Guidebooks for Post-Award Contract Administration for Highway Projects Delivered Using Alternative Contracting Methods, Volume 1: Design Build Delivery (2020)

DETAILS

256 pages | 8.5 x 11 | PAPERBACK
ISBN 978-0-309-67200-9 | DOI 10.17226/25686

CONTRIBUTORS

Keith R. Molenaar, Douglas Alleman, Allen Therrien, Kelly Sheeran, University of Colorado, Mounir El Asmar, Arizona State University, and University of Arizona Dean Papajohn; National Cooperative Highway Research Program; Transportation Research Board; National Academies of Sciences, Engineering, and Medicine

SUGGESTED CITATION

National Academies of Sciences, Engineering, and Medicine 2020. *Guidebooks for Post-Award Contract Administration for Highway Projects Delivered Using Alternative Contracting Methods, Volume 1: Design Build Delivery*. Washington, DC: The National Academies Press. https://doi.org/10.17226/25686.

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

NCHRP RESEARCH REPORT 939

Guidebooks for Post-Award Contract Administration for Highway Projects Delivered Using Alternative Contracting Methods

Volume 1: Design–Build Delivery

Keith R. Molenaar
Douglas Alleman
Allen Therrien
Kelly Sheeran
UNIVERSITY OF COLORADO
Boulder, CO

Mounir El Asmar
ARIZONA STATE UNIVERSITY
Tempe, AZ

Dean Papajohn
UNIVERSITY OF ARIZONA
Tucson, AZ

Subscriber Categories
Administration and Management • Construction • Design

Research sponsored by the American Association of State Highway and Transportation Officials
in cooperation with the Federal Highway Administration

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

TRB
TRANSPORTATION RESEARCH BOARD

2020

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed, and implementable research is the most effective way to solve many problems facing state departments of transportation (DOTs) administrators and engineers. Often, highway problems are of local or regional interest and can best be studied by state DOTs individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation results in increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

Recognizing this need, the leadership of the American Association of State Highway and Transportation Officials (AASHTO) in 1962 initiated an objective national highway research program using modern scientific techniques—the National Cooperative Highway Research Program (NCHRP). NCHRP is supported on a continuing basis by funds from participating member states of AASHTO and receives the full cooperation and support of the Federal Highway Administration (FHWA), United States Department of Transportation, under Agreement No. 693JJ31950003.

The Transportation Research Board (TRB) of the National Academies of Sciences, Engineering, and Medicine was requested by AASHTO to administer the research program because of TRB's recognized objectivity and understanding of modern research practices. TRB is uniquely suited for this purpose for many reasons: TRB maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; TRB possesses avenues of communications and cooperation with federal, state, and local governmental agencies, universities, and industry; TRB's relationship to the National Academies is an insurance of objectivity; and TRB maintains a full-time staff of specialists in highway transportation matters to bring the findings of research directly to those in a position to use them.

The program is developed on the basis of research needs identified by chief administrators and other staff of the highway and transportation departments, by committees of AASHTO, and by the FHWA. Topics of the highest merit are selected by the AASHTO Special Committee on Research and Innovation (R&I), and each year R&I's recommendations are proposed to the AASHTO Board of Directors and the National Academies. Research projects to address these topics are defined by NCHRP, and qualified research agencies are selected from submitted proposals. Administration and surveillance of research contracts are the responsibilities of the National Academies and TRB.

The needs for highway research are many, and NCHRP can make significant contributions to solving highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement, rather than to substitute for or duplicate, other highway research programs.

NCHRP RESEARCH REPORT 939, VOLUME 1

Project 08-104
ISSN 2572-3766 (Print)
ISSN 2572-3774 (Online)
ISBN 978-0-309-48121-2
Library of Congress Control Number 2020933172

COPYRIGHT INFORMATION

NOTICE

The research report was reviewed by the technical panel and accepted for publication according to procedures established and overseen by the Transportation Research Board and approved by the National Academies of Sciences, Engineering, and Medicine.

The opinions and conclusions expressed or implied in this report are those of the researchers who performed the research and are not necessarily those of the Transportation Research Board; the National Academies of Sciences, Engineering, and Medicine; the FHWA; or the program sponsors.

The Transportation Research Board; the National Academies of Sciences, Engineering, and Medicine; and the sponsors of the National Cooperative Highway Research Program do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of the report.

Published research reports of the

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

are available from

Transportation Research Board
Business Office
500 Fifth Street, NW
Washington, DC 20001

and can be ordered through the Internet by going to

http://www.national-academies.org

and then searching for TRB

Printed in the United States of America

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

The **National Academy of Sciences** was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, non-governmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

The **National Academy of Engineering** was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. John L. Anderson is president.

The **National Academy of Medicine** (formerly the Institute of Medicine) was established in 1970 under the charter of the National Academy of Sciences to advise the nation on medical and health issues. Members are elected by their peers for distinguished contributions to medicine and health. Dr. Victor J. Dzau is president.

The three Academies work together as the **National Academies of Sciences, Engineering, and Medicine** to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The National Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

Learn more about the National Academies of Sciences, Engineering, and Medicine at **www.national-academies.org**.

The **Transportation Research Board** is one of seven major programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to provide leadership in transportation improvements and innovation through trusted, timely, impartial, and evidence-based information exchange, research, and advice regarding all modes of transportation. The Board's varied activities annually engage about 8,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

Learn more about the Transportation Research Board at **www.TRB.org**.

