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

TASK 1: BASIC OVERVIEW OF DESIGN-BUILD VS. DESIGN-BID-BUILD

Prepared for:
State of Washington
Joint Transportation Committee

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Introduction

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 (DB) project delivery method, with the objective of identifying potential changes in law, practice or policy that will allow WSDOT to optimally employ DB 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 DB and DBB delivery methods.

Task 2: Identify best practices in DB project delivery.

Task 3: Evaluate WSDOT's current use of DB 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.

The following white paper is an outgrowth of the Task 1 effort to provide a balanced and absorbable overview of the design-bid-build (DBB) and DB delivery methods. Its purpose is primarily educational, for legislators and staff as well as for other stakeholders and interested parties. The paper addresses each of the following general questions in the context of the current state of practice of DB and DBB in the transportation construction industry:

1. What are the basic characteristics of DBB and DB, and advantages and disadvantages related to their use?

2. What key project elements, characteristics or goals should be considered in deciding which delivery method to use?

3. What public agency or organizational characteristics contribute to successful implementation of DB?

4. Are there key policy considerations in the selection of the contracting method that the Legislature should decide, and if so, how best should the Legislature be involved? Similarly, how do key local policy differences between states impact how they are able to implement DB?

5. Does one state or another do an especially good job of implementing DB, and if so, what characteristics of their program contribute to their success and what measures are used? What is the extent of involvement of their State Legislature?

6. Is there a spectrum of implementation that should be considered and evaluated?

In conducting subsequent tasks, these questions will be revisited as necessary to provide updated or more definitive responses.

1. What are the basic characteristics of DBB and DB, and advantages and disadvantages related to their use?

1. Design-Bid-Build

1. Definition and Key Characteristics

DBB is the traditional procurement approach for transportation projects in the United States, in which the design and construction of a facility are sequential steps in the project development process. As shown in Figure 1, design and construction services are procured separately, with Architectural/Engineering (A/E) firms selected based on their qualifications and construction contractors selected based on competitive sealed bids, with award to the bidder with the lowest price who meets specific conditions of responsibility.

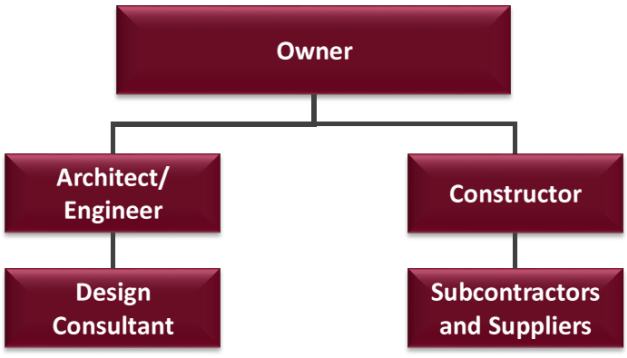


Figure 1: DBB Delivery System

The foundation of the DBB system came from the professional licensing laws established in the late 1800's for design services and, for construction services, competitive bidding requirements reinforced with legislation such as the 1938 Federal Highway Act and the Miller Act that requires surety bonding for construction.[1]

2. Advantages and Disadvantages

Over the decades, the DBB system has provided taxpayers with adequate transportation facilities at the lowest price. For the most part, it has resulted in a reasonable degree of quality, and has effectively prevented favoritism in spending public funds while stimulating competition in the private sector. However, the separation of services under DBB has the potential to foster adversarial relationships among the parties and result in cost and time growth. Summary level pros and cons related to DBB are presented in Table 1 below.

[1] Congress amended the Federal-Aid Road Act of 1916, Ch. 241, 39 Stat. 355, to adopt the precursor to what is now section 112(a). That statute required that the Secretary of Agriculture (then the agency head with authority to approve federally funded highway projects) approve, in connection with federally aided highway construction projects, "only such methods of bidding and such plans and specifications of highway construction for the type or types proposed as will be effective in securing competition and conducive to safety, durability, and economy of maintenance." Pub. L. No. 75-584, § 12, 52 Stat. 633, 636 (1938).

Table 1: DBB Advantages and Disadvantages

Advantages	Disadvantages
Applicable to a wide range of projects	Slower project delivery method due to the sequential nature of delivery (i.e. design then bid then build)
Well established and suitable for competitive bidding	Owner must manage/referee two contracts
Contractor selection based on objective cost criteria	Administrative decision-making and approvals are often less efficient and more difficult to coordinate
Discourages favoritism in spending public funds while stimulating competition in the private sector	Owner largely bears risk of design problems
Extensive litigation has resulted in well-established legal precedents	Separation of contracts tends to create an adversarial relationship among the contracting parties (different agendas and objectives)
Provides the lowest initial price that responsible, competitive bidders can offer	Designers may have limited knowledge of the true cost and scheduling ramifications of design decisions
Clearly defined roles for all parties	No contractor involvement in design has implications on constructability and pre-construction value engineering
Designer directly works for and on behalf of owner	Tends to yield base level quality
Construction features are typically fully designed and specified	Least-cost approach requires higher level of inspection of the work by the owner's staff
Owners retain significant control over the end product	Initial low bid might not result in ultimate lowest cost or final best value
Insurance and bonding are well defined	No built-in incentives to provide enhanced performance (cost, time, or quality)
	Greater potential for cost/time growth
	Greater potential for litigation

2. Design-Build

In the highway sector, traffic growth, deteriorating infrastructure and increasing population have created tremendous pressure to move critical projects quickly from the planning stage through to design and into construction, without a commensurate increase in department resources and available funding. Additionally, projects have become larger and more complicated, rely on a variety of funding sources, must deal with more complex Federal and State regulations, and face public expectations for minimizing construction impacts. In response to these pressures, over the past 20 years many public highway agencies in the U.S. and internationally have increasingly implemented DB. The Federal Highway Administration among other Federal agencies has supported this implementation, developed regulatory policies for DB contracting, and provided leadership and support to state and local agencies implementing DB. [2]

1. Definition, Key Characteristics, and Historical Context

Under the DB contracting method, a single entity is responsible for both the design and construction of a project. This integration of design and construction services under one contract supports earlier cost and schedule certainty, closer coordination of design and construction, and a non-sequential delivery process that allows for construction to proceed before completion of the final design.

As shown in Figure 2, DB delivery in its simplest form is characterized by a single contract between the owner and an integrated DB entity that provides both design and construction services. As DB use has evolved, it has taken on organizational variations that may involve joint ventures or more complicated prime and subcontractor arrangements. In the highway sector, DB is most commonly led by a General Contractor (GC) as the Prime with an A/E firm as a subcontractor.

