Design-Build: A Quality Process

DETAILS

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A Quality Process

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A Quality Process

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Preface

Design–build (DB) is gaining momentum in its use by transportation agencies. Comfortable with the quality management process used in design–bid–build, many agencies are seeking assurance that the quality level of the completed project with design-build is not compromised. The Transportation Research Board (TRB) Task Force on Design–Build sponsored an all-day workshop at the 84th Annual Meeting of the Transportation Research Board to address quality on DB projects. The focus was on achieving quality on DB projects from the preparation of the request for proposals (RFP), to the actual design, to the use of incentives to achieve desired levels of quality, and to final construction.

Noteworthy points discussed at this workshop are included in this document for the consideration of transportation agencies in developing quality management plans for their DB projects.

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Ensuring Quality Is Built into the Request for Proposal Process

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There are cultural challenges that must be overcome within transportation agencies, the contracting industry and private engineering firms to make design–build (DB) successful. These challenges include fear of change, maintenance of control a different way, and avoidance of personnel preferences.

The tenets of teamwork, trust, and ownership are critical for the success of DB projects. The owner is critical in making sure all of this happens. Communication, commitments, information sharing, a sense of urgency, and short turnaround times are all important.

PROJECT SCOPING

The scoping process for DB projects is a key early step. The RFP sets the path for success or failure of a project. Clarity and accuracy are a must. Standardization of documents and DB processes should be used with care, as each project is unique, with unique issues. During the request for proposal (RFP) development process there needs to be a clear understanding of project commitments made during NEPA (National Environmental Policy Act of 1969), planning, and any other design development steps.

Important RFP considerations as part of the scoping process include

- Existing designs should be conceptual in nature only. Providing the DB teams with too many constraints—as with a largely completed design—will limit flexibility and innovation.
- Strategically placed incentives can encourage flexibility for innovation. Allow for proposals of alternate technical concepts.
- A two-step process selection process is essential for success. This should include a best value determination. Low bid is the least desirable method to use to select a DB team.
- All reference documents cited in the RFP should be reviewed for logical connections to the DB process.
- Critical steps in the RFP development process include reviews of the draft RFP by both agency staff and by the shortlisted teams
- Risk analyses should be performed to place responsibilities on the appropriate parties.
- Provide for maintenance and long-term durability considerations. Owners should consider the benefits of long-term warranties. In addition, performance specifications can enhance these opportunities.

- Stipends are important to ensure attention to detail during the development of technical proposals.
- Recognize project specifics—not all projects are the same. Create the RFP with this in mind.
- The concept of confidential questions should be strongly considered—allowing teams to ask individual questions without exposing the answer to the other teams. This creates opportunities for innovation without fear of giving the innovation away—but also reduces the risk in taking a chance on the intent of a scope requirement.
- The technical scoring process is critical. Technical teams must be knowledgeable in both the process and the elements of the project. Scoring must be done with careful consideration of the individual aspects of the project.

After shortlisting, the owner should meet with the shortlisted teams to seek their input concerning different aspects and conditions of the contract. This will net the owner many valuable inputs to improve the RFP documents as well as enhance the final constructed product.

After final selection of the winning team, the owner should meet with unsuccessful proposers to debrief them on the strengths of their proposals and how they might have been improved. This feedback is critical to continuous improvement of the overall proposal process.

Quality control (QC) in DB typically includes traditional QC plus some traditional quality assurance (QA) responsibilities going to the design–builder. Procedures must be in place to ensure design quality as well as construction quality. The design–builder should be responsible for design QC, conducting design reviews of preliminary design, interim designs, final designs, working plans, and signing and sealing the final drawings. The design–builder also becomes a fully engaged part of the construction quality process by performing many of the tasks typically performed by the owner.

As it relates to QA, the owner is responsible for oversight management and a new definition of QA. This new definition includes oversight to provide confidence that the design–builder is performing in accordance with the QC plan, design monitoring and verification through auditing, spot-checking, and participation in the review of the design. During construction it includes reviewing construction processes, holding spot inspections, verifying sampling and testing, completing independent assurance processes, and documenting QA details. The owner is also responsible for final inspection and acceptance.

Achieving Quality Design on Design–Build Projects

AN OWNER'S PERSPECTIVE

Lisa Choplin
Maryland State Highway Administration

How does a contracting agency ensure quality in the preconstruction process in a DB project? With DB, the owner has more options for achieving quality than those available under the traditional design–bid–build project delivery process. Most owners also believe that it is critical to select the right project, the right process, and the right teams to ensure a quality product.

Project selection must be based on risk allocation, the owner's comfort zone with the DB process, and the ability of the process to produce a safe facility that meets the owner's goals. The project development process must include environmental input and utility coordination, and, most important, it must incorporate community needs. The owner's procurement and administrative process must ensure quality by providing a well-defined RFP document and a contract administration process that is based on good communications, clear responsibilities for QC-QA, and a commitment to partner during the life of the project. Finally, the selection of the best design–builder must be matched by the contracting agency's selection of the best personnel for the project management team.