COOPERATIVE RESEARCH PROGRAMS

AUTHOR ACKNOWLEDGEMENTS

This guidebook would not be possible without the input and guidance received from the following:

Members of the Consultant Team:

Stuart Anderson, Texas A&M University
Wylie Bearup, Arizona State University
Kristen Betty, KBA, Inc.
Cliff Schexnayder, Arizona State University, Professor Emeritus
Roy Sturgill, Kentucky Transportation Research Center
Dave Zanetell, Kraemer North America

Members of the Peer Review Team:

John Carlson, Sundt Construction
Lisa Choplin, Maryland Department of Transportation
Peter Davich, Minnesota Department of Transportation
James Ernzen, Arizona State University
Teresa Foster Eckard, Washington State Department of Transportation
Jake Goettle, Montana Department of Transportation
Edward Hammontree, Federal Lands Highway
Bill Hinton, Dispute Resolution Board Foundation
Ben Huot, Utah Department of Transportation
Jean Nehme, Arizona Department of Transportation
Matthew Pacheco, Colorado Department of Transportation
Mark D. Rolfe, Connecticut Department of Transportation
David Sadler, Florida Department of Transportation
Steve Waddle, Kentucky Department of Transportation

(*continued on page vi*)

FOREWORD

By Edward Harrigan
Staff Officer
Transportation Research Board

NCHRP Research Report 939 presents practical guidance for the post-award administration of projects delivered using alternative, nontraditional methods. The report will be of immediate interest to engineers in state and local transportation agencies and industry with responsibility for planning, designing, and delivering transportation projects using alternative contracting methods.

Much research and reporting has been completed in the past decade on project delivery using alternative contracting methods such as design–build, construction manager at risk, construction manager as general contractor (CM-GC), and other nontraditional methods. The bulk of this work has been accomplished with a focus on the decision process for pre-award procurement and project delivery. However, information is lacking on effective methods for administering alternative contracting method contracts after they have been awarded. Previous NCHRP research found that contract administration issues comprised most of the case law in alternative contracting methods, suggesting a need for an evaluation of current methods for post-award contract administration of design–build and CM-GC projects and the preparation of guidebooks describing the most effective methods available.

Under NCHRP Project 08-104, the University of Colorado Boulder—in association with Arizona State University and the University of Arizona—was tasked with developing practitioner guidebooks for post-award contract administration of design–build and CM-GC projects based on the identification and analysis of the methods used in the range of alternative contracting method projects. Their research entailed a review of the current state of the practice in post-award design–build and CM-GC contract administration, development of a model of the contract administration process, case studies of post-award contract administration of 19 design–build and 11 CM-GC projects, an effectiveness evaluation and calibration of tools for post-award contract administration, and testing of the draft guidebooks on ongoing and completed design–build and CM-GC projects.

The key outcomes of this research are *NCHRP Research Report 939: Guidebooks for Post-Award Contract Administration for Highway Projects Delivered Using Alternative Contracting Methods, Volume 1: Design–Build Delivery* and *NCHRP Research Report 939: Guidebooks for Post-Award Contract Administration for Highway Projects Delivered Using Alternative Contracting Methods, Volume 2: Construction Manager–General Contractor Delivery*. Volumes 1 and 2 also include Appendix A: Contract Administration Tools and Appendix B: Case Studies. Volume 3 is the project final report, which provides results and analyses supporting the guidebooks' contents.

AUTHOR ACKNOWLEDGEMENTS (*Continued*)

Agencies that contributed case studies or guidebook testing:

Arizona Department of Transportation
California Department of Transportation
Central Federal Lands Highway Division
Colorado Department of Transportation
Connecticut Department of Transportation
E-470 Public Highway Authority
Federal Highway Administration
Florida Department of Transportation
Georgia Department of Transportation
Hawaii Department of Transportation
Maryland Department of Transportation
Michigan Department of Transportation
Minnesota Department of Transportation
Missouri Department of Transportation
New York State Department of Transportation
North Carolina Department of Transportation
Pennsylvania Department of Transportation
Utah Department of Transportation
Vermont Transportation Agency
Virginia Department of Transportation
Washington State Department of Transportation

CONTENTS

Note: Photographs, figures, and tables in this report may have been converted from color to grayscale for printing. The electronic version of the report (posted on the web at www.trb.org) retains the color versions.

CHAPTER 1

Introduction

This chapter provides an overview of *NCHRP Research Report 939: Guidebooks for Post-Award Contract Administration for Highway Projects Delivered Using Alternative Contracting Methods, Volume 1: Design–Build Delivery*. It identifies the guidebook's audience and describes how agencies can select strategies and tools for their design–build (D-B) projects. For context, the chapter provides a brief history of D-B delivery for U.S. highway projects. It explains the connection and handoffs between the existing AASHTO *Guide for Design–Build Procurement* (AASHTO 2008b) and this guidebook for post-award contract administration. It also explains the industry need for contract administration guidance, and it introduces key terms. The guidebook includes a more comprehensive glossary following References and Bibliography. After a brief explanation of the research approach, the chapter provides a list of tools that agencies can use to administer D-B contracts. Later chapters and Appendix A explain the tools in more detail.

1.1 Overview

This guidebook is a practitioner's guide for construction administration on D-B projects. Whether your agency is using the D-B contracting method for the first time or has significant experience with the method, this guidebook provides useful strategies and tools to support D-B project administration. Highway agency personnel are the audience for the guidebook. As an AASHTO publication, the guidance must apply at a national level. Each agency will need to adapt the strategies and tools to their unique agency policies and practices.

This guidebook will help agencies incorporate contract administration into their D-B procedures manuals.

1.2 Design–Build Background

The federal government takes a proactive position on advancing transportation in the nation. "Congress declares that it is in the national interest to promote the use of innovative technologies and practices that increase the efficiency of construction of, improve the safety of, and extend the service life of highways and bridges" [Moving Ahead for Progress in the 21st Century Act (MAP-21)]. The examples include alternative contracting methods, such as D-B, and construction manager–general contractor (CM-GC). The (FHWA) Every Day Counts programs advanced the use of these alternative contracting methods through training and project support to enhance innovation and improve highway planning, design, construction, and operation. Alternative contracting methods—especially D-B—have now become more common, and FHWA is supporting them through its Resource Center programs (FHWA 2016a).

At the state level, the Florida Department of Transportation (Florida DOT) was the first state agency to attempt D-B in 1987, spurring FHWA to establish the Special Experimental Project

Number 14 (SEP-14)—Innovative Contracting in 1990, which enabled states to experiment with alternative contracting methods (Ellis et al. 1991, FHWA 1996, FHWA 2016b). Due to the success of the D-B projects under SEP-14, the D-B Contracting Final Rule established 23 CFR 636 to provide the regulations for D-B (Federal Register 2002). D-B regulations were later updated in accordance with the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU 2007). D-B selection procedures are detailed in Part 36 of the Federal Acquisition Regulation.