[2] See Title 23 USC 112 (b) (3) and Federal regulations: Title 23 CFR Part 636

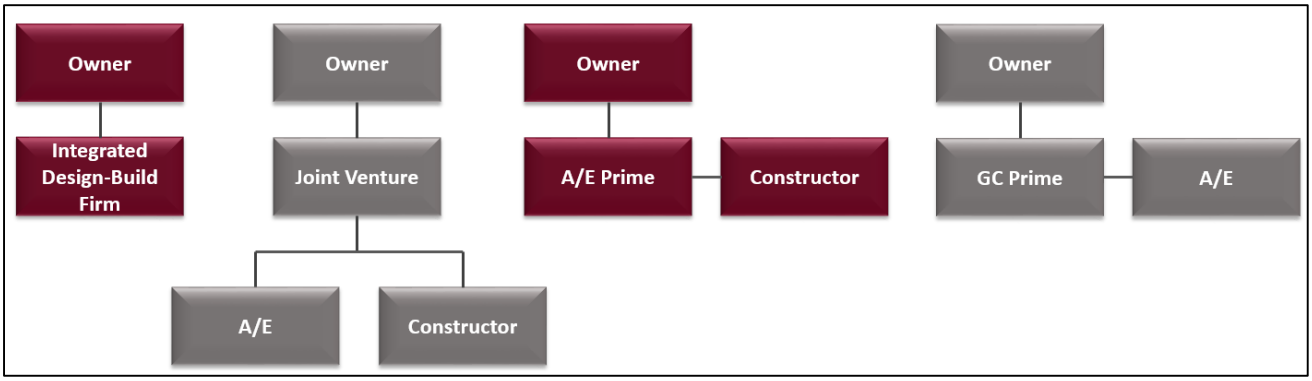


Figure 2: DB Organizational Variations

It is important to note that DB does not represent a departure to something new, but rather a full-circle return to how facilities were historically constructed. Key events in the history of DB contracting are illustrated in Figure 3 and further described in the bullets that follow.

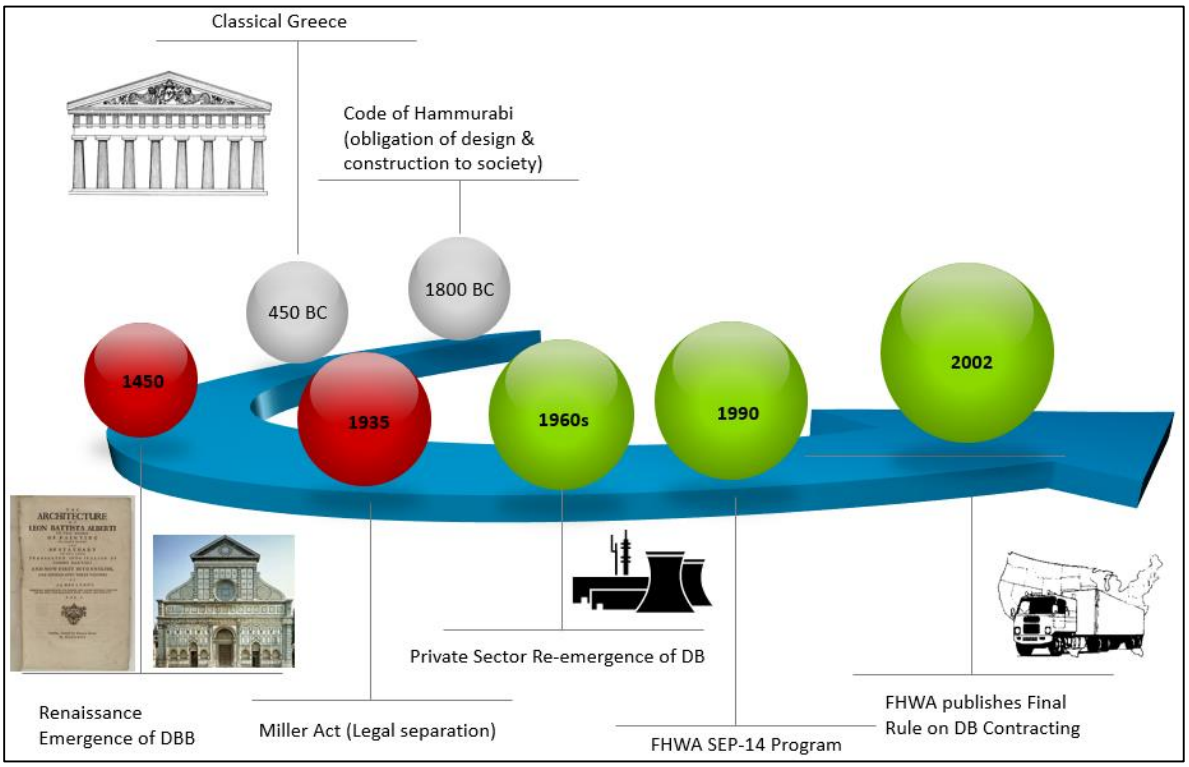


Figure 3: Historical Perspective of DB and DBB Delivery

Up until the mid-1400s, construction was accomplished by so-called Master Builders who were responsible for design and construction, similar to today's design-builders.

With the Renaissance and the rise of the modern-day architect, the design and construction fields began to separate. Individuals began to identify themselves as either designers or construction tradesmen. Guilds were formed. As the Industrial Age unfolded, specialization affected all aspects of Western culture. Professional associations and societies came into being, further defining the separation between architects, engineers and contractors. The Industrial

Revolution encouraged further specialization and segmentation of the design and construction industries through the continued development of Professional Societies and divisions of labor into trades.

In response to the growing segmentation of the construction industry, Congress enacted several laws that served to endorse the DBB delivery model. Key legislative events in the United States that led to the formal separation of design and construction phases of infrastructure projects included the following:

- 1893 Congressional Act formally separating the design and construction phases of a capital project.
- 1926 Omnibus Public Buildings Act required all capital project plans and specifications be completed and approved before the construction phase can begin.
- 1935 Miller Act required the posting of bonds. The Miller Act essentially took designers out of the construction business, because they typically did not have the capital needed to post a bond.
- 1947 Armed Services Procurement Act required that architectural and engineering (design) services be procured on a negotiated basis, while construction services continued to be procured through a formal advertisement and low bid selection process.
- 1949 federal procurement legislation extended the 1947 Armed Services Procurement Act requirements to all federal civilian agencies.
- 1972 Brooks Act reinforced the DBB project delivery method by requiring government agencies to award A/E contracts based solely on qualifications, rather than price.

