

Review of WSDOT's Implementation of Design-Build Project Delivery

TASK 2: BEST PRACTICES IN DESIGN-BUILD PROJECT DELIVERY

Prepared for:
State of Washington
Joint Transportation Committee

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1. Introduction

1.1 Engagement Overview and Objective

The Joint Transportation Committee of the Washington State Legislature engaged a team led by Hill International to study the Washington State Department of Transportation's (WSDOT) use of the design-build project delivery method, with the objective of identifying potential changes in law, practice or policy that will allow WSDOT to optimally employ design-build to maximize efficiencies in cost and schedule, and ensure that project risk is borne by the appropriate party.

The study consists of eight integrated tasks:

Task 1: Prepare basic overview of the design-build and design-bid-build delivery methods.

Task 2: Identify best practices in design-build project delivery.

Task 3: Evaluate WSDOT's current use of design-build project delivery.

Task 4: Propose improvements to maximize cost and schedule efficiencies, and ensure project risk is borne by the appropriate party.

Task 5: Propose next steps for the public and private sectors to adopt the report's recommendations.

Task 6: Work with review panel, legislators and staff workgroup.

Task 7: Prepare and deliver presentations.

Task 8: Prepare and issue draft and final reports.

1.2 White Paper Contents and Structure

This white paper, prepared as the deliverable for Task 2, documents current practices and lessons learned related to the use of design-build for highway construction projects and identifies existing best practices that will serve as the basis for evaluating WSDOT's current use of design-build delivery in Task 3.

Following this introduction, Section 2 presents the results of a state-of-practice review, which was conducted by interviewing 12 departments of transportation (DOT) with active design-build programs as well as selected private sector design-build practitioners (consultants and contractors). Findings are organized into the key topic areas identified below, as noted in the JTC request and supplemented with additional topics suggested by the consultant team:

1. Agency culture, organization and staff development
2. Delivery method selection
3. Project development
4. Design-build procurement processes (delivery options, procurement approach, stipends, ATCs)
5. Risk Allocation in design-build contracts
6. Design-build contract administration (oversight of design and construction)

7. Design-Build Success Factors

Industry perspectives are interspersed within these findings as applicable. Section 3 then compares and contrasts these state-of-practice findings with overarching best practices in design-build delivery from all sectors including water/wastewater, federal buildings, and transportation.

1.3 Study Approach

To identify the state of design-build practice for transportation agencies, the team first identified a broad cross-section of DOTs to interview regarding their implementation of design-build. Considerations used to identify interview candidates included the maturity of their design-build programs, geographical location, and differences in legislation and design-build implementation strategies. Table 1 summarizes the programs interviewed.

Table 1: State DOTs Interviewed

Agency	First Design-Build Project	Total Approximate Number of Design-Build Projects	Size Range of Projects
Colorado	1995	20	\$3M to \$300M
Florida	1987	500+	<\$0.5M to \$200M
Maryland	1998	35	\$20M to \$500M
Minnesota	1996	33	\$1M to \$200M
Missouri	2005	<10	\$18M to \$535M
Ontario (MTO)	1995	60+	\$0.5M to \$55M
North Carolina	1999	111	\$2M to \$460M
Ohio	1995	247	<\$0.5M to \$430M
Oregon	1999	16	\$2M to \$130M
Texas	2003	15	\$80M to \$1B+
Utah	1999	50	\$30M to \$1B+
Virginia	2001	78	\$0.5M to \$100M+

To guide the interview discussions, the team developed a comprehensive questionnaire that addressed the key topic areas identified in Section 1.2 above. A copy of the questionnaire is provided in Attachment A.

All the agencies interviewed were extremely cooperative in providing input and sharing documentation related to their design-build programs. Attachment B presents a compilation of the responses provided by each DOT.

2. Design-Build State-of-Practice Review for Highway Construction

Design-build has been implemented in a variety of ways at the state and local levels. Cultural and organizational factors, enabling legislation and regulatory policies, staff resources and expertise, and the size and competence of local industry, among other programmatic issues and goals, can all drive the strategies used to deliver a design-build program. Despite such diversity in programs, some general trends, as outlined below, can be identified from the interview responses in each of the topic areas of interest. Focus is also placed upon how mature programs have evolved to address issues or to improve or optimize their implementation of design-build delivery.

2.1 Agency Culture, Organization and Staff Development

As acknowledged by all of the agencies interviewed, the traditional policies and procedures developed to support the standard design-bid-build system will not directly transfer to the implementation of design-build. Design-build often demands different skills, processes, and management and coordination efforts for implementation to be successful. Fully integrating the design-build delivery option into a DOT’s capital construction program therefore entails fostering a new cultural and organizational context that establishes distinct roles, responsibilities, and standards for design-build delivery. Trends related to design-build program administration, staffing, outsourcing, professional development, and collaboration with industry are addressed in detail below.

2.1.1 Internal Staffing and Organization

All the agencies interviewed have at least one full-time staff position in Headquarters or the Central Office acting as an organizational unit dedicated to administering and coordinating the design-build program (or an alternative contracting program that includes design-build). As summarized in Table 2, the dedicated Central Office staff ranges from 1 to 86 full-time (F/T) positions. Note that TXDOT is an outlier in that design-build is only implemented for mega or very large projects.

Table 2: Dedicated Design-Build Staff Positions

State	Internal Staffing	
	Dedicated Fulltime Positions	Part time Support
Colorado	1	2
Florida	3	-
Maryland	1	-
Minnesota	2	-
Missouri	1	-
North Carolina ⁽¹⁾	15	-
Ontario (MTO)	8	-
Ohio	1	3
Oregon	1	-
Texas	86	-
Utah ⁽²⁾	1	1
Virginia	8	-

⁽¹⁾ Staff are dedicated to both design-build and P3 delivery

⁽²⁾ 1 F/T manager overseeing design-build and CM/GC programs, supported by 1 P/T position focused on design-build and 1 P/T position on CM/GC

The level and mix of staffing for each of the design-build programs depends upon a number of factors including the DOT’s management culture (i.e. centralized versus decentralized), program size, source of funding, and level of outsourcing. For example, NCDOT describes itself as a centralized organization where all design-build projects are developed, procured, and managed at the Central Office with a dedicated team of 15 F/T staff. In contrast, FDOT, despite its large design-build program (over 500 design-build projects total), largely has a decentralized management structure where the District personnel have the authority to develop, procure, and deliver design-build projects using consultant resources; the Central Office staff in FDOT’s case primarily acts to establish policies and procedures and as a sounding board for issues. In fact, for the majority of the DOTs interviewed, the primary role of the dedicated Central Office staff, at the programmatic level, is to develop and maintain design-build contract and procedural documents and to provide training and outreach to internal and external stakeholders.

Most Central Office staff rely to some extent on internal subject matter experts (e.g., in structures, environmental, geotechnical, etc.) to support the development of design-build documents and/or District or Regional personnel to assist with the program on an as-needed basis. These supplementary resources can be effective if they have had adequate exposure to the design-build process through either training or project experience.

At the project level, Central Office staff may oversee the development and procurement of design-build projects through the award stage. After award, design-build project execution and contract administration is generally managed by District/Regional construction staff assigned to the project team.

2.1.2 Consultant Use

In addition to obtaining assistance from in-house technical staff, most agencies also rely on outside consultants to support the development and/or administration of their design-build programs. As summarized in Table 3, consultants are most often used to assist with development of solicitation documents and preliminary engineering.

Table 3: Use of Outside Consultants

State	Development of Solicitation Documents	Project Development and/or Preliminary Engineering	Design Oversight	Construction Engineering and Inspection
Colorado	X			
Florida		X		X
Maryland		X		
Minnesota	X		X	
Missouri	X			
North Carolina				
Ontario (MTO)	X	X		
Ohio		X		X
Oregon	X		X	X
Texas	X	X		
Utah		X		
Virginia		X	X	X

Some correlation can be seen between size of a DOT’s design-build program and its reliance on outside consultants. Those agencies with larger design-build programs, either by number or size of design-build projects, (e.g. FDOT, TXDOT, and VDOT) tend to be highly outsourced, with consultants used for multiple aspects of project development and management, including preliminary engineering, design oversight, and construction engineering and inspection (CEI). [NCDOT, which also has a large design-build program, is an exception to this finding in that it has chosen to

build up a relatively large internal group of 15 dedicated staff positions instead of relying on consultants.] Agencies with lower levels of outsourcing tend to use consultants more selectively where specialized expertise is required.