1.3 Industry Need for a Guidebook

The innovative efforts of the highway agencies should not be underestimated. The D-B contracting process requires significant procedural and cultural changes.

The D-B contracting process requires significant procedural and cultural changes on the part of agency staff. Agencies are developing manuals on procurement guidance for these delivery methods. However, a review of current alternative contracting method manuals reveals the existence of only a few manuals addressing contract administration processes. The *AASHTO Guide for Design–Build Procurement* primarily focuses on the pre-award phases of the process (AASHTO 2008b).

This guidebook specifically addresses the post-award phase. It provides effective tools for the post-award contract administration of D-B projects.

1.4 Key Guidebook Terms

This section provides a short list of key guidebook terms. A more comprehensive glossary follows References and Bibliography.

Alternative Contracting Method (ACM): The traditional contracting method is design–bid–build (D-B-B). Alternative contracting methods include design–build (D-B), construction manager–general contractor (CM-GC), and alternative technical concepts (ATCs). Other synonymous terms are innovative contracting method and alternative project delivery method.

Design–Bid–Build (D-B-B): The traditional project delivery method for building highways and making highway improvements where the agency (or a consulting engineer working for the department) designs the project, solicits bids, and awards the construction contract to the lowest responsive bidder (construction contractor) to build the project (Molenaar et al. 2005).

Design–Build (D-B): A project delivery system in which both the design—or some portion thereof—and the construction of the project are simultaneously awarded to a single entity. The main advantage of the design–build method is that it can decrease project delivery time.

Strategy: A plan of action for accomplishing specific goals. In this guidebook, strategies address goals relating to D-B administration, such as team alignment, construction quality, or construction efficiency.

Tool: A tool is used to perform an operation. In this guidebook, it is a tactic or process—such as checklists, spreadsheets, guidelines, and structured meetings—relating to D-B contract administration.

1.5 Guidebook Development

This practitioner's guidebook is based on D-B contract administration practices used by a wide cross section of transportation agencies. It was developed through a review of current literature and agency manuals, case studies, and interviews with agency personnel.

More than 100 practitioners contributed to the case studies, tool validation and calibration, and guidebook testing.

A brief summary of the research follows. The corresponding research report provides a detailed description of the work.

State-of-practice reviews—Thirty-one transportation agencies' alternative contracting method manuals and documents relevant to post-award alternative contracting method contract administration identified contract administration tools for D-B contract administration.

Process model development—A detailed process model of the D-B contract administration process was developed to aid in data collection and guidebook layout. The process model revealed the D-B contract administration phases of Alignment, Design, Construction, and Closeout.

Project case studies—A diverse set of 19 D-B projects were the subject of case study interviews. The team interviewed and collected data from 13 state DOTs and Central Federal Lands, all with active or recent D-B highway projects at the time of the research. Seven of the projects had a total project cost greater than $50 million (including design and construction), six were between $10 million and $50 million, and six were less than $10 million.

Tool effectiveness evaluation and calibration—Twenty-eight tools appropriate to D-B contract administration were identified through the case studies and state-of-practice reviews. A survey approach was used to calibrate the effectiveness corresponding to project size, level of complexity, and phase of contract administration.

Guidebook development and testing—In addition to a thorough NCHRP panel review, the research team met with agencies from across the country to test the guidebook on ongoing and completed projects.

1.6 Overview of Post-Award Phases and Tools

The D-B project delivery process offers the opportunity to enhance performance in areas such as cost, schedule, and quality through stronger alignment, constructability input, innovation, and single point of contact. Ultimately, D-B delivers a project that meets at least the same technical standards and levels of quality as the traditional D-B-B process. The contract administration process ensures this end result.

The D-B contracting process shifts traditional roles and responsibilities, but the contract administration process ensures that all quality and contracting requirements are met.

Due to the inclusion of design within the construction contract, D-B contract administration processes are different from the D-B-B process. At times, the processes, roles and responsibilities of the agency, engineer, and constructor for D-B differ from D-B-B. While D-B process modeling for this guidebook revealed that D-B contract administration processes vary from agency to agency (and within agencies), key D-B processes were found on all projects. D-B projects proceed through four overlapping phases from the agency's perspective of contract administration:

- Alignment,
- Design,
- Construction, and
- Closeout.

A key distinction of D-B is the involvement of the design–builder in design under what is essentially a fixed-price construction contract. This distinction requires different roles and

responsibilities for the agency. Ultimately, the agency performs administrative tasks during all four phases that are also critical to project delivery.

Agencies have developed a number of tools to help accomplish the administrative tasks in these four phases and with these key distinctions. Table 1.1 lists the tools and describes the phases for use. Chapters 4 through 7 describe the application of these tools across the four phases.

Tools for agency contract administration vary, depending on the phase of project development, the specific task, project complexity, and project size. Just as objectives and tasks change across phases, so, too, do the tools used for contract administration. Agencies apply some tools during one phase only and others across multiple phases.

It is not necessary to use all of the tools in this guidebook to have a successful project. During tool selection, agencies should consider project goals, project complexity, project size, and project phase.

Chapters 4 through 7 detail the effectiveness of tools across varying levels of complexity, size, and phase. Appendix A provides full information about each tool, with advice for application and examples from the agency case studies.

Table 1.1. Design–build contract administration tools.