As owners began to experience problems with DBB, DB re-emerged as a possible solution for expediting project delivery, obtaining better cost certainty earlier in the delivery process, and shifting the risk of design errors away from owners.

In 1990, FHWA implemented Special Experimental Project No.14, Innovative Contracting (SEP-14) as a vehicle for State highway agencies to use Federal-aid funds to experiment with certain alternative contracting methods, including DB, for selected projects.

1998: The Transportation Equity Act for the 21st Century (TEA-21) took the first steps in developing regulations for the regular use of DB on federally-funded transportation projects.

2003: FHWA's Final Rule on DB Contracting becomes effective.

Market research indicates that DB is now being used in virtually all industry sectors, and every State allows DB at some level in the public sector, as illustrated in Figure 4. [3]

[3] See DBIA https://www.dbia.org/advocacy/state/Documents/state_statute_report.pdf

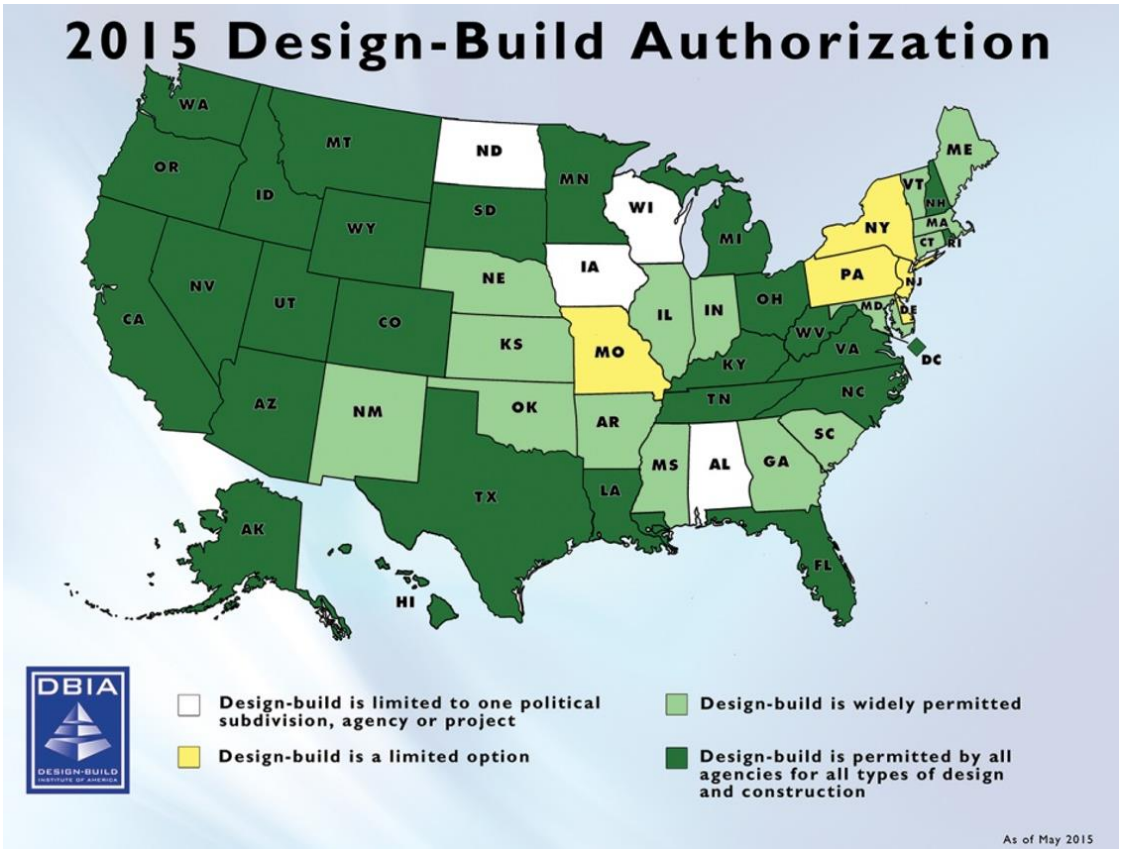


Figure 4: DB Statutory Authority

2. Advantages and Disadvantages

DB has fundamentally changed the way DOTs conduct business. Its use has in some cases resulted in dramatic improvements in performance, but not without challenges. Empirical studies from the last 20 years comparing DBB with DB across multiple construction sectors have shown significant cost and time savings. For example the first major federal study mandated by Congress compared DB highway projects with comparable DBB projects and found that DB resulted in significant time savings and to a lesser extent cost savings.[4] Conversely, some DOTs have reported higher initial costs or cost growth with DB. The delegation of quality management responsibilities to industry has also been an ongoing concern. Because of some of the reported challenges with implementing DB, highway agencies with more mature DB programs have sought ways to improve and optimize their DB programs to achieve greater efficiencies in project and program delivery. This need for optimization and refinement is particularly prevalent today, given the budget pressures facing most DOTs.

Time savings is the most commonly cited and quantifiable advantage of DB. A conceptual comparison of the sequence of project delivery is shown in Figure 5.

[4] 2005 Design-Build Effectiveness Study: On average, the managers of DB projects surveyed in the study estimated that DB project delivery reduced the overall duration of their projects by 14 percent, reduced the total cost of the projects by 3 percent, and maintained the same level of quality as compared to DBB project delivery. The project survey results revealed that DB project delivery, in comparison to DBB, had a mixed impact on project cost depending on the project type, complexity, and size.