As programs mature, consultant involvement may decline to some extent. Some agencies (MnDOT, MoDOT, Oregon DOT) noted that they relied heavily on consultants to develop their initial design-build programs, prepare standard templates, and assist with training and/or staff development. However, as internal staff gained more experience with design-build, the need for consultant assistance became less critical. For example, MnDOT indicated that although it views outsourcing to be a “good startup model,” it is now seeking to internalize more design-build functions. Similarly, MoDOT reported that after its first 3 design-build projects, it was able to scale back consultant use and now only retains consultants to provide expertise in discipline areas for which it lacks resources in-house. Expressing a similar sentiment, Oregon DOT noted that if it were to pursue design-build projects again in the future, consultant use would be based on project needs and available internal resources.

Given the potential conflict-of-interest issues that may arise, DOTs generally preclude consultants that assist with preliminary engineering and site investigation efforts from participating on design-build teams. To attract the interest of consultants that may otherwise be inclined to wait for opportunities to participate on design-build teams, MnDOT retains consultants, typically for 5-year terms, to work exclusively for the Department under General Engineering Consultant (GEC) agreements. These long-term arrangements allow MnDOT to efficiently issue work orders to on-call consultants as necessary for assistance with project scoping and RFP development activities.

2.1.3 Programmatic Design-Build Infrastructure (Guidance, Templates, and Training)

To promote programmatic consistency, all of the DOTs interviewed have attempted to formalize their processes to some extent through the implementation of some, if not all, of the following techniques:

- **Standard Templates and Forms:** Most DOTs have developed, often with consultant assistance, standard templates and forms (e.g., Request for Qualifications, Instructions to Proposers, Requests for Proposals, Design-Build General Provisions, standard performance specifications, etc.) containing boilerplate language as well as instructions for tailoring requirements to project-specific conditions. Use of such templates can help reduce the effort needed to develop and review solicitation and contract documents for specific projects, while also ensuring that roles and responsibilities related to design, quality, third-party coordination, and similar requirements that may change under design-build are clearly and adequately defined. They also help the DOT focus programmatically on its design-build procurement, contracting, and execution procedures.

From industry’s perspective, the familiarity and comfort level afforded by an owner’s repeated use of standardized documents can facilitate their bidding processes and lead to better proposals, especially if industry groups had some involvement in the initial development of these templates.

DOTs that do not currently maintain template documents (e.g., MoDOT), would like to develop them in the future as a means to streamline their project development process.

- **Procedural Guidance:** To help transfer and preserve design-build knowledge and promote consistency in contract administration, several DOTs (CDOT, FDOT, MDSHA, MoDOT, MTO, NCDOT, and VDOT) have developed design-build manuals or guidance documents. For example, the MTO has created a detailed Contract Administration Manual for DB that addresses changes in roles and responsibilities, design administration, construction administration, and inspection.
- **Training/Workshops:** Most of the agencies interviewed have instituted some type of formal training program. For example, each year Florida DOT, through its Design-Build Task Force, conducts training to District and Project Engineers on specific design-build topics. Similarly, Colorado, Ohio, and Virginia DOTs have developed classroom design-build training modules addressing project development, procurement and contracts, and post-award contract administration. The training may include role playing, exercises, and case studies designed to enhance understanding of design-build delivery.

UDOT has successfully used peer-to-peer information exchanges as a way to transfer design-build knowledge to targeted audiences. For example, if a project manager, who is not that well-versed in design-build processes, is identified for a future project, he/she will be brought on to observe or shadow an experienced project manager assigned to an active design-build project. UDOT has also found it beneficial to organize face-to-face meetings between current design-build project teams that are in the post-award project phase with teams that are still in procurement to discuss any lessons learned. Similarly, UDOT has organized training for project team members assigned to specific roles, with a focus on what individuals assigned to those roles in the past would want to convey to future team members (e.g., top 10 design phase tips).

Some agencies also noted that they often hold workshops with individuals serving on technical proposal scoring committees to emphasize the need to score only against the minimum requirements stipulated in the RFP rather than according to their own preferences.

- **Tracking Performance Metrics and Lessons Learned:** Only a few of the DOTs interviewed (FDOT, MDSHA, MnDOT, and MTO) currently track performance metrics. FDOT and MDSHA track project performance outcomes such as cost increases, time increases, and number of claims. MnDOT monitors more process-oriented metrics such as the DOT's time to respond to ATCs, number of clarifications needed, and variances between promised versus actual dates related to the procurement process.

The remaining interviewees all noted that they viewed performance monitoring to be a best practice that they would like to implement in the future, pending available resources. Several DOTs also expressed a desire to better document and raise awareness of lessons learned, which were viewed by some to be just as, if not more, important than tracking metrics. However, as explained by UDOT, tracking performance metrics and lessons learned can be very resource intensive. Although it has recently conducted a review of change orders on design-build projects, UDOT has not yet established a standing database that aggregates all of the data. Similarly, CDOT noted that design-build project teams often conduct lessons-learned workshops or after action reviews, but no centralized repository has been established to archive such information.

2.1.4 Internal/External Design-Build Issues

For most agencies, design-build did not emerge as a fully viable alternative to design-bid-build overnight, with both internal DOT staff and industry exhibiting some reluctance to supporting its use. Some DOTs (e.g., VDOT) noted that this was particularly true in its rural districts. Over time, as design-build programs matured, such resistance has generally declined, indicating a steep though not insurmountable learning curve.

The primary concerns of internal and external stakeholders regarding design-build are discussed below, along with some methods employed by DOTs to help overcome these challenges.

Internal Issues. Under the traditional design-bid-build delivery approach, a DOT (or alternatively, a consultant retained by the DOT) will prepare complete plans and specifications that fully define project requirements. These design documents are then used to procure construction contractors (typically on a low-bid basis) to build the project in strict accordance with the DOT's design. In contrast, under design-build delivery, the design-builder, and not the DOT, is the Designer-of-Record responsible for the final project design, in addition to construction of the project in accordance with this design.

Before embracing the use of design-build, DOT personnel had to thus grow accustomed to relinquishing some control over the final design as well as to performing some new and often unfamiliar job responsibilities. For example:

- Design staff must focus their design efforts on developing scopes of work in terms of minimum requirements and expectations – a task that can often be much more challenging and resource-intensive than developing 100% complete designs based on the agency's standard specifications and standard details. Additionally, if implementing a best value procurement process, DOT personnel must develop meaningful criteria for evaluating proposals that align with the goals of the project and reveal clear differences among the proposers.

Such tasks often require the active involvement of more senior or seasoned staff, with less opportunities to delegate work to junior staff members.

- After award of the design-build contract, DOT staff must then act in an oversight role, performing “over-the-shoulder” design reviews as the design-builder prepares its final design. Note that the design-builder’s role as Designer-of-Record does not diminish the DOT’s responsibility for ensuring that the final design complies with the technical criteria and performance requirements outlined in the procurement documents. However, in enforcing these contract requirements, DOT personnel must take care not to direct, complete, or otherwise actively control the design-builder’s engineering and design efforts so as to avoid inadvertently shifting design risk back to the DOT and/or resulting in scope changes that increase project costs.
- The manner in which the DOT administers a design-build contract, particularly with regard to measurement and payment and quality assurance and quality control, may also differ from the standard approach taken on design-bid-build projects. For example, if the design-build contract were to delegate construction quality management to the design-builder, the DOT’s inspection staff would then replace their traditional quality assurance responsibilities with more of a verification and acceptance role. Similarly, design-build contracts are generally awarded on a lump sum basis, which requires methods other than the standard measurement of quantities to determine progress and payment (e.g. use of cost-loaded project schedules).

The development and maintenance of design-build procedural guidance, standard templates, and formal training programs can help impart the necessary knowledge, lessons-learned, and skills upon DOT staff assigned to deliver design-build projects. Gaining experience on design-build projects and realizing firsthand the potential benefits design-build can offer can act to further dispel any fears or misconceptions related to design-build use.

As suggested by one DOT, it remains important to recognize that some staff may have difficulty transitioning to the design-build process and that some individuals may never fully adapt. Having an organizational unit dedicated to administering and coordinating the design-build program can help eliminate this issue.

External Issues. Similar to their DOT counterparts, industry also required some time and experience with design-build to embrace its use. Some of the more common issues with design-build that have been expressed by the industry include:

- Subjectivity of evaluation and selection process
- Cost of preparing technical proposals and inadequacy of stipends for shortlisted firms
- The size of design-build projects limiting the ability of smaller contractors to participate in design-build and challenges regarding teaming.