Tools for Design–Build Contract Administration	Contract Administration Phase			
	Alignment	Design	Construction	Closeout
1 Kickoff Meeting	✓			
2 Roles and Responsibilities	✓			
3 Confidential One-on-One Meeting	✓			
4 Glossary of Terms	✓			
5 Co-Location of Key Personnel	✓	✓		
6 Regulatory Agency Partnering	✓	✓		
7 External Stakeholder Coordination Plan	✓	✓		
8 Design–Build–Specific Partnering	✓	✓	✓	✓
9 Continuity of Team Members	✓	✓	✓	✓
10 FHWA Involvement Overview	✓	✓	✓	✓
11 Permit Commitment Database	✓	✓	✓	✓
12 Plan Standards		✓		
13 Deviations from Agency Standards		✓		
14 Discipline Task Force		✓		
15 Independent Party Design Review		✓		
16 Cost–Savings Matrix		✓		
17 In-Progress Design Workshops		✓		
18 Over-the-Shoulder Reviews		✓		
19 Scope Validation Period		✓	✓	
20 Public Announcements		✓	✓	✓
21 Delegation of Authority		✓	✓	✓
22 Contractor-Controlled QC Testing			✓	
23 Contractor Involvement in Establishing QC Standards			✓	
24 Incentive–Disincentive Program for Superior Quality			✓	
25 Real-Time Electronic QM Information			✓	
26 Dual Construction Engineering Inspector Roles			✓	
27 Witness and Hold Points			✓	
28 Payment Checklist			✓	✓

Note: QC = quality control. QM = quality management.

1.7 Reader's Guide

The target audience for this guidebook is state transportation agency personnel. The guidebook contains information for agency leaders, D-B project managers, and technical staff. Consultants, engineers, and contractors will also benefit from the guidebook because it allows them to understand their roles and responsibilities in the process and understand the tools agencies will use to administer their D-B projects. The guidebook will assist agencies with achieving the cost and time savings that SAFETEA-LU and the FHWA Every Day Counts envision through the use of D-B.

A Strategic Perspective for Leaders

To maximize the benefits of D-B contract administration tools, the guidebook suggests five overarching contract administration strategies: alignment, scope, design quality, construction quality, and construction efficiency. Chapter 2 discusses these strategies in detail. Agency leadership is the primary audience for this chapter. Strategies support the use of the tools in this guidebook and the creation of new, agency-specific tools.

Agency leaders must commit to transforming organizational culture, mentoring individual behavior, and developing procedures for alternative contracting methods.

Moreover, agency leaders must be aware of and commit to transforming organizational culture, mentoring individual behavior, and developing procedures for alternative contracting methods. Agencies that are effective at modifying their culture and procedures specific to D-B contract administration will ensure the integration of strategies and tools in all project phases. For example, agency leadership must support a shift in roles, such as reviewing submittals for conformance with performance specifications and not prescribing design decisions. This is a significant change in culture from the traditional D-B-B contracting method, which approaches reviews from a perspective of standardization rather than innovation.

The application of D-B contracting affects agency culture in all phases of contract administration. Agency leadership can support this change through the application of the strategies and tools found in this guidebook.

Guidebook Organization

Chapter 2 describes overarching management strategies that help categorize and recommend tools for use in D-B contract administration within an agency. Chapter 3 discusses the D-B process at the pre-award phase and touches on key topics, such as the reasons why D-B is selected and how much design is typically completed prior to the involvement of the design-builder. Chapters 4 through 7 are the heart of this guidebook. Each of these chapters introduces one of the four post-award phases and briefly describes the tools available in that phase. These chapters help to clarify an agency's role in administering alignment, design, construction, and closeout. Chapter 8 describes the steps that agencies can take to implement the strategies and tools in this guidebook. It also provides guidance on performance measures and continuous improvement. Finally, Appendix A provides details in a consistent format of each tool identified, along with descriptions and successful examples from various agencies.

The *AASHTO Guide for Design–Build Procurement* (AASHTO 2008b) complements this guidebook. The *Design–Build Procurement Guide* emphasizes setting projects up for success by focusing mostly on the pre-award phases of the process. It is an excellent precursor to this guidebook. As part of the research for this guidebook, the research team also developed *NCHRP Research Report 939: Guidebooks for Post-Award Contract Administration for Highway Projects Delivered Using Alternative Contracting Methods, Volume 2: Construction Manager–General Contractor Delivery*. While the organizational and administration processes differ between D-B and CM-GC, many of the strategies and tools overlap.

CHAPTER 2

Overarching Contract Administration Strategies

2.1 Introduction

The purpose of this chapter is to introduce overarching strategies that will aid in successful D-B contract administration. A comprehensive examination of the 28 tools in this guidebook, content analysis of agency alternative contracting method manuals, and themes from the case studies reveals higher-level strategies for D-B contract administration success. The following five overarching D-B contract administration strategies will assist with the implementation of the existing tools, the creation or addition of new contract administration tools, and, ultimately, the successful administration of D-B projects:


ALIGNMENT

Alignment Strategy—Establish clear project goals, and create productive relationships within the agency and between the agency and D-B team members.


SCOPE

Scope Strategy—Ensure that the project scope and responsibilities are understood and agreed upon by all parties.


DESIGN QUALITY

Design Quality Strategy—Ensure design quality through active participation in design reviews and accurate implementation of the request for quote (RFQ) and request for proposal (RFP) requirements.


CONSTRUCTION QUALITY

Construction Quality Strategy—Promote quality during construction and enforce requirements of the D-B contract.


CONSTRUCTION EFFICIENCY

Construction Efficiency Strategy—Implement a system that increases efficiency during construction and aligns with roles and contractual responsibilities.

The following sections describe the strategies in more detail and discuss how agency leadership can implement them across programs and within projects. Readers will find the strategy icons throughout the guidebook—particularly in the tools appendix—to highlight the strategies that the tools address.

2.2 Alignment Strategy


ALIGNMENT

Establish clear project goals, and create productive relationships within the agency and between the agency and D-B team members. A key element to construction administration project success begins with clear communication and purposeful alignment between team members during the early stages of the project, right after procurement. Better alignment and integration between project stakeholders correlates with better project performance on a variety of metrics and in diverse sectors, including transportation.

Developing effective lines of communication and working on agency–design–builder relationships early on will set positive behavioral expectations for the duration of the project. Delaying stakeholder alignment may allow the project team to revert to traditional D-B-B roles and behaviors where there is a purposeful and legal separation between these parties. The D-B contracting methods require strong collaboration. Agencies must align these parties from the onset of the contract.