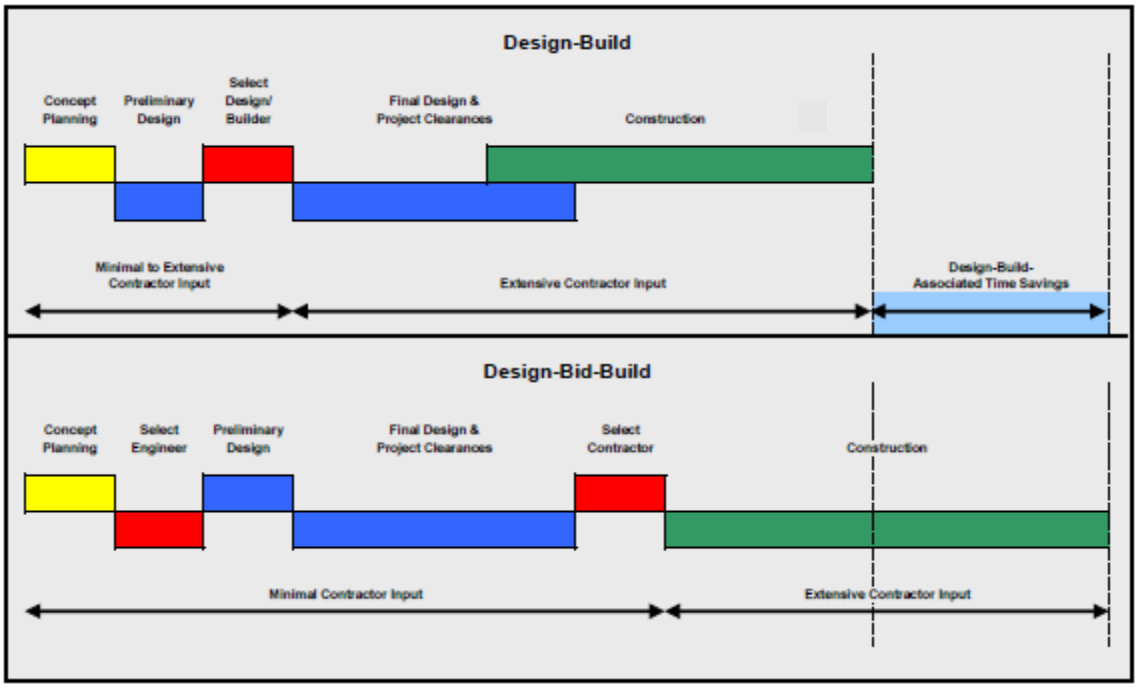


Figure 5: DB v DBB Sequence of Project Delivery Activities
[Source: DB Effectiveness Study 2005]

A summary of additional pros and cons associated with DB is provided in Table 2. However, in reviewing this list, it is important to note that the advantages of DB are generally only realized when a careful and well-informed approach is taken to enabling legislation, project analysis and selection, procurement, contracting, and oversight. Likewise, some of the identified disadvantages may be averted or mitigated to some extent through similar means.

Table 2: DB Advantages and Disadvantages

Advantages	Disadvantages
Ensures that the Department can select a capable, qualified DB contractor	Reduced owner control over design process
Single point of responsibility creates opportunity for efficient risk transfer	Time and cost to run a 2-step competitive procurement process
Can encourage contractor innovation	Challenges with scoring technical evaluation factors
Early contractor involvement	Personnel learning curve - changes in roles and responsibilities requiring different levels of training for owner and industry
Allows for project schedule, quality, and/or other non-price parameters to be competed	Potential for higher initial costs (i.e. risk pricing)
Owner not at significant risk for design errors	Parties assume different and unfamiliar risks
Less owner coordination of A/E and contractor	Standard owner communication and contract administration practices in conflict with expedited delivery
Time savings and often cost savings	Fewer opportunities for smaller contractors with limited resources to serve as prime contractors
Earlier cost and schedule certainty	Cost for contractors and designers to participate in the procurement process
Improved owner risk allocation and management options	

2. What key project elements, characteristics or goals should be considered in deciding which delivery method to use?

No single delivery method is appropriate for *all* projects and situations. For a given project, a key early decision in the project development process therefore entails selecting the *optimal* delivery approach based on project characteristics, goals, risks, and constraints.[5]

Based on the literature and experience of practitioners, Table 3 summarizes the typical conditions under which the DBB and DB project delivery methods have been effectively applied.

Table 3: Project Characteristics for DB and DBB Use

DB Project Characteristics	DBB Project Characteristics
A compressed schedule or flexible schedule is needed	Schedule constraints are not a critical issue
Early cost certainty is desirable	Lowest initial cost is the primary driver
Project scope can be adequately defined without 100% complete plans, specifications, and estimates	Design must be at or near 100% completion before a contractor could be hired
Project allows for innovative design or constructability solutions	The project type is typical and common (i.e. limited opportunities for innovation, constructability or value engineering)
Project is complex, requiring early contractor involvement	Third party risks and unknowns exist that are best managed by owner
Minimal third party risks exist or can be mitigated or managed by owner or DB team	
Major project risks can be mitigated by having the contractor and designer in a direct contractual relationship	

As discussed in Section 1, both DBB and DB hold advantages and disadvantages that should be carefully weighed when considering how to best deliver a particular project. To facilitate such decision-making, several DOTs have developed systematic processes or tools that align project goals and characteristics with the attributes of a given delivery method (e.g., DBB, DB and its variants, GC/CM, etc.). Common considerations included in these decision processes include the following:

- Project delivery schedule
- Project complexity
- Design flexibility and/or opportunities for innovation
- Level of design needed to clearly define the DB scope and requirements
- Staff experience and availability to execute the project delivery method under consideration
- Competition and contractor experience

[5] The vast majority of DOT projects are satisfactorily delivered using DBB. For example, WSDOT has delivered or is in the process of delivering 29 DB projects, which represent only a small percentage of total projects delivered during the same time frame (2002 to present); but the dollar value of DB projects is considerably higher. Similarly, from the year 2000 to present, Virginia DOT has delivered or is delivering 42 DB projects, along with more than 7,000 DBB projects. Though less than 1% of the total number of projects, the DB project value in Virginia is approximately 10% of the total project value.

Selection processes can range from simple checklists or decision trees to more complex risk-based decision support tools, such as the process shown in Figure 6 below. This process has been applied by the Colorado, New York, Georgia, and Minnesota DOTs. As illustrated in Figure 6, one starts with a project's goals and constraints and then evaluates selection factors regarding opportunities and challenges associated with each delivery method.

The project delivery selection process should also consider procurement options (e.g., low bid vs. best value) based on the project's characteristics, risk, design flexibility, staff experience, scheduling, and cost.

