and mapping, and drainage.
6. **Finalize Project Scope Criteria** – Tasks to complete by the STA are to determine design criteria and the extent to which performance-based specification can be used, to select a request for qualifications/request for proposals (RFQ/RFP) evaluation system, and to develop and outline of the RFQ/RFP package. The STA should ensure here that the level of design is appropriate to maximize the benefit of the D-B method.

7. **Develop RFQ/RFP Package** – During this step, the STA develops the contract language including the scope of work, any special provisions, and the technical specifications and finalizes the RFQ/RFP package. Some things to consider are the risk allocation, procurement approach, stipends, and whether this D-B will be combined with other procurement methods such as alternative technical concepts.
8. **Advertise, Select, and Award** – This is the final step of the D-B procurement process and includes advertising the RFQ, evaluating the statements of qualifications, publishing the RFP to selected proposers, evaluating proposals, and selecting design-builder.

When to use it?

The D-B method is not suited for every project. This method works best for project that require acceleration, projects that have unique opportunities to appropriately transfer risk to the design-build team, and on projects with opportunities for innovation (8). This method has been used successfully on projects for which (1):

- A compressed schedule was needed,
- Schedule certainty was needed,
- Early costs certainty was required,
- Project scope could be adequately defined without 100% complete plans, specifications, and estimates.
- Project quality could defined through minimum design, and
- Where minimal third party risks existed or could be mitigated.

Limitations

Although the D-B delivery method is a good alternative to the traditional D-B-B method, it also has some risks and disadvantages. For instance D-B (6, 7):

- Shifts additional control and responsibility to the design-builder,
- Makes bidding process more expensive for D-B teams,
- Makes coordination more challenging due to faster pace,
- Parties are more familiar with traditional methods,
- Requires a comprehensive and carefully prepared performance specification,
- There is potential for conflict of interests between design and construction, and
- STA interests may be underrepresented throughout the process.

Who uses it?

Based on a FHWA Division Offices survey conducted in 2012, 42 U.S. States have authority to use design-build for roadway projects. The states with the most experience with D-B are Florida DOT, Utah DOT, and Virginia DOT. States that do NOT have authority for using D-B are Alabama, Arkansas, Illinois, Iowa, Nebraska, Oklahoma, Wisconsin, and Wyoming.

Example

The Colorado Department of Transportation (CDOT) embarked on a U.S. highway reconstruction project in 2009 that included safety and mobility improvements along U.S. Highway 285 from Federal Blvd to Kipling Blvd in Denver, CO (9). The project included replacing three structurally deficient bridges and reconstructing portions of U.S. 285 that were determined to be in poor condition.

Initially, the project was budgeted at \$10 million to replace one of the structurally deficient bridges. However, after further investigation, the project ballooned to a \$40.1 million reconstruction project. Due to the length and complexity of replacing three bridges and still allowing four lanes of traffic to flow, CDOT determined (with the use of the PDSM) that D-B would be the best delivery method for this project.

Using D-B allowed CDOT to merge a high level of buy-in and dedication from the project team with an innovative contracting method that led to the design and construction of the project to be bid along with specific innovations such as keeping traffic flow and keeping the traveling public safe. The use of D-B resulted in efficiencies and benefits that typically are found on much larger projects. The benefits received included:

1. Optional procurement selection approaches: Used best value, but initially considered low bid
2. Expanded scope within a set budget: D-B firm provided the maximum possible scope to fit the set budget
3. Design innovations: Design innovations were included as a part of the bidding process and during the project, which occurred without numerous change orders.
4. Positive schedule impacts: Contractor and STA were co-located at the project site, which allowed issues to be quickly addressed. CDOT estimates this saved two years of time on this project
5. Maximized budgets: D-B allowed for additional scope to be completed within the set budget
6. More efficient owner involvement: With co-location of CDOT with the contractor, CDOT was able to adapt to its role as overall quality assurance, owner verification, and owner approval.

7. Effective teaming and partnering: The nature of D-B encouraged the project team to work more closely together. Co-location also assisted with creating a team atmosphere
8. Increased accountability to the project and team: By eliminating the separation between design and construction, project team members acknowledged a more vested interest in the project, which led to improvements in project quality
9. Shared risk: CDOT found three elements that are critical to successful risk sharing (1 – focus on removing any ambiguity from the specs, 2 – plan ahead with the specialty contractors, and 3 – require an issue resolution process as part of partnering and implement it quickly)

CDOT did make one final note about this project in that the U.S. 285 reconstruction project was successfully completed on time and on budget due to gaining the entire project team's commitment to collaboration and partnering. This critical element turned out to be essential to the project and CDOT uses this project as a model for current and future mid-sized D-B projects.

References

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