Agencies should establish project goals when selecting the D-B method (see Chapter 3, Project Goals, Section 3.2). Project managers must emphasize these project goals with the D-B team throughout all project phases, beginning with the Kickoff meeting.

To ensure success, the agency and D-B team should consult the project goals during critical design, risk allocation, scheduling, and pricing decisions.

The D-B contracting method provides one point of responsibility for both design and construction. Therefore, traditional roles and responsibilities can change. The use of the 2 Roles and Responsibilities tool can clarify team member functions and help to avoid problems. The use of 5 Co-Location of Key Personnel can help to expedite decisions, as well as the overall design and construction process.

> The Roles and Responsibilities tool can clarify team member functions and help to avoid problems.

The use of D-B encourages partnering by assembling the team early and establishing relationships and communication protocols before the project activities ramp up (see 8 D-B–Specific Partnering). This partnering can be either informal (occurring organically with team formation and normal interactions), or it can be done more formally with facilitated meetings producing a team charter in alignment with project goals and using an evaluation plan.

On major projects, using formal partnering with a formal evaluation plan is a very effective Alignment Strategy.

Project teams should also realize that alignment extends beyond the core project team. The team must also align key stakeholders, especially those who might not be familiar with the team integration or fast pace of a D-B project. Project teams can apply tools such as 7 External Stakeholder Coordination Plan, 6 Regulatory Agency Partnering, and 10 FHWA Involvement Overview to maximize alignment with external stakeholders.

2.3 Scope Strategy


SCOPE

Ensure that the project scope and responsibilities are understood and agreed upon by all parties. A clear understanding of the project scope is essential for successful execution of a D-B project. Note that the alignment strategy discussed earlier is a foundation to allow for a successful Scope Strategy because it helps align all key stakeholders around the scope of the project.

The D-B process involves design in the procurement process and moves quickly into final design upon project award. Design–builder team integration and single-point responsibility of the D-B team ensure constructability and efficiencies of design. However, there is a risk that

The fast-paced nature of D-B contracting requires a stable group of core team members to maintain design intent and scope control from the RFP to design and construction.

the scope intent from the RFP and design–builder proposal can be lost in the fast-paced final design process. Some agencies use a 19 Scope Validation Period—or similar tool—to prevent a misunderstanding of project scope in the handoff from procurement to design and construction. Project teams must identify any discrepancies in team understanding of scope or areas of uncertainty as soon as possible to avoid delays, cost growth, or disputes.

The tool 9 Continuity of Team Members describes a key lesson learned from the research case studies. The highly integrated and fast-paced nature of D-B contracting requires a stable group of core team members. Teams can also gain beneficial scope management through the use of 15 Independent Party Design Review, as long as the design reviewers have a clear grasp of the original project scope. Among the tools that support the Scope Strategy are 11 Permit Commitment Database and 14 Discipline Task Forces.

2.4 Design Quality Strategy

Ensure design quality through active participation in design reviews and accurate implementation of the RFQ and RFP requirements. One of the most fundamental differences between D-B and D-B-B contracts is the design process. D-B-B projects are fully designed prior to bidding, with all the required information to accurately bid the project. In theory, the project plans should not change significantly after the project has been bid. In contrast, D-B projects are typically procured with only about 20 percent or 30 percent of the design complete and require the D-B team to complete the design under the construction contract. To complicate matters further, the design–builder does not typically finish design until after some construction has already begun. Expectations for the design often do not consist of biddable documents by a diverse set of contractors but, instead, consist of enough details to inform efficient construction by one firm: the same team completing the design. Since the timing, expectations, and requirements of the project design in a D-B project are significantly different from those of a D-B-B project, tools that promote this Design Quality Strategy can be implemented to achieve an efficient and effective design and review process.

Expectations for the design often do not consist of biddable documents by a diverse set of contractors but, instead, consists of enough details to inform efficient construction by one firm.

Tools to support the D-B Design Quality Strategy can include 12 Plan Standards and 13 Deviations from Agency Standards. Often times, 14 Discipline Task Force and 17 In-Progress Design Workshops are used to align the designs for subsets of the D-B project and/or stakeholders. 15 Independent Party Design Reviews and 18 Over-the-Shoulder Reviews provide assurance to the agency that the D-B firm is performing a quality design. These tools and others support the Design Quality Strategy, which is critical to a successful D-B project.

2.5 Construction Quality Strategy

Promote quality during construction, and enforce requirements of the D-B contract. While agencies often select D-B contracts for their potential time and cost savings, it is important to maintain excellent project quality. All quality assurance (QA) and quality control (QC) methods that apply to D-B-B projects also apply to D-B projects. Additionally, the D-B contracting approach provides agencies with opportunities to implement alternative QA-QC methods that align with project goals.

The primary difference between D-B and traditional D-B-B construction quality approaches occurs in the *QA/QC Roles and Responsibilities*; not necessarily in any QA-QC process changes.

Since the D-B process involves the contractor early and provides an opportunity for specifying construction means and methods, agencies can request that the D-B firm be responsible for various QC activities. Tools to support the Construction Quality Strategy can include 22 Contractor-Controlled QC Testing, 23 Contractor Involvement in Establishing QC Standards, 24 Incentive–Disincentive Program for Superior Quality, and 26 Dual Construction Engineering Inspector Roles. Moreover, the tool 25 Real-Time Electronic Quality Management Information provides an organizational system to record and access quality-related information in a central location, track noncompliance issues, and ensure that all areas of concern are documented and closed out.

Because of the contractor's knowledge of design, materials, and methods in the D-B process, agencies are more apt to involve them in QC activities.

The D-B process allows for alternative approaches to ensure achievement of existing requirements and specifications. If the agency desires, alternative approaches allow for a focus on superior quality during the construction phase.

2.6 Construction Efficiency Strategy

Implement a system that increases efficiency during construction and aligns with roles and contractual responsibilities. The D-B contracting method provides a strong potential for time and cost savings. Achievement of this potential depends on efficient construction operations.