All of the DOTs interviewed indicated that they currently partner with industry in developing the design-build program and meet regularly, which results in greater support for the program. Some of the solutions to the issues noted were:

- Including a healthy mix of projects (both size and type)
- Regular meetings with industry
- Thorough debriefing of proposers with unsuccessful proposals to clarify the reasons why they were unsuccessful

2.2 Delivery Method Selection Process

With regard to the decision to apply design-build to a given project, all of the interviewees acknowledged the following:

- Design-build is not appropriate for all projects.
- The decision as to which delivery approach best aligns with a given project’s characteristics, goals, risks, and constraints should be made relatively early on in the project development process.
- Expedited project delivery was by far the most common reason design-build was chosen, with the DOT’s interest in obligating funds for the entire project being regularly cited as well.
- Other key considerations when contemplating use of design-build delivery should include factors such as:
 - Need for expedited delivery schedule
 - Design flexibility and/or opportunities for innovation
 - Ability to define the scope for both design and construction without 100% complete designs
 - Risks that can be effectively and efficiently managed by the design-builder

Where the DOTs diverged in their responses relates to the tools or techniques used to support the decision-making process. Some DOTs, including CDOT, MDSHA, MnDOT, and MTO have implemented formal decision tools similar to or modeled after the Project Delivery Selection Matrix (PDSM) developed for the Transportation Pooled-Fund Study, TPF-5(260). As discussed in the first white paper, the PDSM provides a systematic process for considering a project’s goals and constraints and then evaluating the opportunities and challenges associated with each delivery method under consideration. Using such a structured approach lends transparency and consistency to the decision process – a key benefit that the interviewees noted was particularly useful for justifying the delivery decision to executive leadership, stakeholders and the public. For example, VDOT requires a formal decision by the Commissioner (Finding of Public Interest) that design-build is in the best interest of the Commonwealth of Virginia based upon a conclusion that project delivery needs to be expedited and an evaluation of other Objective Criteria (a defined statutory term).

The remaining DOTs, which form the majority of those interviewed, use less systematic processes to make their project delivery decisions, but have nonetheless established guidance or criteria for appropriate and/or inappropriate application of design-build. Such screening criteria have generally been informed by each DOT’s past experience with design-build. Prior to finalizing the decision, a risk workshop may also be performed to ensure that the delivery method aligns with the risk allocation strategy selected for the project. As the owners that use these more ad hoc decision processes include agencies such as FDOT, NCDOT, and ODOT – whose design-build programs are among the oldest and most active in the United States – suggests that as the use of design-build becomes more ingrained in the culture of an organization, less deliberation and formal justification may be needed to support the decision to use design-build on a particular project.

Industry Perspective

The decision by the private sector to pursue a design-build project is not taken lightly. For very large projects, putting out a request for a letter of interest is an effective first step to gauge industry interest and clarify scope and requirements. Projects should be large enough to justify the effort and have the potential for innovation to distinguish the team. Greenfield projects, highway or bridge projects on new alignments, offer the greatest opportunity for creativity and cost and time savings. Interstate widening projects are excellent candidates for design-build, but not for innovation, just for time savings. Some designers are not interested in pursuing projects where innovation is not the primary objective. The cost to pursue (i.e. submittal requirements and stipend) and the perceived project risks and how they can be managed is factored into the decision.

2.3 Project Development by the Owner or Public Agency

Design-build fundamentally changes the traditional project development process. Instead of taking design to 100% completion, the key project development task for the owner or DOT is to instead craft an adequate and realistic project scope that will ensure the needs of the agency and other stakeholders will be met, without materially compromising the intended risk allocation strategy, stifling creativity and innovation, affecting value for money, or otherwise detracting from project goals.

All of the DOTs agreed that meeting this objective required performing sufficient preliminary engineering to obtain the necessary environmental clearances and to adequately understand and define project risks. Note that although federal regulations allow agencies to issue RFPs and select design-builders prior to completing the National Environmental Policy Act (NEPA) process, none of the DOTs interviewed expressed a desire to pursue such an approach.

As the project scope represents the DOT’s last chance to fully influence the design, its development should be carried out with extreme care. The following lessons learned related to scope development activities were cited during the interviews:

- The scope needs to address both what the DOT wants and does not want with regard to design options.
- Limiting scope development activities to a core group of staff that fully understands the design-build process generally results in better proposals and pricing.
- Project goals should inform the level of design and the decision of whether or not to use performance specifications. For example, if contractor innovation is the primary goal, the preliminary design should only be advanced to the level needed to identify the minimum requirements and technical criteria in accordance with the risks to be allocated to the design-builder. Performance specifications should then be used to the extent possible to provide the greatest opportunity for flexibility and innovation.

In contrast, if an expedited delivery schedule is the motivating factor for using design-build, a higher level of design and prescription may result in better pricing and allow for a quicker and more streamlined procurement process (e.g., low bid). As explained by NCDOT, even with prescriptive specifications, design and construction flexibility can still be achieved through the Alternate Technical Concepts (ATC) process.

2.4 Design-Build Procurement and Delivery Options

This topic area addresses the processes used by DOTs to solicit, evaluate and select design-builders. It also addresses different design-build delivery options currently used in the highway construction industry. In some cases, design-build state legislation specifically defines how the procurement process will work (e.g. the Task 1 overview of design-build noted that Minnesota’s enabling legislation defines specific requirements for a two-step best-value process including a short-listing phase and a final proposal and selection phase for short-listed proposers).¹

2.4.1 Design-Build Procurement Options

A wide variety of procurement options are being used by the agencies interviewed. Such differences are in keeping with the FHWA Final Rule on Design-Build Contracting, which grants agencies broad discretion in selecting a procurement approach appropriate for the specific needs of a given program or project. The most common distinction in procurement strategies is between a low bid design-build process and a best-value design-build process. This distinction and defining characteristics are briefly summarized in Table 4.

Table 4. Comparison of Low Bid and Best Value Procurement

	Low Bid Design-Build	Best Value Design-Build
Description	Selection of design-builder based on lowest price	Selection of the design-builder based on price and other factors including qualifications, experience, and technical solutions

¹ See Minnesota MSA 161.3410 to 161.3426

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	Low Bid Design-Build	Best Value Design-Build
Rationale	<ul style="list-style-type: none"> • Streamline procurement • Time-savings 	<ul style="list-style-type: none"> • Encourage industry innovation to get better designs, constructability, or enhancements resulting in cost or time savings • Select the best qualified team
Applicability	Smaller projects, with less flexibility or room for innovation	Larger, more complex projects with more flexibility or opportunity for innovation
Process	Submission of separate pricing and qualifications packages with selection of lowest priced offeror (meeting the qualification requirements)	Most often implemented as a two-step process: Phase 1 - submission of a qualifications package followed by evaluation and shortlisting 3 to 5 proposers Phase 2 - submission of technical and cost proposal followed by evaluation and selection of the design-build team offering the best value in terms of cost and other factors

The experience of the DOTs interviewed with the low bid and best value design-build approaches is summarized in Table 5. (For informational purposes, the table also identifies those agencies that use CM/GC, which, although not a form of design-build, represents another alternative to design-bid-build delivery.)

Table 5: Summary of DOT Experience with Different Procurement Strategies

State	Low Bid Design-Build	Best Value Design-Build	CM/GC
Colorado ⁽¹⁾		X	X
Florida ⁽²⁾	X	X	X
Maryland	X	X	X
Minnesota	X	X	X
Missouri		X	
North Carolina	X	X	
Ohio	X	X	
Oregon	X	X	X
MTO	X	X	X
Texas		X	
Utah	X	X	X
Virginia	X	X	

⁽¹⁾ CDOT used the low bid design-build approach once but does not plan to use it again

⁽²⁾ FDOT has used CM/GC, but it is not that common

With this basic distinction between low bid and best value in mind, some of the more mature DOTs have the flexibility to use multiple procurement strategies or delivery options to meet the unique needs of a given project. For example, FDOT, UDOT, MnDOT, CDOT, VDOT, Ohio DOT, MTO, MDSHA, and others have the ability to use (and have in fact used) both a two-step best value and more streamlined procurement options (e.g., one-step best value, or one or two-step low bid) with design-build delivery. Streamlined design-build procurement is most often applied to smaller projects having clearly defined scopes of work and lower risk, and where innovation is not sought. Conversely, best value is applied to larger, more complex projects where innovation and alternative means and methods are possible. Flexibility with regard to procurement options is perceived to be beneficial by these agencies in that it allows them to tailor the procurement effort to the project type in the interest of saving cost, time, and effort. Furthermore,

implementing design-build for smaller projects (NCDOT, TxDOT) is perceived as a beneficial approach allowing firms with less design-build experience to participate and grow the pool of qualified design-build contractors and designers.

2.4.2 Other Design-Build Delivery Variations

As summarized in Table 6 and described further in the narrative that follows, DOTs have implemented design-build in other noteworthy ways to control costs or achieve more efficient delivery.