A CONSULTANT'S PERSPECTIVE

Ronald L. Ewing
Dewberry

From the perspective of a consultant who participates as a member of the DB team, ensuring quality in the design process equates to "doing the right thing right (correctly)." Of course, knowing the right process, procedure, and relationship is a must, and correctly executing these steps in the project delivery process is the secrets to achieving quality in design.

The right business relationship is the first and most important decision in forming a successful DB team. The consultant must team with a construction contractor who practices a culture of quality. The relationship between the consultant and the contractor must be professional, and the contract between these two parties must provide for fair terms for cost reimbursement, liability, incentives, risk allocation, and indemnity for site safety, means, and methods. Contractors should look for consultants with in-house design knowledge, DB expertise, good experience with the owner, willingness to collaborate, financial strength, and willingness to be innovative.

The right process includes knowing which projects are right for DB. DB projects should be within the realm of experience of both the owner and the DB team. Finally, the entire design process is successfully folded into the project delivery with the right project manager.

A CONTRACTOR'S PERSPECTIVE

Clark Bottner
Shirley Contracting

From the contractor's perspective, ensuring quality in the design process starts with the successful team selection and is followed with a good measure of team building and partnering. When selecting a good consultant team member, the contractor must look for a design firm that recognizes the value of design, is willing to be an equity partner, is agreeable to certain pre-proposal cost reimbursement procedures, exhibits integrity in its business dealings, is willing to take risks, and shares similar interests in the project.

When working with the design firm during the proposal and design process, the consultant must use a collaborative process and be sure to include the contractor at key stages of the design and other stakeholders involved in the design such as subcontractors and utilities.

Finally, the successful execution of a quality design process will be dependent on good communication procedures including a colocation facility that facilitates coordination, a realistic design development schedule, a seamless review process, and a design development goal of achieving a final design with a minimum of review.

Quality Control–Quality Assurance
What Works on Design–Build Projects

ACHIEVING QUALITY ON DESIGN–BUILD CONTRACTS: THE FLORIDA DOT STORY

Ananth Prasad
Florida Department of Transportation

Florida's approach has been to balance innovation against fast tracking of projects using the DB method. Minimum design requirements and variances and exceptions are provided in the RFP. To help the DB proposer understand the intent, Florida conducts question and answer sessions with the DB proposer to provide clarifications. Florida does not allow innovations that deviate from design criteria or specifications. However, innovations attributable to means and methods are encouraged. The proposer must identify all innovative aspects separately.

If the DB proposer identifies specification changes, Florida evaluates the long-term durability of the proposal, and only then is the specification change allowed. Florida watches for cutting edge design issues, as this type at times requires special ability on the part of the contractor to build it right. Institutional controls are set up within Florida Department of Transportation to verify innovative proposals and their details, including thorough peer review.

Before construction begins, the component plans need to be reviewed by the owner, and a released for construction process has to be set up. Florida requires a QC plan from the designer. The designer performs quality assurance reviews of the construction process.

Shop drawings are reviewed for compliance and released for construction. They require an independent review for repair proposal and proposals for acceptance of non-complying elements or work. Efforts are made to distinguish clearly the roles and responsibility for engineer of record and specialty engineer.

In regard to acceptance and testing, Florida reports good success with DB firm quality control. However, the owner must change procedures within its organization to adapt to the DB world.

QC-QA: THE E-470 EXPERIENCE

Mathew M. McDole
E-470 Public Highway Authority

E-470 is a four-lane, controlled-access, 47-mi tollway that roughly forms the eastern half of a circular beltway around the Denver Metropolitan area. All but the first 5 mi of E-470 were developed through two DB contracts.

Although the authority believes a product of good quality was achieved on the first DB project, there were some quality challenges and room for improvement. In both contracts, the DB contractor was responsible for QC, and the owner, the authority, was responsible for QA. Under both contracts, the owner hired an engineering firm as an extension of staff to assist in QA, including construction monitoring, design reviews, document control, and contract administration.

The improvements for the second DB contract were achieved primarily through a strengthening of the QC specifications, strengthening of the owner's QA organization, and improved partnering.

In the first contract, the design–builder was allowed to structure the QC organization without restriction, and QC reported to the construction manager (CM). This led to conflicts between QC and production. In the second contract, QC was required to be managed by a registered professional engineer independent of the DB contractor's production arm and reporting to the project director.

Also, as a member of the DB contractor's team, an independent engineering firm was required to verify and certify project quality. This independent quality verification worked in an integrated fashion on the project team with QC-QA demonstrating good partnering and achieving a quality project. Additional improvements in the second contract included improved inspection and testing coverage, monthly quality reporting and better resolution of nonconformance reports. The authority is now on to its third DB contract with minor modifications of the quality program, and it believes that it has developed an effective and efficient DB QC-QA program.