The Construction Efficiency Strategy is dependent on clear project goals and scope being set during procurement (see Chapter 3, Project Goals, Section 3.2). In other words, construction efficiencies are made possible by the D-B aligning with other team members during design, gaining a clear understanding of the project scope, and agreeing upon appropriate means and methods of construction.

The D-B firm can adapt to the design and be ready for the construction phase ahead of time, by planning earlier than they typically can in a traditional D-B-B delivery. For example, a temporary traffic control plan is vitally important to project safety. D-B offers a tremendous advantage because the design-builder can design the plan with interaction and input from the agency and can allocate the necessary resources to ensure a high level of worker and motorist safety. Although this activity is similar in D-B-B and D-B, the timing of it makes a significant difference. D-B offers these types of opportunities to improve construction performance and efficiency. D-B also offers opportunities for a more efficient construction closeout phase to transition from construction to operations and ensuring a safe and efficient startup of the new facility.

Examples of D-B tools to support the Construction Efficiency Strategy can include tools to keep stakeholders adequately informed, such as 14 Discipline Task Force and 20 Public Announcements. The tool 16 Cost–Savings Matrix tracks innovative ideas and their impact on cost, and the 28 Payment Checklist tool keeps payments organized and helps guide invoice preparation and review. 27 Witness and Hold Points allow for checking technical quality requirements and safety requirements so that the next activities can proceed smoothly. 21 Delegation of Authority enables some project decisions to be made quickly by personnel with specific project knowledge, which promotes construction efficiency.

2.7 Summary

Agencies can use these five D-B strategies to select tools that will help achieve the project's goals. By implementing these strategies, agencies can thoughtfully and appropriately select tools from within this guidebook, adapt tools for project-specific use, and develop new

tools to fit agency-specific needs. An important aspect of developing D-B project tools is to identify differences from D-B-B projects and determine how to leverage these differences to lead a more successful project. By emphasizing strategies of alignment, scope, design quality, construction quality, and construction efficiency, agency leadership can guide the project stakeholders toward D-B contract administration success. To facilitate this task, each of the tools in Appendix A have icons corresponding to the strategy or strategies that the tool addresses.

CHAPTER 3

Pre-Award Phase Administration

3.1 Introduction

This chapter introduces the pre-award phase and its underlying principles, which will help establish a foundation for the administration of the D-B contract. In general, this guidebook focuses on post-award processes and tools for D-B contract administration, whereas the *AASHTO Guide for Design–Build Procurement* (AASHTO 2008b) describes D-B procurement activities in detail. Before getting into post-award contract administration in later chapters, this chapter highlights some of the key project delivery and procurement decisions that lay the foundation for effective contract administration. These include

- Project goals,
- Project delivery selection,
- D-B procurement,
- Betterments, and
- ATCs.

3.2 Design–Build Pre-Award Activities that Affect Contract Administration

FHWA D-B regulations give state DOTs wide discretion in identifying D-B projects (U.S. Department of Transportation 2002). D-B delivery has been successfully applied on simple pavement overlays and complex corridor reconstructions. However, as stated in the AASHTO *Guide for Design–Build Procurement* (AASHTO 2008b), not all projects are appropriate for D-B. If D-B project delivery is applied to an unsuitable project, the construction administration strategies and tools in this guidebook may not help make a project successful. This section of the guidebook addresses a few key concepts from the D-B procurement stage that are important to project success.

Project Goals

D-B project delivery can provide advantages over D-B-B project delivery. These potential advantages can include shorter project durations, earlier schedule certainty, lower initial costs, earlier cost certainty, and better life-cycle solutions. However, these advantages all assume that the agency has selected an appropriate project and has clearly defined its project goals. Clearly written project goal statements, which are included in the RFQs and RFPs for the design-builder, are among the most important factors for D-B project success. They help guide the contract administration process. Table 3.1 provides example project goal statements that have been adapted from the *AASHTO Guide for Design–Build Procurement* (AASHTO 2008b).

Table 3.1. Mapping of design–build benefits to project goals.

Possible Design–Build Benefits	Project Goals
Schedule • Shorter duration • Earlier schedule certainty	Schedule • Minimize project delivery time • Complete the project on schedule
Cost • Initial cost savings • Earlier cost certainty • Less cost growth	Cost • Minimize project cost • Maximize project budget • Complete the project on budget
Quality • Equal or better quality • Quality in procurement	Quality • Meet or exceed project requirements • Select the best team
Innovation • Better constructability • Less impact on the traveling public	Innovation • Provide innovative solutions • Minimize impact on the traveling public

Agencies should consistently refer to the project goals throughout all phases of the project. To help integrate the project goals into the contract administration phase, the agencies can explicitly include them in the 1 Kickoff Meeting, 7 External Stakeholder Coordination Plan, and 8 D-B–Specific Partnering tools.

Project Delivery Selection

With a clear understanding of project goals in mind, agencies can select the most appropriate project delivery method. Some agencies provide criteria for project selection in their alternative contracting method guidebooks, based on project goals, project constraints, and legislative authority (Colorado Department of Transportation 2016, Washington State Department of Transportation 2004). Others make the decision on a case-by-case basis.

To properly administer a project during the construction phase, agencies should be clear as to why they select D-B.

The FHWA Next Generation Transportation Construction Management Pooled Fund study developed a project delivery matrix to facilitate the project delivery selection process (Molenaar et al. 2014). FHWA promoted the selection matrix in the Every Day Counts initiative (FHWA 2016a). The process promotes a project delivery workshop that is up to 1 day in length. The workshop gathers key project personnel to discuss the opportunities and obstacles of each delivery method around eight critical project issues. These issues are important for project delivery selection and for construction administration.