Table 6: Design-Build Delivery Variations

Description	Procurement Selection	Characteristics
Design-Build with Options or Design-Build Maximum Price	Selection based on base bid with options not to exceed budget & representing the best value to the owner	A strategy to control cost by seeking the maximum scope for a defined budget ceiling
Bundled Design-Build	Low bid or best-value selection	Bundling small projects (e.g. bridge rehabilitation) under a single design-build contract to accelerate delivery and achieve efficiencies in design, environmental permitting, and construction sequencing
Progressive Design-Build	Qualifications-based or best-value selection	Hybrid of General Contractor/Construction Manager (GC/CM) and design-build. Project can be delivered in phases or progressive work packages
Design-Build with warranty or maintenance agreements	Low-bid or best-value selection	Design-Build for preconstruction and construction combined with additional post-construction scope and responsibilities for maintenance and/or operations phases in some cases with deferred compensation
On-call Design-Build	Qualifications-based with negotiated pre-determined pricing for specific work items	Establishment of a pool of prequalified firms. These firms can then be brought in more rapidly for emergency work or specific work items with pre-set pricing

Design-build has been implemented under the best value umbrella to control costs by asking the industry to provide the most scope or best design solutions within a defined budget ceiling. **Design-Build with Optional Scope** (FDOT, VDOT) asks proposers to provide a base bid and options in a specific order (priority) not to exceed the stipulated budget. **Fixed price, Variable Scope** (MnDOT), **Design-Build Maximum Price** (FDOT), and **Fixed Price, Maximum Scope** (UDOT) ask proposers to offer the most scope (e.g. lineal feet of paving) for a fixed price. **Fixed Price, Best Design** (MoDOT) asks proposers to offer design solutions that represent the best value to the owner within a fixed price.

DOTs have also bundled multiple small projects (e.g. small bridge rehabilitation) under single design-build contracts to accelerate delivery and achieve efficiencies in design, environmental permitting, construction sequencing, and quality management, particularly when the projects are located within a similar geographic region and qualify for a categorical exclusion under 23 CFR 771.117 (and thus not require an extensive NEPA review process). MoDOT recently completed a design-build best value bundled program to replace 554 bridges under a single design-build contract amounting to \$487M. According to FHWA, the program was completed 10 months earlier than required. The average bridge closure for the 493 bridges was 45 days, nearly half of what a typical Missouri DOT bridge project requires. PennDOT is adapting the same bundled approach for an even larger bundled bridge rehabilitation program involving 560 bridges using a Design, Build, Finance and Maintain delivery method with a 42-month construction phase and a 25-year maintenance responsibility for each bridge.

Despite the potential for greater efficiencies under a bundled design-build program, some DOTs noted that having to satisfy a large number of permitting agencies with overlapping jurisdictions can hinder the efficient delivery of a bundled program. Oregon DOT, under its statewide bridges program, was able to streamline the environmental review process by using a batched or programmatic permitting process. For example, the DOT worked with the US Army Corps of Engineers to develop a single regional general permit to cover the permitting needs related to Section 404 and 401 of the Clean Water Act for nearly all of its relevant bridge replacement or repair projects.

NCDOT also uses bundled design-build for small bridges using a low bid process called **Express Design-Build** where high level scope is standardized and contractors are allowed a flexible window of time to sequence and complete the bridges as part of contract work. The bridges are bundled based on geographic proximity and type. Once a road/bridge is closed and construction starts, there is a set amount of time to complete each project. NCDOT also uses a concept called **“Nested Design-Build”** under a low bid process where the contractor will engage a designer to perform a portion of the work.

Several of the DOTs interviewed, as identified in Table 5, have implemented **Construction Manager/General Contractor (CM/GC)** as an alternative to design-build.² CM/GC is a delivery system where the DOT engages a construction manager (CM) to act as the agency’s consultant during the pre-construction phase and as the general contractor (GC) during construction. During the design phase, the CM acts in an advisory role, providing constructability reviews, value engineering suggestions, construction estimates, and other construction-related recommendations. At a mutually agreed upon point during the design process, the CM and the agency will negotiate a Guaranteed Maximum Price (GMP). At this point the CM acts as a General Contractor to manage and construct a project for the GMP. In some cases, the work will be structured in progressive work packages to allow early construction work to commence concurrent with design development. The DOTs that use CM/CG noted that it was most applicable to projects for which the scope is difficult to define and estimate, or projects having significant risks that are better managed collaboratively or retained by the owner

Progressive Design-Build is similar to CM/GC where the design-builder is selected largely based on qualifications, and will negotiate a GMP or lump sum price and develop progressive work packages to allow for early construction work to commence before design completion. However, unlike CM/GC, a progressive design-build entity will be responsible for integrated design and construction work, and will be legally responsible under a single point of responsibility theory of liability.

Design-build is in some cases combined with post-construction **warranty** or optional maintenance agreements. TxDOT and MnDOT have default warranty provisions in their design-build contract documents.

Lastly, MnDOT and FDOT use an **“On-call” or Pushbutton Design-Build** where prequalified firms can be brought in more rapidly for emergency work or specific work items with pre-set pricing. For example, MnDOT used an on-call approach for the installation of rural intersection conflict warning systems, for which a set cost was established for four different intersection configuration types.

2.4.3 Best-Value Evaluation and Selection

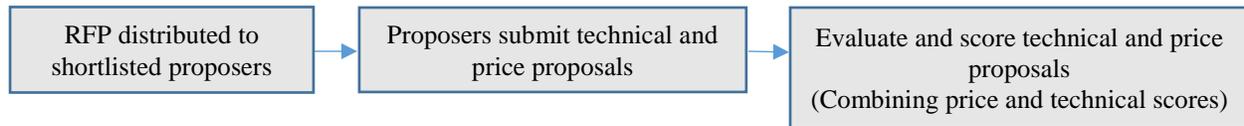
With regard to methods for best value selection of a design-builder systems, the majority of the DOTs interviewed use point-based systems or formulas for scoring and selecting the design-build team. This typically involves a two-step process where in step one, the top 3-5 firms (highest combined scores) are shortlisted. One agency, FL, carries the qualification scores through the process and uses the step one RFQ score in the step 2 evaluation.

Phase 1: (draft RFP often included in RFQ solicitation package)



² CM/GC is comparable to the General Contractor/Construction Manager (GCCM) delivery option available to WSDOT.

Phase 2:



The shortlisting process has in some cases resulted in protests or pressure from design-build contractors that did not get shortlisted, but both DOT and industry generally support limiting the number of proposers invited to submit a Phase 2 proposal to get the most qualified teams and increase the design-build team’s chances of success.

Point-based formulas used for Phase 2 selection include adjusted bid,³ weighted criteria,⁴ and price adjusted by quality or technical credits.⁵ The mathematical combination of price and non-price factors are often weighted such that the apparent best value is lowest price proposer (e.g., 80% price and 20% non-price factors). Some DOTs agencies (FDOT, UDOT) have also incorporated a time value calculation to adjust the price based on accelerating milestones or the completion date.

One DOT (MDSHA) is using cost and technical trade-offs in lieu of point-based ratings and formulas. This approach is similar to the selection processes used by Federal agencies (e.g., Corps of Engineers and NAVFAC). While proponents of this approach believe that it gives the owner maximum flexibility in procurement decision-making and reduces the likelihood of disputes over selection decisions, data from Federal sector design-build projects suggest that disputes related to subjectivity using a trade-off analysis are equally as likely.

Another key consideration in developing an effective procurement process is identifying appropriate evaluation criteria. Owners are often challenged to use meaningful “differentiators” for selecting the design-build team. For example, asking for a proposer’s general management plan is less meaningful than asking for a plan that will minimize the risks of critical utility conflicts on the project. MnDOT recently implemented a more formal process for determining technical weightings. Weightings are tied to assessments of the importance that the factor has in achieving project goals. To streamline the evaluation process, certain factors, for example the Design-builder’s financial balance sheet, are not point scored but rated on a pass/fail basis based on meeting a minimum threshold.

2.4.4 Alternative Technical Concepts

An Alternative Technical Concept (ATC) is a request by a proposer to modify a contract requirement, specifically for that proposer’s use in gaining a competitive benefit during the bidding or proposal process. An ATC should provide a solution that is equal to or better than the owner’s base design requirements. Most of the DOTs interviewed reported that the use of ATCs during the procurement process has been a powerful and key source of innovation or cost savings particularly for more complicated projects. However, several DOTs also noted that reviewing ATCs can be time consuming and require significant time and effort. FDOT and NCDOT reported that proposers in some cases submit “strategic” ATCs to clarify the base requirements, or to receive assurance that an idea will be acceptable. To reduce the time and streamline the process, DOTs have capped the number of ATCs it will review or defined pre-approved or pre-accepted elements for use in ATCs in advance to reduce the level of effort or risk in submitting them as part of technical proposals. In return for a stipend, the proposer may also execute an agreement that allows the agency to use the proposer’s ideas. DOTs (TxDOT, CDOT) reported that they have asked the successful proposers to incorporate the ATCs of unsuccessful proposers.