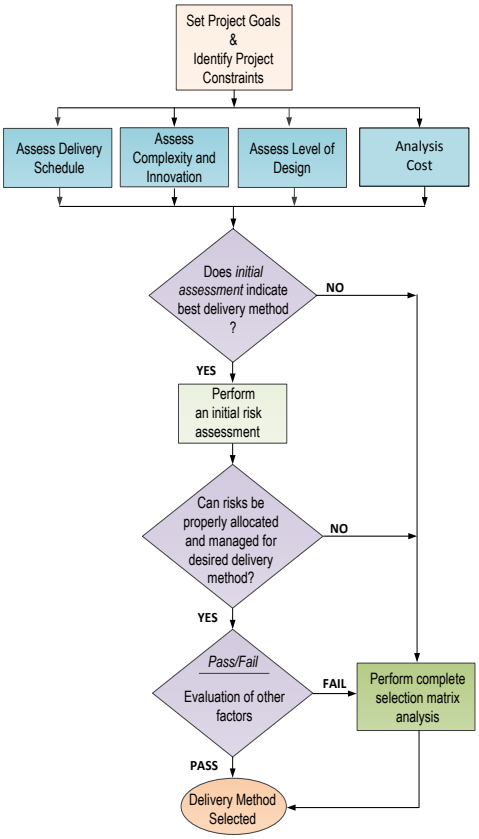


Figure 6. Selection Tool

3. What public agency or organizational characteristics contribute to successful implementation of DB?

The use of DB and other alternative contracting methods are viewed by many DOTs today as a strategy to better manage limited internal DOT resources and improve efficiency by shifting more responsibility for project delivery to the private sector. This has resulted in transitioning DOT staff from traditional roles in the organization (e.g., design and quality management) to more of an oversight and compliance role. For DB in particular, DOT staff experienced in DBB delivery will need to make the transition from a prescriptive mindset ("this is the way we have always done it and will continue to do it") to more of an outcome–based approach requiring flexibility and the ability to adapt to different roles and skill sets when working on a DB project compared to a traditional DBB project. Some of the key differences in DB and DBB project development and administration are summarized in Table 4.

Table 4: Differences in DB vs. DBB Project Administration

Element	DB Responsibilities	DBB Responsibilities
Communication/ Decision-making	Design and construction are integrated (and in some cases co-located). Communication and decisions flow directly between design and construction with DOT concurrence.	Design and construction are separated. Communication and decisions flow through DOT staff.
Design	DOT develops scoping documents and performance criteria as a basis for DB team design.	DOT develops detailed designs (or oversees consultant design).
Design Reviews	Advisory - Review for compliance with scope and performance criteria.	Directive - Compliance with standard specifications and design standards.
Quality Management	DB team or a 3rd party has primary responsibility for quality management including design and construction. DOT performs QA oversight verification testing, and independent assurance.	DOT staff primarily responsible for quality management, inspection, QA verification and acceptance testing, and independent assurance.

Element	DB Responsibilities	DBB Responsibilities
Payment	Partial progress payments by DOT based primarily on percent complete of lump sum items.	Periodic payments by DOT for unit-priced items based on calculation of detailed quantities of work.

Organizations that have successfully made the transition to include DB in their programs have adopted the following strategies:

- Identify and train key staff dedicated to the DB program to develop DB guidance and standards until sufficient DB expertise can be passed on to other DOT staff members.
- Provide more extensive DB training in different discipline areas so that staff in these technical discipline areas can understand the key differences between traditional DBB and DB to better support the DB program.
- Use consultant resources to assist with the development of technical documents, quality management, inspection, or other specialty areas, but ensure that the consultant has sufficient DB experience and technical resources/qualifications to provide meaningful assistance with decision-making (even if the consultant must draw upon out-of-state resources or provide specialized subconsultant expertise).
- Work closely with industry to make the DB process work better for all parties.

In 2013, WSDOT commissioned an independent consultant to assess three WSDOT DB mega projects. This 17-page Mega Project Assessment recommended changes in management to improve the delivery of major construction programs. Subsequently, in May of 2015, WSDOT issued a report evaluating the delivery of six small DB pilot projects. The report was based on input from the WSDOT project teams, the design-builder teams, and project data. The findings included in the WSDOT 2013 Mega-project Assessment and the 2015 Small DB Pilot Project Evaluation are generally consistent with some of the recommendations noted above:

- Avoid cyclic hiring and downsizing of internal DOT staff in lieu of developing and maintaining a stable workforce with the skills and leadership to deliver large projects.
- Develop a transition strategy (succession planning) to retain permanent WSDOT employees in key leadership positions.
- Continue to use a mix of General Engineering Consultants and WSDOT staff to deliver large transportation projects.
- For DB, outsource management responsibilities, particularly for quality, to industry (the DB team).
- Tailor the oversight and Construction Quality Program to smaller DB project delivery (e.g., use third party QA resources, bundle small projects, etc.)

Though program characteristics may vary significantly (i.e., with regard to the number, size, and types of projects, approach to program administration, staffing, outsourcing, professional development, collaboration with industry, etc.), the more mature DB programs have had to adopt some of the organizational characteristics noted above to ensure the successful delivery of their DB projects.

4. Are there key policy considerations in the selection of the contracting method that the Legislature should decide, and if so, how best should the Legislature be involved? Similarly, how do key local policy differences between states impact how they are able to implement DB?

1. DB Legislation in Washington State

The legislation authorizing WSDOT to use DB in RCW 47.20.780, Design-build—Competitive bidding, and RCW 47.20.785, Design-Build - Qualified Projects, provides a general framework for using DB contracting. The framework addresses specific project criteria and objectives and basic requirements for procurement (i.e. criteria for evaluating technical information and project cost) as part of contractor selection criteria. RCW 47.20.780 states:

> *The department of transportation shall develop a process for awarding competitively bid highway construction contracts for projects over two million dollars that may be constructed using a design-build procedure. The process developed by the department must, at a minimum, include the scope of services required under the design-build procedure, contractor prequalification requirements, criteria for evaluating technical information and project costs, contractor selection criteria, and issue resolution procedures.*

RCW 47.20.785 further states:

> *The department of transportation may use the design-build procedure for public works projects over two million dollars where:*
>
> *(a) The construction activities are highly specialized and a design-build approach is critical in developing the construction methodology; or*
>
> *(b) The projects selected provide opportunity for greater innovation and efficiencies between the designer and the builder; or*
>
> *(c) Significant savings in project delivery time would be realized.*

2. Overview of DB Legislation around the Country

State Legislatures have generally taken two approaches towards creating a legal environment for the implementation of DB delivery for transportation projects:

a) One approach, as seen in Florida and Virginia, is to establish rather broad guidelines that empower the DOT to determine the specific processes and functions needed to implement DB. The Washington legislation for DB delivery for highway construction (RCW 47.20.780 and RCW 47.20.785) is an example of this broad-based approach. The perceived advantage of such an approach is that the DOT has the flexibility to tailor the procurement and delivery process to a given project's objectives.

b) The second approach is to define more prescriptive statutory language to address key aspects of DB implementation. The Washington legislation for DB ferries (RCW 47.60.810-47.60.824) is an example of this more prescriptive approach. Minnesota's statutes for DB contracts (MSA 161.3410 to 161.3426) defines specific requirements related to project selection criteria, contents of solicitation documents, proposal evaluation procedures, makeup of the technical review committee, and the award process (two step best value based on adjusted score or low bid).[6] Strong and detailed enabling legislation can help ensure program-wide consistency in DB implementation; however, if the statute is too prescriptive (e.g., with regard to project

[6] See 2015 Minnesota Statutes, MSA 161.3410 to 161.3426 https://www.revisor.mn.gov/statutes/?id=161.3410

type, size, or procurement method), it may not result in the most cost-effective use of DB. In particular, it precludes the DOT from being able to make needed changes and modify the DB approach to meet specific project goals/needs.