- Delivery schedule—The overall project schedule from scope through design, construction, and opening to the public;
- Project complexity and innovation—The need for applicability of new designs or processes to resolve complex and technical issues;
- Level of design—The percentage of design completed at the time of the project delivery procurement;
- Initial project risk assessment—The process of quantifying the preliminary risk events to ensure the selection of a delivery method that properly addresses them;
- Cost—The financial process related to meeting budget restrictions, ensuring accuracy of cost estimation, and controlling project costs;
- Staff experience and availability—The experience and availability of the owner's staff to execute the project delivery methods under consideration;

- Level of oversight and control—The level of and manner in which the owner exercises control over design and construction processes; and
- Competition and contractor experience—The level of competition, experience, and availability in the marketplace and its capacity for the project.

Evaluating these issues will allow for the selection of appropriate strategies and tools for agency contract administration.

Design–Build Procurement

D-B has two distinctly different procurement methods: Best Value and Low Bid. The choice of procurement method will impact the manner in which the agency administers construction. Therefore, agencies should develop their construction administration processes to be consistent with their choice of procurement methods.

Agencies typically employ low-bid procurement only on smaller, non-complex D-B projects. FHWA data shows that agencies most frequently use this method on projects valued between $2 million and $10 million (FHWA 2017). These agencies provide a high level of design in the RFP—typically greater than 60 percent—and award the project to the lowest bidder who meets the technical minimums. Therefore, D-B low-bid construction administration is similar to D-B-B construction administration. QA and QC processes are typically similar to D-B-B processes. Design reviews and lump-sum payment procedures are different from D-B-B in D-B low-bid.

Agencies employ best value procurement on larger, more complex D-B projects. FHWA data shows that agencies most frequently use this method on projects valued at more than $10 million (FHWA 2017). Best value D-B projects contain a lower amount of design in the RFP, typically less than 30 percent. Awards are made on a combination of technical proposal and price. The technical proposal is then scored and a cost–technical tradeoff is made with price (Molenaar and Tran 2015). The following are some general categories that agencies use for best value selection:

- Schedule—Time to design and build project;
- Proposed Design Approach—Design–builder designs to meet the technical performance requirements set forth by the agency;
- Quality Management Plans—QA–QC plan prior to award;
- Project Management Plans—Plans for logistics, material management, equipment, public relations, and so on;
- Key Personnel—Experience and qualifications of key personnel;
- Subcontractors Information—Subcontracting plan, including small business utilization; and
- Safety Record and/or Plan—Corporate safety record and plans for specific safety hazards.

It is imperative that agencies carry the best value technical proposals into construction administration. Design–build teams will frequently propose more than the minimum agency requirements to win the project. Agencies frequently call these proposal items "betterments." A betterment should be an improvement, not merely a change to the basic configuration. A betterment is distinguishable in that it adds improvements to the project requirements. Betterments must be identified during the proposal evaluation stage, carried forward into the contract, and implemented during construction administration.

Agencies have developed some tools to assist with understanding the full scope of the procurement and the transition to design and construction. Some agencies use a Scope Validation Period—or a similar tool—to prevent a misunderstanding of the project scope in the handoff from procurement to design and construction. Teams can also gain beneficial scope management through the use of 15 Independent Party Design Review, as long as the design reviewers have a clear grasp of the original project scope.

Betterments

D-B proposers can suggest betterments during procurement, which add an improvement to the project beyond the given scope. Betterments are a way for D-B teams to demonstrate the value they can bring to a project. If a betterment is accepted by the agency, it is included in the contract and becomes a required deliverable. Some agencies use a 19 Scope Validation Period—or similar tool—to clarify betterments in the handoff from procurement to design and construction. 9 Continuity of Team Members is also a helpful tool to coordinate betterments across the project delivery process.

Alternative Technical Concepts

Alternative technical concepts (ATCs) are design–builder proposed changes to agency-supplied basic configurations, project scope, design, and/or construction criteria. These changes provide a solution that is equal or better to the requirements in the RFP. ATCs provide flexibility to the proposers to enhance innovation and achieve efficiency (AASHTO 2008b, Gad et al. 2015).

Similar to the discussion of best value criteria in the previous section, ATCs represent a change to the minimum requirements of the RFP that has implications on construction administration processes. ATCs must be identified during the proposal evaluation stage and carried forward into the contract during construction administration. ATCs need not be a betterment, but they frequently are. ATCs are not a reduction in scope or function. They always involve a change to the basic configuration or technical criteria set forth in the RFP. ATCs and betterments also help promote alignment between the agency and D-B, which is important for effective contract administration.

Agencies and design–builders must track ATCs during procurement and ensure that they are incorporated into design and construction after project award.

3.3 Summary

Actions and decisions made by the agency during pre-award can influence the contract administration post-award. Defining project goals, criteria used in selecting a delivery method, and criteria used in the selection of a D-B team affect the D-B contract and the expectations for the project. Key procurement activities—such as betterments and ATCs—can help establish scope and alignment on project goals. Thus, the pre-award phase establishes the foundation for administration of a D-B contract.

CHAPTER 4

Alignment Phase Administration

4.1 Introduction

This chapter discusses the alignment phase and presents tools that contribute to team alignment. This chapter addresses

- D-B alignment process overview and
- Alignment phase contract administration tools.

Agencies should strive for team alignment throughout the entire project, but the alignment phase is especially critical in establishing a strong foundation. In this phase, agencies foster an environment of team integration and group cohesion to facilitate successful project delivery. Alignment is sought on every aspect of the project, including goals, scope, processes, and communication. Construction projects bring together a variety of individuals and organizations to achieve a common goal. The D-B process allows the agency and design–builder to work as an integrated team to complete design and construction.

4.2 Design–Build Contract Administration Process

How the team—agency, design–builder, and project stakeholders—moves from the procurement phase to the construction phase is critical to project success. Generally, the owner holds a kickoff and team alignment meeting in which the payment schedule, work package execution flow, communication plan, organizational structure, and roles and responsibilities of the owner are discussed and formalized. The agency and design–builder can update project management plans and preliminary project plans together as a team. Key agency activities in the alignment phase include the following:

- Conduct kickoff meeting;
- Administer team alignment meetings;
- Align project plans;
  - Align stakeholder management plans;
  - Agree on cash flow, schedule of values, and schedule;
  - Align quality management plans and risk management plan;
  - Align construction implementation plans with design–builder and agency;
  - Execute partnering plan and align team integration; and
  - Develop a project plan package.