Stipends are an essential tool to stimulate competition and motivate the industry to innovate. They are awarded to shortlisted proposers as a percentage of the contract value (e.g. 0.2-1.0%). Stipends are in some cases specifically defined and limited by statute. When DOTs are not constrained by statute, they nevertheless use them routinely. In

³ An *adjusted bid* approach entails selecting the proposer that has the lowest adjusted bid, calculated as price ÷ technical score

⁴ Using a *weighted criteria* approach, award is made to the proposal that receives the highest Total Score, as calculated using the following formula:

$$\text{Total Score} = W_1S_1 + W_2S_2 + \dots + W_iS_{2i} + W_{(i+1)}PS$$

Where, W_i = weight of factor i ; S_i = score of factor i ; PS = price score

⁵ Using a *price adjusted by quality credits* approach, award is made to the proposer having the lowest adjusted price calculated as follows: Adjusted price = Price – Quality Credits

response to industry concerns and pushback that stipend amounts are insufficient, DOTs have trended towards increasing stipend amounts where a larger proposal efforts are required to motivate industry to submit better proposals.

2.4.5 One-on-one Meetings

One-on-one meetings are confidential meetings between the design-builder and DOT staff. They are considered by all the DOTs to be a key communication practice at various points during the procurement process. They are used for a variety of purposes including information exchanges prior to the release of procurement documents to minimize risk. They are used for initial scoping meetings conducted by FDOT to ensure that all proposers understand the proposal requirements. Confidential meetings are an integral part of the ATC process to clarify and discuss ATCs, and are also used to discuss and clarify proposals as part of the final evaluation and selection process. There are a variety of issues associated with conducting one-on-one meetings depending upon the Freedom of Information Act (FOIA) requirements in a state.

Industry Perspective

Industry respondents generally agree that the procurement process for design-build (particularly a two-step process, where proposers are short-listed and then required to submit technical proposals in phase two) can be burdensome, requiring significant effort to provide technical submissions that are not fully compensated for in the stipends offered. Design firms often work at a reduced fee (overhead multiplier on direct costs) to respond to RFPs. In some cases industry commented that procurements were too rushed while others too lengthy. A key consideration for designers is that the RFP requirements must be clear and allow flexibility for innovation. Also, a beneficial practice is to release the draft RFP document with the RFQ in the shortlisting phase so that the industry can better understand the technical requirements early in the process and make more informed business decisions as to whether or not to compete.

In the same vein, because ATC's are clear differentiators, the DOT must be open to changes in specification requirements to allow for reasonable ATC concepts. It is better to vet ATCs as part of preliminary one-on-one meetings to shortcut the effort to pursue. Furthermore, one-on-one meetings can be very effective. Multiple meetings are recommended. Finally, selection decisions must be clearly justified and supportable.

2.5 Risk Allocation in Design-Build Contracts

As part of the interview process, DOTs were asked about the design of their contracts, specifically focusing on how key risk areas – including differing site conditions, permitting, coordination with utilities and third parties, and right-of-way (ROW) – were addressed.

An overarching philosophy expressed by respondents was that risks are best allocated to the party best able to manage the risk for the specific project. That philosophy resulted in DOTs adopting risk sharing approaches for most of the key risks. Most of the DOTs advocate conducting a project risk assessment as early as possible as a standard practice so that risks can be properly allocated in the contract. More specific discussion for these risk areas follow:

- **Differing Site Conditions (DSC):** DOTs allocate the risk of encountering subsurface conditions that are materially different than anticipated or planned (i.e., a “differing site condition”) in a variety of ways. At one end of the spectrum, several DOTs reported that they expected the design-build team to build the risk of DSCs into their bids – thereby shifting the risk of subsurface conditions to the design-build team. At the other extreme it was reported that the DSC risk is essentially retained by the owner consistent with federal contract provisions addressing DSC for standard design-bid-build contracts. For known preexisting hazardous subsurface materials DOTs may use a time and materials approach to payment or set up an owner allowance for the purposes of paying for removal of hazardous materials.

For large, complex contracts, some DOTs reported that DSC impacts, for example delays and/or additional costs related to DSCs, may also be shared. For example, the design-builder may be responsible for delays and costs to a defined ceiling, above which the DOT would be responsible for additional delays and costs above the defined ceiling.

For DOTs that transfer greater DSC risk to industry for design-build projects, a key prerequisite is that the DOT perform reasonably detailed subsurface investigations, perform more borings that would normally be performed, or compensate proposers to perform additional site investigations prior to their submitting proposals. In return the DOT will not accept DSC change orders. Another strategy is to require the design-builder to conduct a post-award scope validation of subsurface conditions, and issue a change order to pay for a DSC only for conditions discovered during the scope validation period.

- **Permitting:** The risks related to permitting typically involve completion of environmental documents and resource agency permits for design-build projects. The risks typically entail delays in obtaining and maintaining the required project permits or mitigating environmental impacts. Most of the respondents indicated that the DOT, as the permit holder, retains the primary responsibility and risk for permitting; however, the D-Builder will often be required to assist with the permitting process and may be responsible for modifying the permit if a proposed alternate design concept requires it. Though the FHWA final rule allows the issuance of the RFP before environmental clearance, the DOTs interviewed generally require the completion of environmental documents before the final RFP is issued.
- **Utility and Third Party Coordination:** Different approaches are used to manage utility/third party coordination risks depending on the statutes, the specific project conditions, or level of control a DOT has over utilities and third parties. Generally, the DOTs will try to mitigate third party risks by coordinating with municipalities and railroads (obtain consents, easements, and agreements) in advance of issuing an RFP. Some DOTs enter into master utility agreements or can claim eminent domain over utilities in the Right of Way (ROW). Others transfer responsibility for “wet” (i.e. water and sewer) utilities to the design-builder or evaluate proposers on their ability to minimize or avoid utilities. If utility relocations are necessary, some DOTs use a utility reserve account and incentivize the design-builder to come in under the reserve account and share in the savings or pay up to stipulated amount and require the design-builder to absorb any costs above the allowance.
- **Right of Way:** The responsibility for acquisition of ROW and easements are generally retained by the DOT. If ROW responsibility is delegated, the design-builder will develop the ROW map, compile ROW information and conduct appraisals, and DOT ROW department will review and approve each step and handle the legal work. In some cases, acquisition costs are included in the pricing and proposers are evaluated based on minimizing the ROW costs. In others, if the design-builder proposes a different concept or alignment, the ROW risk is on the design-builder.

Industry Perspective

From the industry’s perspective, in some cases risks are pushed too far towards industry, who find them difficult to manage or price. Contracts need to carefully address risk allocation for the project, and not be poorly adapted from existing design-bid-build contracts. For design-build projects, the industry will typically shoulder a greater share of the contractual risk than for design-bid-build; however, design-build should not turn risk allocation upside down and shift all of the risk to industry. For example, owner reference documents should be able to be relied upon by proposers, and limiting the DSC clauses for unforeseen site conditions can be problematic. Capping risks or risk sharing will help.

2.6 Design-Build Contract Administration

One of the key areas affecting design-build project success involves practices for owner monitoring, supervision, and oversight during project execution. The design phase in particular is a critical area where roles and responsibilities between the owner and design-builder must be clearly defined. The DOTs interviewed agreed that DOT and consultant staff need to understand that design reviews require a quicker turnaround than would be the case for a standard design-bid-build contract and should be limited to auditing to evaluate compliance with the approved scope design criteria, and design-builder’s quality plan. Some DOTs streamline the review process, bring on additional staff, coordinate responses, or establish set limits on timeframes and stress the importance of the expedited process. DOT design staff may in some cases get too picky with their design preferences, which bogs down the process, and

leads to delays in getting designs completed. Most agree that co-location and over-the-shoulder reviews greatly help to expedite the design review process.

Similarly, the approach to construction oversight is to perform audits during construction to ensure that the design-builder is complying with the contract and following its quality management plan (QMP) for construction. QMPs typically define hold points or critical activity points where the DOT or consultant staff must ensure that the work complies with contract requirements before moving to the next stage. Regarding quality management, for some DOT design-build programs the design-builder performs QA or uses a third party quality firm to perform QA. Other DOTs are taking back QA responsibility. Design-builder quality control test results are often used for acceptance (TxDOT, MoDOT, FDOT, and MTO) with the DOT performing verification testing. TxDOT also uses a risk-based approach for acceptance for design-build projects that adjusts the level of verification testing based on the inherent risks in the material properties.

Industry Perspectives

From industry's perspective, the relationship between the designer and builder is key. Designers used to dealing with owners in some cases have difficulties working in a design-build environment. Teaming partners typically form strategic relationships. Teaming agreements among designer and builder should clearly spell out expectations, compensation, etc. Co-location with owner, contractor, and design staff is very important. Owner design reviews sometimes do not take into account how owner reviews should change from detailed reviews to auditing for compliance with contract requirements. For example, DOT bridge engineers often review plans the same way for design-build as for design-bid-build and owner preferences are given too much weight. Some comments show up very late in the game at 90% plans that should have been made at 30% plans, which further delays the design process. Owner design staff must understand how their approach to reviews must change with design-build.

