

The Designer's Role in the Transportation Design-Build Process

The creation of valuable partnerships

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The design-build project delivery method has emerged as a valuable mechanism to improve vital infrastructure in a timely, affordable manner. By its nature, the design-build process requires teaming and coordination of design and construction activities to achieve a successful conclusion. With a thorough understanding of project scope, team capabilities, and related constructability issues, designers are better equipped to develop innovative and cost-effective solutions. The designer can take steps throughout the process to facilitate winning, designing, and constructing the project. This article highlights key elements the designer should understand to maximize designer contribution to the project's success. Considerations outlined apply to projects of all sizes, from large signature bridges to small, short-span structures.

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A Winning Proposal

Success of a design-build teaming arrangement and project delivery begins with a thorough understanding of the project scope, goals, and challenges. Owners often depend on the design engineer and contractor to evaluate project features, constraints, environmental issues, geotechnical conditions, traffic and right-of-way related issues, and much more. The designer can assist in translating the owner's desires to the contracting partners. Coordinating an understanding of the project requirements with the owner's key interests is fundamental to developing a winning proposal.

A second, and equally vital consideration, is an understanding of



Precast concrete girder companion bridges carry 127th Street over Interstate 35 and adjacent rail lines in Olathe, Kans. All photos: Burns & McDonnell.

the design-build contractor's preferred construction methods and capabilities. Although means and methods of construction are typically at the contractor's direction, designing to the efficiencies of the contractor's methods, equipment, and materials can reduce construction cost and time.

Consider the changing dynamic in today's procurement environment. Design-build opportunities, once reserved for large projects, are now occurring on a much smaller scale in the transportation industry. The opportunity of smaller design-build projects opens a door to new and different teaming arrangements. To develop effective solutions and assure success, the designer must understand the contracting partner's unique experiences and methodologies.

Due consideration of the owner's scoring system, and how it affects the team's potential to win the project, is also imperative. A decision to not pursue may be more cost effective than pursuit of a low-cost bid situation where innovation and design is not appropriately valued. Likewise, the risk involved versus the potential rewards must be considered.

Design Phase

Once the scope and contractor expertise is understood, the designer can strive to develop innovative and economic solutions, leading to faster construction, lower costs, fewer traffic delays, and minimal public and environmental impacts. An owner that truly understands the flexibility involved in the design-build process is open to new ideas, alternative details, and other specifications. It is the designer's job to apply these alternative concepts appropriately and provide the owner with supporting information necessary to ensure the quality of the project.

All aspects of the design should consider constructability. Input from contractors, precasters, and suppliers regarding methodology is essential to achieve efficient, practical designs. Simplification of the design often results in simplified, lower-cost construction. The best ultimate solution is ideally the aggregate of many smaller, coordinated decisions.

Typically, all aspects of design-build happen faster than conventional design-bid-build delivery, and often this condensed scheduling is the reason design-build is the preferred delivery method. Critical decisions are



Precast concrete, curved Nebraska University (NU) girders carrying Interstate 470 eastbound connector road over U.S. 50 at Lee's Summit, Mo.



A 3200-ft-long, curved precast concrete solution eliminated multiple at-grade rail crossings at the Capitol Parkway West in Lincoln, Neb.

made throughout ranging from the determination of overall bridge type and span layout to the selection of specific expansion joints, bearings, and other details. Because of the accelerated process, attention to quality control and quality assurance of both design and construction is paramount.

Changes happen fast and flexibility is required. Plans can be delivered in smaller sets to accommodate construction scheduling. The design engineer must be responsive to the contractor, aware of owner's needs, and be available to the team at a moment's notice to contribute to the design-build project success. A properly staffed and qualified design team is essential to develop an optimal design and to meet the schedule demands of the design-build process.

Construction Phase

Once construction begins, the design engineer's role can vary. At a minimum,

the role can include reviewing shop drawings and responding to an occasional field question. The design-build process will usually require more interaction between the designer and the contractor. Contractors often continue to seek innovative and alternate construction methods even after final plans have been submitted.

"Equal or better" change orders can be submitted to the client throughout the project. The change orders allow the contractor to manage costs and schedule and sometimes provide a cost savings to the client. The designer should anticipate plan revisions during the construction phase. The contract between the designer and the contractor should document how plan revisions will be addressed. The designer's role can also include more involvement in construction-related design such as temporary shoring, falsework, and bridge-erection procedures.



Designer led, design-build was used to construct multiple small bridges for the owner, ATK, in Independence, Mo., in the less than \$1M category.



U.S. Highway 75 reconstruction project in McKinney, Tex. shows TX46 and TX62 girders spanning the East Fork of the Trinity River.



Precast concrete girder spans provide economy over floodplains in the Route 370 Missouri River Bridge at St. Charles, Mo.

The process can be rewarding.

Conclusion

A good understanding of the designer's role on design-build projects is critical to achieve a successful project. Although design-build can be demanding due to schedule and staffing requirements, the process can be rewarding.

Valuable partnerships are created with contractors and closer relationships can be developed with clients. Design-build also provides the opportunity to play a key role in all phases of a transportation project. 