QC-QA EXPERIENCES ON THE TACOMA NARROWS BRIDGE PROJECT

Thomas E. Baker
Washington State Department of Transportation

The Tacoma Narrows Bridge, which is under construction, is the largest suspension bridge to be built in the United States in four decades. The project will be completed in the spring of 2007.

Through quarterly partnering sessions and mutual endorsement of the quality program, Tacoma Narrows Constructors (TNC) and Washington State Department of Transportation (WSDOT) are one team, and quality is a core value.

Because of the project's complexity and the fabrication of bridge components overseas in Korea, Japan, England, and Canada, there are quality management challenges for TNC and WSDOT. The goal of both parties is to ensure bridge components are manufactured and installed to the highest quality. The TNC management team, consisting of a QC manager (QCM), a CM, and an engineering manager, all reporting to TNC's project manager, are responsible for developing and implementing a projectwide quality program. In addition, a QA manager, a member of the TNC management team, reports to the Joint Venture Board (executive sponsors and management representing the DB project). This manager is responsible for independent surveillance of the implementation of the quality program relating to QC, engineering, and construction. He coordinates with the QCM on matters relating to performance of the quality program and compliance to the DB agreement.

WSDOT personnel are responsible for the oversight of the design, construction, and administration of the project. WSDOT has implemented a compliance audit system to measure and evaluate the level of quality of the project. WSDOT uses field auditors to collect objective evidence of construction activities and materials concerning TNC's adherence to design, construction, and environmental standards.

In the auditing of management systems, WSDOT staff ensures that practices comply with all requirements as they relate to quality, subcontractors, and insurance and project controls. Further, WSDOT uses audit findings to evaluate TNC's quality management practices and

overall compliance to the DB agreement. These results are communicated to TNC for coordination purposes and also reported to the WSDOT executive team.

In addition to the objective tools described above, subjective tools such as monthly awards to recognize crews performing the highest quality work, colocation of TNC and WSDOT staff to improve communication, and open biweekly forums between TNC and WSDOT staff to discuss and evaluate specific quality topics are also employed.

Quality Incentives

INCENTIVES FOR QUALITY DO MAKE A DIFFERENCE: A CONTRACTOR'S PERSPECTIVE

Larry Cochran
Peter Kiewit Sons' Inc.

Project excellence includes giving the same emphasis to quality, as cost, safety, and schedule. DB projects increase the contractor's responsibility for quality. Responsibility for quality includes QC, QA, and owner verification.

There are reasons for the use of incentives. Incentives provide added value, going beyond the minimum contract requirements and enhancing the product to perform better under service; are quantifiable, on the basis of measured data or test results specifically related to goals; are achievable, able to produce a uniform product consistently; provide extra money for product enhancement; and are good for public recognition.

QUALITY INCENTIVES: A FEDERAL PERSPECTIVE

Jerry Blanding
Federal Highway Administration

Special Experimental Project No. 14 (SEP-14), Innovative Contracting, was initiated in 1990. The objective was to evaluate project specific contracting practices that maintain product quality and reduce life-cycle cost. Transportation Equity Act for the 21st Century Design–Build Legislation Section 1307 authorized states to use DB for approved "qualified projects," including intelligent transportation system projects with costs greater than $5 million and other projects with costs greater than $50 million.

Special Experimental Projects 15 (SEP-15), Public Private Partnerships, was introduced as a new FHWA program to encourage tests and experimentation in the entire development process for transportation projects.

INCENTIVES ON DESIGN–BUILD PROJECTS: TWO DIFFERENT APPROACHES

Joseph Gladke
Minnesota Department of Transportation

Two project approaches are offered to illustrate how incentives were used by the Minnesota Department of Transportation (MnDOT) to achieve project objectives. The first project, ROC 52 ($232 million), used postletting incentives. The second project, Interstate 494 ($136 million), did not use postletting incentives but rather incorporated them into the RFP process. ROC 52 used incentives with the following maximum rewards:

- Project schedule: $50, 000/day, maximum $1,500,000;
- Design QC and QA program: maximum $200,000;
- Construction QC program: maximum $200,000; and

- Public relations program: maximum $100,000.

For the I-494 project, MnDOT determined that no postletting incentives would be offered but that certain aspects of the RFP would provide opportunities for the right contractor with the right approach to win the work. To achieve this, RFP selection process included the following:

- Areas of great importance receive higher scoring weights;
- Contractor is rewarded in the proposal scoring for exceeding minimum requirements; and
- Contractor's past performance is considered during evaluations for future projects.

Both approaches to the use of incentives have provided MnDOT with the desired objectives for their projects.

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