Formal partnering and communication among all parties – owner, designer, and builder – are key to a successful project and can facilitate efficient and timely responses to design-builder requests for clarification or change order requests and resolution of owner non-conformance notifications. Owners, designers and builders must elevate issues in a timely manner in order for the project to proceed smoothly and with the least delay and cost.

2.7 Design-Build Success Factors

The key success factors cited most frequently by the DOTs included:

- Improved risk allocation
- Interaction of the private sector design-build team (i.e. designer and contractor staff)
- Communication and coordination among all parties
- Clarity of RFP scope and criteria
- Timely owner and third party reviews and approvals

Other general comments on success factors included targeted design-build training, using ATCs to promote innovation from the private sector, and the use of one-on-one meetings during the procurement process for clarification purposes.

3. Best Design-Build Practices

3.1 Introduction

The preceding section reviewed a number of organizational, procurement, contracting and execution practices used by transportation departments on their design-build programs. Note, however, that the mere fact that a practice is widely used does not mean that the practice qualifies as a “best practice.” A “best practice” is one that should increase the probability of a successful project that meets the expectations of all stakeholders. Stated differently, if a “best practice” is not implemented, there is an increased probability that the project’s performance will be compromised and that some or all of the stakeholders will be disappointed.

Consider, for example, single phase design-build procurements where the proposer having a technically acceptable proposal and the lowest price is awarded the contract. While many DOTs and other public agencies use this process, there are strongly held views from industry that this is not a best practice. It does not consider qualifications or team chemistry and experience working together, which clearly impact the probability of success. Because there is no shortlist, there can be a substantial number of proposers depending on the type of project. If there is a large pool of proposers, an agency may find itself challenged to administer the procurement efficiently, particularly in terms of conducting proprietary meetings and meaningfully considering alternative technical concepts. Low bid, technically acceptable procurements also retain one of the key drawbacks to design-bid-build, where the lowest price is the sole selection factor – thereby incentivizing proposers to provide the minimum.

While there are many opinions as to what constitutes a best design-build practice, nothing was formally published on the subject until recently. The Design-Build Institute of America (DBIA) recognized the importance of separating “common practices” from “best practices” and, after almost a year of extensive industry outreach and feedback, published in February 2014 a document entitled “Design-Build Done Right: Universally Applicable Best Design-Build Practices.” This publication identifies practices that have two basic characteristics: (1) they are universal in applicability, spanning any type of design-build project; and (2) they are important enough to directly affect project performance. A total of ten (10) best practices are discussed, distributed into three categories – procurement, contracting and execution. Each best practice is supplemented by several implementing techniques that provide guidance on specific ways to implement the best practice – essentially “mini-best practices.” The combination of best practices and implementing techniques are DBIA’s view as to “design-build done right.”

DBIA’s publication recognizes that there are real-world differences among design-build market sectors including water/wastewater, transportation, and federal facilities, and that specific implementation techniques might differ slightly from one market sector to another. Consequently, the DBIA Transportation Committee, using the Universally Applicable Best Design-Build Practices as a baseline, created “Design-Build Done Right: Transportation Sector Best Design-Build Practices (“Transportation Best Design-Build Practices”), attached as Appendix A. Published in April, 2016, this document provides a number of important best practice implementing techniques that address unique issues associated with transportation projects – such as right-of-way acquisition and utility relocation.

The sections that follow highlight some of the more noteworthy best practices and implementing techniques from DBIA’s Transportation Best Design-Build Practices. Note that many of these are already being implemented by the various DOTs surveyed for this white paper and, while it is beyond the scope of this white paper to discuss WSDOT practices, WSDOT is currently using several of these practices as well.

3.2 Best Practices in Procurement

An owner’s choice of project delivery system and procurement approach strongly influence project results. These choices are among the first decisions an owner makes on a project, and they form the foundation for how: (a) the project will be developed, procured and executed; and (b) key project stakeholders will communicate and relate to each other. DBIA observes that in making these choices, it is critical for an owner to consider the particulars and circumstances of each project, including the procurement options available to the owner. DBIA advocates that, once the owner has determined that design-build is the most appropriate delivery process for a particular project, it thoroughly consider how to take full advantage of the many benefits that are inherent in the design-build process.

3.2.1 Proactive and Objective Assessment of Program

One of DBIA's best procurement practices is that, before deciding whether to use design-build for a program or project, the owner "***conduct a proactive and objective assessment of the unique characteristics of its program/project and its organization.***" Among the implementing techniques to accomplish this are:

- Owners should create an organization that supports the successful procurement and execution of a design-build project, with key personnel (including those advising/representing the owner) educated and trained in, among other things: (a) the procurement, contracting and execution of design-build projects; and (b) the importance of setting expectations and fostering a collaborative relationship among all members of the project team.
- Owners should involve senior leadership that is committed to the success of the design-build process, as this will foster a healthy and trusting relationship among the entire project team.
- Owners should carefully research and assess current market conditions as they plan their design-build programs, as this will identify potential risks and opportunities. Among the issues to be researched and assessed include: (a) procurement actions that could limit or expand competition; (b) projected labor, material and equipment availability; (c) lessons learned from similar projects; and (d) realism of budget and schedule estimates.
- Owners should use a rigorous and equitably-balanced project risk assessment process early in the procurement process and update/refine the risk assessment as the project proceeds from procurement through project execution.

Many of the DOTs that were surveyed abide by this best practice, and have specifically implemented some of the above-referenced techniques. Several DOTs (e.g., CDOT, MnDOT, MTO, and VDOT) have developed a formal project selection process for determining whether design-build is the best delivery system for the project. Most of the DOTs surveyed have organizations dedicated to alternative delivery and most conduct formalized training for those working on design-build projects. Likewise, the survey indicated that virtually every DOT has specific outreach to their industry partners (e.g., ACEC, AGC) for market conditions and views on how to make design-build more effective.

3.2.2 Procurement that Enhances Collaboration and Benefits of Design-Build

Another of DBIA's best procurement practices is that an owner: "***implement a procurement plan that enhances collaboration and other benefits of design-build and is in harmony with the reasons that the owner chose the design-build delivery system.***" Among the key implementing techniques to accomplish this are:

- Owners should use a procurement process that: (a) focuses heavily on the qualifications of the design-builder and its key team members rather than price; and (b) rewards design-build teams that have a demonstrated history of successfully collaborating on design-build projects.
- Owners should develop their design-build procurement with the goal of minimizing the use of prescriptive requirements and maximizing the use of performance-based requirements, which will allow the design-build team to meet or exceed the owner's needs through innovation and creativity.
- Owners should consider the level of effort required by proposers to develop responsive proposals, and should limit the deliverables sought from proposers to only those needed to differentiate among proposers during the selection process.
- Owners who require project-specific technical submittals (e.g., preliminary designs) for evaluating and selecting the design-builder should: (a) use a two-phase procurement process; and (b) limit the requirement for such submittals to the second phase, where the list of proposers has been reduced.

The DOT survey demonstrated that many of the implementing techniques for this best practice are not widely used. A prime example is that while most DOTs shortlist based on qualifications, the ultimate selection process is based on price, either as a result of selecting the low bidder or using a best value process that is heavily weighted to price. Note however that some DOTs (e.g., MnDOT, UDOT and VDOT) have used best design or most scope for a fixed price to control costs. As for the use of performance requirements, which are widely used for buildings and process plants, the state survey indicated that most DOTs use them in a limited manner. While there are practical reasons for this in terms of how the procurement documents are initially developed (principally NEPA-related), DOTs are using ATCs to give proposers opportunities for innovation or cost savings. Finally, feedback from industry has indicated that DOTs continue to ask for more deliverables than are reasonably needed to make their procurement decisions.

3.2.3 Characteristics of Competitive Design-Build Procurements

The third of DBIA's best procurement practices states that an owner using a competitive design-build procurement that seeks price and technical proposals should: "***(a) establish clear evaluation and selection processes; (b) ensure that the process is fair, open and transparent; and (c) value both technical concepts and price in the selection process.***" Examples of implementing techniques include:

- Owners should perform appropriate front-end tasks (e.g., geotechnical/environmental investigations and permit acquisitions) to enable the owner to: (a) develop a realistic understanding of the project's scope and budget; and (b) furnish proposers with information that they can reasonably rely upon in establishing their price and other commercial decisions.
- Owners should appropriately shortlist the number of proposers invited to submit proposals, as this will, among other things, provide the best opportunity for obtaining high quality competition.
- Owners should conduct confidential meetings with shortlisted proposers prior to the submission of technical and price proposals, as this encourages the open and candid exchange of concepts, concerns, and ideas.
- Owners should offer a reasonable stipend to unsuccessful shortlisted proposers when the proposal preparation requires a significant level of effort.
- Owners should ensure that their technical and cost proposal evaluation team members are: (a) trained on the particulars of the procurement process; (b) unbiased; and (c) undertake their reviews and evaluations in a manner consistent with the philosophy and methodology described in the procurement documents.