As a practical matter, the degree of statutory prescription is often driven by balancing the goals of alternative project delivery (e.g., accelerated schedule, innovation, etc.) against local circumstances and polices that require limiting the DOT's discretion. For example, stakeholders in certain areas of the country have successfully steered legislation to address specific concerns related to competition, professional licensure, stipends, DBE participation plans, and similar matters. In some cases this has resulted in sunset provisions or limits on the project size threshold, or number of DB projects. Legislation in other states limits the ability of DOTs to transfer certain risks and responsibilities to DB teams (e.g., environmental issues, utility and railroad coordination, etc.).

3. Involvement of the Legislature

A key objective in the development of DB transportation legislation is to establish a sound framework or governance structure within which the DOT can successfully make decisions and take action to achieve project and system-wide goals while avoiding unacceptable situations that could compromise public trust.

To this end, the Legislature's involvement in DB delivery should include:

- Having a balanced perspective on different project delivery methods that would allow for informed decision-making related to the role of DB delivery for transportation projects;
- Enacting statutory changes as necessary to address constituent needs or other changes in the social, economic and legal environment;
- Enacting statutory changes as necessary to fix something that is not working; and
- Conducting periodic legislative reviews of project performance to gather lessons-learned and to foster opportunities for continuous improvement.

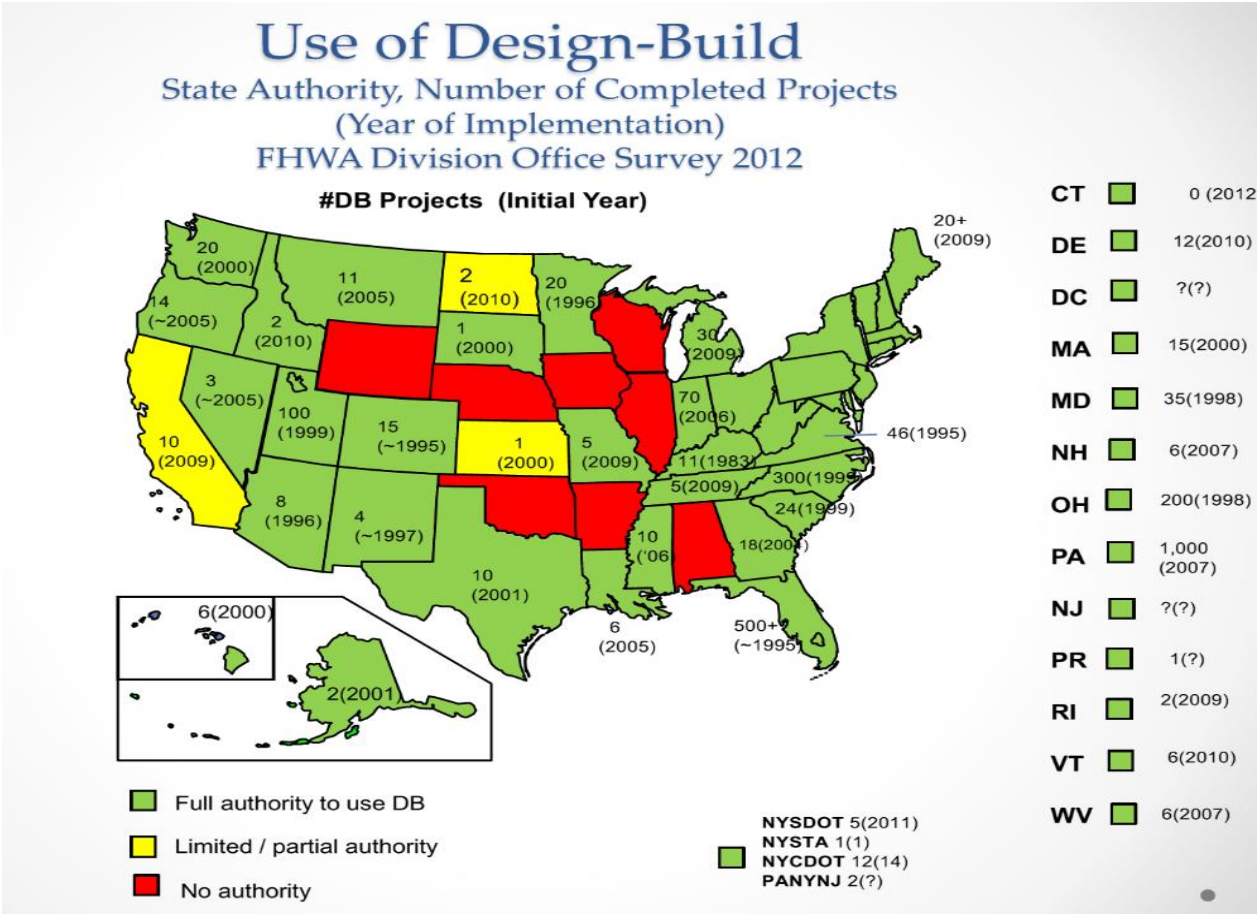
As part of our Task 3 evaluation of WSDOT's current use of DB project delivery, we will recommend whether additional or modified legislation or policies are needed to ensure that DB is implemented appropriately and to maximize its benefit to the WSDOT program.

5. Does one state or another do an especially good job of implementing DB, and if so, what characteristics of their program contribute to their success and what measures are used?

As evidenced by a FHWA Division Office survey completed in 2012 shown in Figure 7 below, DB use in the highway industry has grown significantly since DB was first implemented by DOTs in the mid to late 1990's. Some of the DOTs with significant years of experience or numbers of DB projects include Colorado, Florida, Ohio, Pennsylvania, Maryland, Missouri, Minnesota, North and South Carolina, Utah, Virginia, and Washington.