While the DOT survey did not exhaustively review each of these implementing techniques, it is clear that many of the DOTs are using them routinely as part of their design-build programs where best value is used and innovation is sought. Shortlists, confidential meetings, and stipends are routinely used/provided by most of the DOTs interviewed (although some DOTs will use single step, low bid procurements without stipends). Additionally, all of the DOTs noted that they perform front-end geotechnical and survey work as part of their procurement documents. An implementing technique that some DOTs are not following is the ability of proposers to reasonably rely upon the geotechnical and other information contained in the solicitation documents in establishing their prices. As noted in the surveys, several DOTs (e.g., NCDOT) do not give differing site condition remedies to the successful design-builder, which means that proposers are likely to increase their prices to assume such risks.

3.2.4 Transportation-Specific Procurement Implementing Techniques

As noted above, DBIA's Transportation Best Design-Build Practices has established a number of implementing techniques that address key aspects of the procurement process for transportation projects – namely, right-of-way ("ROW"), utility relocation, railroads, and environmental permitting. These techniques are as follows:

- Owners should take appropriate steps to reduce ROW acquisition risk for the project. The owner should: (a) clearly define the existing ROW boundaries; (b) provide expected dates for owner ROW acquisitions affecting the construction schedule (if the owner will be responsible for the acquisitions); and (c) provide other information enabling the proposers to understand how the ROW acquisition process interrelates with

the construction schedule. Owners should be closely involved when ROW acquisition is the responsibility of the design-builder, or when the ROW needed for the project may vary based on the final project design. The owner should clearly specify the scope of the design-builder's responsibilities and identify the procedures that the design-builder must follow with respect to acquisitions. The owner should retain responsibility for paying ROW acquisition costs and costs of relocations so as to reduce contingency that will otherwise be included in the contract price.

- Owners should be actively involved and take appropriate steps to reduce project risks relating to utility relocation, including: (a) developing risk mitigation strategies and evaluating how best to assign risks associated with utility relocation; (b) including, where appropriate from a risk mitigation perspective, an allowance in the contract for utility relocation cost instead of requiring a lump sum; and, to the extent reasonably possible, (c) negotiating and securing, before the RFP is released, agreements with utility owners and stakeholders that establish the parameters for work to be performed by the design-builder. Utility agreements should clearly define divisions of responsibilities and, when work is being performed by the private utility, should include schedule commitments that can be relied upon by the design-builder.
- Owners should meet early with any impacted railroad management team to discuss the project and define scope.
- Proposers should be encouraged to submit ATCs that do not compromise project quality or intent, and that allow proposers to provide input to the owner regarding new ideas, innovations or concepts that may not have been reflected in the RFP documents.
- Owners should perform an adequate search to identify necessary environmental permits for the project in order to avoid potential permit issues with the RFP conceptual design. If necessary, prior to issuance of the RFP, a risk management strategy tied to the permitting process should be considered.

Note that DBIA's Transportation Best Design-Build Practices also specifically recognized that if prescriptive requirements are included in the procurement documents, "owners should take the design to the minimum level required to obtain major approvals required for project development, and consider other means that encourage design flexibility, such as allowing: (a) shortlisted proposers to propose ATCs; and (b) the design to deviate from the project configuration defined in the preliminary design, within specified parameters."

As is evident from the DOT survey, many DOTs are already using these specific practices. The discrepancies between current practices and best practices appears to be in terms of developing the level of robustness of existing ROW and utility information, as some transportation departments execute their procurements without having the information on these areas fine-tuned. This can create challenges in terms of the pricing that is developed by the proposers.

3.3 Best Practices in Contracting for Design-Build Services

DBIA's Universally Applicable Best Design-Build Practices publication observes that the use of fair and clear contracts is fundamental to any delivery process. It also observes that there are some important differences between design-build contracts and those for other delivery systems, and that it is important for the individuals who administer the design-build procurement and execution to understand the contract's language and its practical application. Two of DBIA's best contracting practices are discussed below:

3.3.1 Fair, Balanced Contracts

Consistent with its philosophy on design-build contracting, DBIA has the following best practice: "***Contracts used on design-build projects should be fair, balanced and clear, and should promote the collaborative aspects inherent in the design-build process.***" Among the implementing techniques are:

- Contracting parties should proactively and cooperatively identify significant project-specific risks and clearly identify in the contract how such risks will be handled.

- Contracts should reasonably allocate risks to the party that is best capable of addressing and mitigating the risk.
- Contracts should use language that is understandable to those personnel who are administering the project.
- Contracts should encourage, rather than hinder, communications among project stakeholders.
- Contracts should contain a fair process that facilitates and expedites the review and resolution of potential changes to the contract and adjustments in the contract price and time.
- Contracts should contain a dispute resolution process that promotes the prompt identification and resolution of disputes at the lowest possible level of hierarchy within the parties' organizations.

While the survey did not fully review all of the implementing techniques included with this best practice, it did assess each agency's view of risk allocation. Suffice it to say that while some DOTs have a more balanced view to risk, others have used design-build as an attempt to shift substantial risk to the design-builder, including in areas where the design-builder is not capable of addressing and mitigating that risk (e.g. site conditions or errors in the owner's design documents). Moreover, as contracts become more complex with big dollar values, some contracts are difficult to read for project managers, and often have the appearance of financing/lending documents than project management documents.

3.3.2 Unique Aspects of Design-Build Process

Another DBIA best practice on contracting is that: ***"The contract between the owner and design-builder should address the unique aspects of the design-build process, including expected standards of care for design services."*** Four specific implementing techniques are:

- Owners should, consistent with their overall procurement strategy, evaluate and use appropriate contractual incentives that facilitate the alignment of the performance of their design-build teams with the owner's project goals.
- If the design-builder is expected to meet performance guarantees, the contract should clearly identify such guarantees, and the guarantees should be capable of being measured and reasonably achievable by a design-builder performing its work in a commercially reasonable fashion.
- The contract should clearly specify the owner's role during project execution, particularly relative to: (a) the process for the design-builder reporting to and communicating/meeting with the owner; (b) the owner's role in acting upon design and other required submittals; and (c) the owner's role, if any, in QA/QC.
- The contract should clearly define the role of the designer(s)-of-record and how it/they will communicate with the owner.

3.3.3 Transportation-Specific Procurement Implementing Techniques

Consistent with the preceding section on procurement, DBIA's Transportation Sector Design-Build Done Right publication has several implementing techniques on contracts, including the following:

- The contract should clearly specify the respective responsibilities of the owner and design-builder in the areas of design, permitting, ROW, environmental mitigation measures, improvements that will be owned by third parties, and utility relocations.
- The contract language should address risk allocation when unexpected conditions (including subsurface conditions, utilities and hazardous materials) are encountered.

- The contract should clearly identify the design-builder's submittal requirements for utility and other third party work, emergency response plan, subsurface utility engineering validation, utility plans and conflict matrix, including record drawing requirements if applicable.
- The contract should clearly identify any restrictions placed upon the design-builder's ability to perform work on third party property or facilities, or if time restrictions apply.
- The contract should clearly identify the scope of the design-builder's responsibilities for maintenance of traffic (e.g., flagging) and traffic management constraints affecting the construction schedule (e.g., lane closure restrictions, lane rental, maintenance of access, special events).
- The contract should clearly establish which party has responsibility for risks associated with: (a) governmental approvals, including permits required for project development; (b) any changes to the existing NEPA documents, including any NEPA re-evaluation; and (c) changes in law and changes in standards.

The document also notes, consistent with the Universally Applicable Best Design-Build Practices, that contractual incentives to complete work ahead of schedule may be of benefit to owners, and that any restrictions related to maintenance of traffic during construction (e.g., lane restrictions or closures) should be clearly identified and addressed.

3.4 Executing the Delivery of Design-Build Projects

DBIA's Universally Applicable Best Design-Build Practices publication has the following four best practices associated with the execution of a design-build project. The common element to these practices is that they focus on developing relationships – among owner, designer, and contractor representatives – built upon trust, transparency and team integration, with individuals who understand the design-build process and are committed to working together collaboratively.

1. All design-build team members should be educated and trained in the design-build process, and be knowledgeable of the differences between design-build and other delivery systems.
2. The project team should establish logistics and infrastructure to support integrated project delivery.
3. The project team, at the outset of the project, should establish processes to facilitate timely and effective communication, collaboration, and issue resolution.
4. The project team should focus on the design management and commissioning/turnover processes and ensure that there is alignment among the team as to how to execute these processes.