These and other DOTs with established or emerging DB programs are currently incorporating processes to improve or optimize their use of DB delivery. Our team previously evaluated DB programs from a cross-section of these DOTs as part of a 2011 DB process review for Virginia DOT, and will reach out to several of these DOTs, apart from WSDOT, as part of this study to determine the most current best practice thinking. Some general characteristics of these mature DB programs include:

- Dedicated DB central office staff and statewide DB guidance and standards
- Flexibility in DB procurement and delivery to fit the project characteristics



- Standardized procurement, contracting and project administrative forms and templates, along with guidance on such documents

- Efficiency in DB execution through:

    - Early engagement and coordination with resource agencies and stakeholders

    - Co-location of the owner staff and DB team staff to promote timely reviews

    - Optimizing quality management in part by relying to a greater extent on the DB team to manage quality

- DB training and feedback

    - Learning from others and implementing a continuous improvement mindset (based on lessons-learned and project performance outcomes)

    - Collecting and evaluating project performance metrics to determine the extent that project goals were met. Metrics may include quantitative and qualitative data. (i.e. time, cost, safety, public impacts, quality, and communications),

Figure 7: DB Use among Transportation Agencies from FHWA Survey

For owners, a key challenge in implementing DB is transitioning from a prescriptive (DBB) to a more outcome-based (DB) mindset. It also involves the recognition that for DB to work well, there has to be a mutual level of trust and respect between the owner and DB (particularly the contractor) team. For industry, the challenges include forming effective teaming arrangements, working to meet performance standards, taking responsibility for design and quality processes, and assigning the best people for their DB projects. A more in-depth discussion of these programmatic characteristics follows.

1. Programmatic DB Infrastructure (Dedicated Staff)

States with mature DB programs or emerging programs have staff or offices dedicated to DB or alternative project delivery. For example, California, Florida, North Carolina, Virginia, Utah, and Minnesota, have well-established DB (or alternative delivery) programs with one or more full time central office staff dedicated to administering and coordinating their DB programs. These offices frequently have responsibility for the DB project until contract award, and are supplemented with, or supported by, part-time staff in geotechnical, bridge, or other technical disciplines. For example, Florida DOT, given the depth of DB knowledge and experience possessed by its District engineers, is able to advertise on the order of 50 DB projects annually with minimal oversight and direction from the DB coordinator in the central office.

Similarly, other agencies have resources in specific technical discipline areas that can be called upon to support the development of DB documents. Minnesota DOT, with a large DB program for bridges, uses a dedicated staff member in its bridge office to oversee the development of technical criteria packages, thus freeing up the primary DB coordinator to focus on the standard administrative documents (e.g., Instructions to Proposers and General Provisions).

WSDOT also has construction headquarters staff dedicated to its DB program with responsibility for documenting and improving current practices, participating in procurement, developing and maintaining standard templates, and coordinating with the Regions.

2. Flexibility in DB Procurement

DOTs with the flexibility to use alternate procurement strategies will adapt the DB procurement approach to meet the unique needs of a given project, considering the distinct advantages and drawbacks of each approach. Florida, Utah, Minnesota, Colorado, Virginia, Ohio, Maryland, and others have the ability to use 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 DB delivery. These variations in procurement approaches are shown in Table 5 below. Such flexibility with regard to procurement options allows these programs to tailor the procurement to the project type in the interest of saving cost, time, and effort. Most of these agencies consider project classifications (e.g., small/medium/large or levels of complexity) when determining the optimal procurement approach. Streamlined DB is most often applied to smaller projects having clearly defined scopes of work and lower risks, and where innovation is not sought. Conversely, best value is generally applied to larger, more complex projects where innovation is sought. Additional examples of streamlining include Florida DOT's use of post-qualification of the apparent low bidder to save on internal evaluation effort. Instead of reviewing qualification packages for all the bidders, Florida DOT staff only review the qualifications of the apparent low bidder. Florida has also used DB with options or maximum price to control project costs.

Another key consideration in developing an effective procurement strategy is identifying appropriate evaluation criteria. Owners are often challenged to use meaningful "differentiators" for selecting the DB team. Proposers compound this problem by often failing to clearly explain how they are different. The current thinking in DB selection criteria is that it should focus on the meaningful distinctions between teams, which may include past DB experience on comparable projects, the team's history of working together and/or project management plan (i.e. interface between design and construction), innovative or project-specific approaches to quality management as opposed to boilerplate quality management plans, and the proposer's demonstrated understanding of project risks and identification of viable mitigation strategies.

With regard to evaluation systems, some DOTs with mature DB programs are, particularly for larger projects, using qualitative cost and technical trade-offs and competitive negotiations in lieu of numeric ratings and formulas. This approach is similar to the selection processes used by Federal agencies (e.g., Corps of Engineers and Naval Facilities

Engineering Command). 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 DB projects suggest that disputes related to subjectivity using a trade-off analysis are equally as likely.

Many DOTs, including WSDOT, have incorporated performance specifications and Alternative Technical Concepts (ATCs) into their DB procurement processes, to promote innovation and cost/time savings for a project where design flexibility is possible. An ATC process, where a proposer essentially submits a confidential request to modify a contract requirement prior to the Proposal due date, can be an effective tool to achieve savings. However, because of the potential for ATCs to add significant time and cost to an already resource-intensive procurement process, some DB programs (e.g., in Minnesota and Colorado) have looked for ways to streamline the ATC process by using pre-accepted elements, or adding language to the DB Request for Proposal (RFP) restricting the number and type of ATCs to the ones that achieve the greatest return for the investment.

3. Design-Build Infrastructure (Guidance, contract forms and templates)

To promote programmatic consistency, many owners have developed "an infrastructure" for DB procurement and delivery through the use of standard templates and model forms (e.g., Instructions to Proposers, DB General Conditions, and Technical Requirements) and standard policies and guidance. These templates, forms, and guidelines are designed to provide reasonable and enforceable requirements that clearly define the roles and responsibilities of the owner and design-builder and promote consistency in contract administration. With DB, design and construction are integrated. Communication and decisions flow directly between design and construction with owner concurrence at key decision points. Standard contract forms for DB should clearly define those areas where DB changes the traditional roles and responsibilities of the parties for coordination, design, quality, changes, payment, legal requirements, and other key responsibilities.

The standard administrative documents for DB may include stand-alone DB contract documents and also modifications to standard DOT procedural manuals for project development, design, and construction management. As DB fundamentally changes the traditional project development process, project decisions regarding packaging, scoping, level of design, and delivery objectives need to be made earlier in the project development process to retain a DB firm and expedite project delivery. The need to expedite must be carefully balanced with the pragmatics of clearly defining the scope (in terms of minimum requirements and expectations). Ohio DOT has recently mapped how the project development process changes with DB. For example, the planning phase includes early steps to identify and rank the project's goals and objectives; identify, evaluate, and allocate project risks; and develop project scoping as a basis for the DB RFP.

4. DB Execution

One of the areas requiring the most guidance (and currently the least documented in DB procedural manuals) is best 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 DB team must be clearly defined. DOT staff need to understand that design reviews are limited to evaluating compliance with the approved scope and design criteria. Furthermore, the DOT staff should have a keen understanding of how the DB contractor will manage the design process.

Similarly, the responsibility for DB quality management during construction shifts to the design-builder with the owner responsible for verifying that the design-builder is meeting quality requirements. Experienced owners are trying to move away from a one-size-fits-all approach to quality management in order to eliminate duplicative effort and conserve resources. Several agencies with established or emerging DB programs (e.g., Texas, New York, and Florida DOTs) are using a risk-based approach to owner acceptance for DB projects that adjusts the level of verification inspection and testing based on the inherent risks in the materials or work products.

5. Training and Feedback

Training, both on the job and in the classroom, is a key programmatic tool to transfer knowledge, lessons-learned, and skills to designated DOT staff assigned to deliver DB projects. Each year Florida DOT, through its DB Task Force,

conducts training for District and Project Engineers on specific DB topics. Similarly, Virginia and Ohio DOTs have developed classroom DB training modules addressing project development, procurement and contracts, and contract administration. The training includes role playing, exercises, and case studies designed to enhance understanding of DB delivery.

The DOTs with significant DB experience (e.g., Utah and Florida) are compiling project performance data on DB in terms of various cost, schedule, and quality metrics compared to DBB (and GC/CM). In California, the DB enabling legislation specifically required the DOT to assess the success of the initial DB pilot program as a precedent to reauthorizing DB.

6. Is there a spectrum of implementation that should be considered and evaluated?

As DB use has grown and evolved, it has been implemented in a variety of different ways at the State and local levels. Some of these differences were driven by state and local industry interests affecting how the original enabling legislation and regulatory policies were crafted. As owners have gained experience with DB delivery, some DOTs decided to try variations of DB delivery to address lessons-learned related to DB delivery, or improve or optimize their process based on the project type. Some of the more mature DOT DB programs now have the ability to implement DB in different ways based on project types or characteristics. These variations are briefly summarized in Table 5.

Table 5: Summary of DB Variants used for Delivery of Transportation Projects

Description	Procurement Selection Process	Agreement Type	Project Types	Characteristics
Low Bid DB	One or Two-Step process with selection based on lowest price. Technical proposals evaluated on a pass/fail basis.	Lump Sum	Smaller, less complex projects having clearly defined scopes of work and lower risks, and where innovation may not be sought	Owner provides proposers with a design that is used as a basis for proposals. This approach is often used when owner chooses not to differentiate proposers based on technical approach. For a two-step process, the initial step would shortlist the most qualified firms and the second step would select the low bidder.
DB with Optional Scope[7] or DB Maximum Price	Selection based on base bid with options not to exceed the stipulated budget & representing the best value to the owner	Lump Sum with additive or deductive options		A strategy to control cost by seeking the maximum scope for a defined budget ceiling.
Best Value DB[8]	One or two-step process with selection based on price and technical/ qualifications factors Numeric (Point scoring) v. Non-numeric ratings (i.e. good, better, best) with trade-offs, upset price, competitive negotiations w/best and final offer (BAFO)	Lump Sum or Guaranteed Maximum Price (GMP)	Larger, more complex projects where innovation is sought and owner believes that it is beneficial to consider factors other	Most commonly used method for DB in public sector construction. Owner provides proposers prescriptive and/or performance-based requirements.

[7] WSDOT has used DB with Optional Scope for one of its DB projects
[8] WSDOT currently uses a Best Value procurement process for most of its DB projects

Description	Procurement Selection Process	Agreement Type	Project Types	Characteristics
Progressive DB	One or two-step process with selection based on either pure qualifications/technical approach or best-value	One of two approaches. (1) Preliminary Services Agreement followed by a Lump Sum or GMP Final Design and Construction Agreement; or (2) Lump Sum or GMP Design-Build Agreement, with an initial preliminary services phase and a final design and construction phase	than simply price in making a selection	This type of DB is used when the owner wants to have a DB help develop the program and design before a firm contract price is established. The DB will perform preliminary services to confirm owner's program, develop preliminary design and GMP/Lump Sum proposal. Upon acceptance of a proposal, the final design and construction will proceed, based upon the commercial agreement reached. This process also allows the delivery of the project in phases through early work packages.
DB with finance, maintenance and/or operations components.	Best value or low bid selection	Various contracting approaches to address total services, scope, risk and payment.		Often thought of as public-private partnership (P3) approaches, these can vary dramatically depending upon the degree of public financing and procurement approach (competitive or negotiated, solicited or unsolicited) taken by the owner.

In the highway industry, the most frequent implementation approach is DB using either low bid or best value selection processes with lump sum agreements. DOTs typically have requirements to encumber project funds based on defined revenue constraints that align better with lump sum contracts. These and other variants in DB delivery and implementation, including procurement, project characteristics, specifications and other criteria, will be considered and further evaluated as part of the Task 2 best practices review.

7. Conclusions

As noted in various sources within the industry including the Design Build Institute of America and RSMeans, a leading industry source of construction cost data, DB has gained traction in public sector construction and commands more than 40% of the market share in non-residential construction. This trend is further supported by procurement reforms at the federal and state level. The majority of states currently allow the use of DB for transportation projects with certain limitations, and many states are considering or moving to expand DB authority.

As these DB programs mature, the nature of owner and industry best practice initiatives has evolved from focusing on why these methods should be used to how they can be used in the optimal manner to maximize cost and schedule efficiencies. As part of the next task, the team will identify best practices for DB delivery and the extent to which these have been implemented as part of WSDOT's DB program.

List of Recurring Abbreviations

BAFO	Best and Final Offer
DB	Design-Build
DBB	Design-Bid-Build
DBIA	Design-Build Institute of America
DOT	Department of Transportation
GC/CM	General Contractor/Construction Manager
GMP	Guaranteed Maximum Price
RFQ	Request for Qualifications
RFP	Request for Proposals