Among the implementing techniques associated with these four best practices are the following:

- All members of the design-build team must understand that the project's success is dependent on the ability of the team members to work collaboratively and to trust that each member is committed to working in the best interests of the project.
- Projects should be staffed with individuals that are educated and experienced in the implementation of design-build best practices, and whose personalities are well-suited to the collaborative nature of the design-build process.
- All project teams should have senior leadership committed to the success of their projects and actively supportive of design-build best practices.
- Owners and the appropriate members of the design-builder's team should co-locate when justified by project characteristics (e.g., project's complexity and volume of design submittals).

- Owners and design-builders should ensure that the administrative processes established for project execution are appropriate, well-understood and expeditious.
- The owner and design-builder should create an executive leadership group, including individuals from key members of the design-builder's team (e.g. designer(s)-of-record and key subcontractors) to meet regularly, monitor the project's execution, and facilitate the understanding and achievement of the parties' mutual goals.
- The owner and design-builder should, at the outset of the project, endorse and liberally use techniques that effectively integrate design and construction activities and take steps to continue these processes throughout the duration of the project.
- The owner should be fully engaged and prepared to make the timely decisions necessary to facilitate the design-builder's performance, including being represented by staff that has the authority to make decisions and perform its project functions.
- The owner and design-builder should acknowledge the significant level of effort required to manage the development and review of the design and, consequently: (a) dedicate sufficient resources to foster a collaborative environment for this work; and (b) mutually develop a realistic design development plan that efficiently engages the owner and key members of the design-builder's team (e.g., designer(s)-of-record and key subcontractors) in purposeful meetings.
- The owner and design-builder should agree upon clear, realistic and expeditious submittal and review/approval processes that are in harmony with the parties' schedule and other project-specific goals.

The themes from other best practices are clearly established in these implementation principles, with the understanding that individuals are trained in design-build, leadership is supportive of the process, and that the parties are each recognizing what the other needs to make the project successful.

DBIA's Transportation Best Design-Build Practices adds several specific implementing techniques addressing project execution, including the following:

- The owner and design-builder should develop processes that enable key stakeholders (e.g., government agencies, utility and property owners, and third-party operators) to interface directly with the design-builder and its design professionals on significant elements of the work. Among the processes that might be considered are the use of special task forces to address issues related to ROW acquisition, utility relocation and environmental permitting that will engage key stakeholders into the process.
- All parties involved with environmental compliance should attend project coordination meetings during the design and construction phases.
- Design-builders should gain an understanding of the owner's goals and should be aware that compliance with environmental mitigation requirements and other legal requirements (e.g. affirmative action, DBE) are often of critical importance to the owner even though they may not affect the ultimate work product.
- The design-builder should identify early action items that will reduce the potential for future delays, including: (a) identifying challenging ROW issues; (b) ordering long lead items; (c) expediting geotechnical and utility investigations; and (d) developing relationships with utility owners and other key stakeholders.

3.5 Other Studies on Design-Build Practices

There have been numerous industry reports published over the past 20 years evaluating the effectiveness of design-build, and how it compares to design-bid-build and (sometimes) CM/GC. For the most part, these reports do not look at design-build practices, but instead evaluate the delivery systems in terms of cost, schedule and quality metrics. Consequently, they do not provide data on the subject matter of this white paper. However, the results from one of

the most widely-acclaimed studies of this nature does have provide some helpful information. It was published in 1999 by Penn State University and the Construction Industry Institute, and compared data from 351 U.S. projects representing a cross section from industrial to offices and multi-story dwellings. The purpose of the study was not to conclude what delivery system was “best,” as there are many factors involved in choosing a delivery decision. Rather, the study was to assess how design-bid-build, design-build and CM/GC projects compared to each other in terms of cost, schedule and quality metrics, and what were the attributes of “best in class” projects, regardless of the delivery system used. The projects were comprised of approximately equal number of public and private owners, and divided approximately equally among design-bid-build, design-build and CM/GC delivery systems. While the white paper does not address transportation projects, its findings can inform best practices in the transportation sector.

The study found that design-build showed significant advantages in cost, time, and quality performance over design-bid-build and CM/GC. The researchers cautioned, however, that there are many factors affecting the performance of projects, some of which may have a more significant effect on project performance than the delivery system itself. The study identified critical success factors associated with each project delivery system. Some of the success factors cited were the same variables affecting project performance, while others were new. Factors related to the success of design-build included:

- Project team communication.
- Low percent design completed prior to selecting construction team.
- Excellent subcontractor experience (with design-build).
- Design-builder experience with delivery system and type of facility.
- Owner ability to prequalify bidders and restrain the contractor pool (i.e., in essence having the most highly-qualified contractors bidding the project as opposed to using open bidding).
- Owner’s ability to define the project scope.

The study also concluded that there were some common attributes for projects that were “worst in class,” regardless of delivery system. These included: (a) onerous contract terms; (b) failure of the parties to communicate; (c) lack of shortlisting/prequalification in selecting the contracting teams; and (d) engaging the contractor late in the design process.

The 1999 Penn State/CII study was recently followed up, and resulted in a study commissioned by the Charles Pankow Foundation and CII, conducted by the University of Colorado. This study examined, for the first time, building projects which used forms of integrated project delivery, such as design-build and CM/GC, and attempted to assess what differentiated successful projects from those that were less successful. The study is in draft form, and was released in October 2015 for industry comment. Entitled “Maximizing Success in Integrated Project Delivery: An Owner’s Guide,” it was based on an empirical study of over 200 capital facility projects in the public and private sector. Using a variety of statistical methods to model the relationship between project delivery and project success, the primary finding of the study is that owners should consider an overall project delivery strategy when structuring design and construction services, rather than focus exclusively on the delivery method – in essence, by considering how the project’s organizational structure, contract payment terms and team assembly process can work together.

One of the biggest takeaways from the study was that during project execution, higher performing project teams engage in integrated practices (e.g., collectively considering design options, over-the-shoulder design reviews) and develop into a cohesive group, producing better project results for cost, schedule and quality metrics. While the application of this study to the transportation sector has not yet been examined by industry, two of the study’s conclusions provide some important information, and correlate to the DBIA Universally Applicable Best Design-Build Practices:

- **Early involvement:** Early involvement, not only of the primary builder, but also of key design-build or design-assist specialty contractors, is common in the delivery of successful projects. Engaging the core project team members in the design process, before advancing beyond schematic design, is critical to garner the full value from this approach. Early involvement also enables participation in integrated practices, such as developing project-specific goals, leading design charrettes and developing a Building Information Model (BIM) execution plan. Participation does not stop at the front end, as value was also found in the continued engagement of design team members throughout construction and project turnover.

- ***Qualification-based selection:*** To enable early, high-quality interactions within the core project team, qualification-based selection of these team members is important. The most cohesive teams were selected after the review of relevant qualifications and after an interview process that assessed the quality of individual team members. The shift away from price-based selection criteria derived from the construction scope, toward non-price considerations, such as qualifications or interview performance, is a valuable first step in assembling a project team.

Early involvement of key players has been shown to create project success, as it enables multi-disciplinary thinking and input into the development of scope. Maryland SHA had this in mind when it chose to use progressive design-build on one of its most complicated projects, and will be selecting the design-builder prior to determining the precise design for the project. While progressive design-build in the transportation sector has to date been largely confined to rail and airport projects, there is an increasing interest in using it for more traditional highway and bridge projects. The finding that cost and schedule metrics for building projects are improved with the use of qualifications-based selection (QBS) might seem elementary (i.e., the most qualified organizations, using the most qualified personnel, give the best chance for a highly successful project). However, the survey shows that DOTs do not use QBS for their design-build projects, and ultimately base their selection primarily on price.

4. Conclusions

This best practice review, including the responses from the DOTs and industry and the overarching national design-build best practices, resulted in a number of general findings in the different topic areas investigated that will be used as a benchmark to compare current practices and trends found within WSDOT's design-build program. As part of the Task 3 review of WSDOT, we will compare the DOT and industry input for the same topic areas including organization and staffing, project selection, risk management, procurement, project execution, and other aspects. Additionally, we will evaluate a sample of projects in WSDOT's design-build program to assess performance outcomes against similar design-build projects from the DOT programs that currently track performance metrics (i.e. FDOT, MnDOT). Based on these comparisons, the team will begin to develop specific recommendations for improvements to the WSDOT design-build program as part of Task 4.

List of Recurring Abbreviations

ATC	Alternative Technical Concept
BAFO	Best and Final Offer
CEI	Construction Engineering & Inspection
CM/GC	Construction Manager/General Contractor
DBIA	Design Build Institute of America
DOT	Department of Transportation
GMP	Guaranteed Maximum Price
RFQ	Request for Qualifications
RFP	Request for Proposals