4.3 Agency Contract Administration Tools

In this phase, alignment that began during procurement continues. Alignment must occur internally (within the agency and within the D-B entity), as well as externally (with outside stakeholders). Outside alignment includes building a common understanding between the agency

and the design–builder and other stakeholders, such as regulatory agencies, utility companies, and local municipalities.

For decades, D-B-B has been the traditional method of delivery. Thus, agencies, engineers, and contractors have long-established processes and a history of roles and relationships in the D-B-B environment. Seeking alignment in goals, processes, and responsibilities is important for any project, but it is especially important when an agency is implementing alternative contracting methods. Miscommunication and misunderstanding can result when project participants are not aligned. Alternatively, by investing in alignment, project teams clarify what to do, how to accomplish it, and who is responsible for leading various tasks.

Teams with strong alignment can expect to be more collaborative, efficient, and unified.

A D-B champion with the agency can help keep alignment a priority at the start of the contract and throughout the project. A D-B champion is a key team leader who is knowledgeable about the D-B process and how it differs from D-B-B. To assist with project team alignment and help mitigate any team conflicts, the D-B champion must also be very knowledgeable of the project goals. Ideally, the champion would have been a part of the project delivery selection process and the establishment of project goals that are in alignment with the advantages of the D-B contracting method.

Even before an agency selects a D-B team, they can promote alignment through the tool of 3 Confidential One-on-One Meeting. In these meetings, agencies can test the common understanding of the project scope and performance specifications. They can also vet the project goals. The agency can also use a Glossary of Terms tool during procurement and into later project phases. A foundation for a common understanding is having universally accepted definitions on a project, especially for terms related to contract language such as bidding methods, adjusted bid, and firm neutral. The agency can also include a Glossary of Terms tool in its alternative contracting method manuals and in their RFQs and RFPs.

Likewise, 2 Roles and Responsibilities is a tool often represented as a table that clarifies which team member is responsible for certain tasks. This can prevent tasks from being forgotten.

The 4 External Stakeholder Coordination Plan is another tool to manage stakeholder involvement and input by identifying key times when specific outreach actions will be taken with stakeholders. This is especially useful with local jurisdictions or developers that are requesting and funding project betterments. Federally funded projects will involve the FHWA, and some of these team members may be new to D-B. The FWHA Involvement Overview tool likewise helps ensure that required meetings, reviews, and tasks that involve FHWA take place. The agency can communicate permit requirements in a 11 Permit Commitment Database, which they can share with the D-B entity to ensure the project team makes decisions and takes actions in line with these commitments.

Agencies choose to partner on select D-B-B projects because it has been proven to improve performance. But partnering is critical on all D-B projects because of the unique and concurrent nature of the design and construction process.

Communication fosters team alignment, and team meetings such as the 1 Kickoff Meeting help to further focus the team on project objectives and challenges and introduce team members to the people involved in various tasks. It is common for projects to hold a kickoff meeting, but in the context of a D-B project, a 1 Kickoff Meeting provides the additional opportunity for the team to review D-B processes and the division of roles and responsibilities.

Partnering can also build alignment with agency and D-B team members through the 8 D-B–Specific Partnering process with partnering meetings and assessments. Partnering can also occur with outside stakeholders through 6 Regulatory Agency Partnering. The D-B team can better understand

regulator concerns before design progresses, and the regulatory agency can better understand project-specific constraints before reviewing permit applications.

Another tool to facilitate collaboration between team members is 5 Co-Location of Key Personnel, which brings the agency, engineer, and contractor under one roof to expedite communication and feedback. 9 Continuity of Team Members is used to build a history and understanding of project decisions as the project moves through different design phases and into construction.

To facilitate alignment on scope after execution of the D-B contract, agencies frequently implement the 19 Scope Validation Period tool. This tool designates a given time period when the D-B entity can perform a thorough review of the RFP documents to check for defects, errors, or inconsistencies. If the team discovers scope issues during this period, the design–builder and agency work together to come into alignment on these issues.

The agency should employ tools for building team alignment early in the project. It can also apply these tools throughout project development and reap benefits in all phases of a project. For example, if the project team adds new team members during final design or at the start of construction, they may need to revise the D-B roles and responsibilities and revisit D-B specific partnering activities. Building team alignment is a fundamental part of unifying individuals and organizations. Alignment reduces uncertainty about where a team is going and how they are getting there, this in turn leads to more efficient project execution.

Table 4.1 lists the alignment phase tools. It also includes recommendations for tool use with different levels of project size and complexity. The tool descriptions in Appendix A elaborate on the tools and their applicability by project complexity and size.

Table 4.1. Summary of design–build alignment phase tools.

Tools for Design–Build Contract Administration	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
Phase 1. Administer Alignment Between Design-Builder and Agency										
1 Kickoff Meeting	✓				●	●	●	●	●	●
2 Roles and Responsibilities	✓				◗	●	●	●	●	●
3 Confidential One-on-One Meeting	✓				◗	●	●	◗	●	●
4 Glossary of Terms	✓				●	●	●	●	●	●
5 Co-Location of Key Personnel	✓	✓			○	◗	●	○	◗	●
6 Regulatory Agency Partnering	✓	✓			○	●	●	◗	●	●
7 External Stakeholder Coordination Plan	✓	✓			◗	●	●	◗	●	●
8 Design–Build–Specific Partnering	✓	✓	✓	✓	◗	●	●	◗	●	●
9 Continuity of Team Members	✓	✓	✓	✓	◗	●	●	◗	●	●
10 FHWA Involvement Overview	✓	✓	✓	✓	●	●	●	●	●	●
11 Permit Commitment Database	✓	✓	✓	✓	◗	●	●	●	●	●
19 Scope Validation Period	✓	✓			●	●	●	●	●	●

● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

4.4 Summary

The alignment phase of a project is a joint effort between the agency and design–builder. The tools in this chapter are those that agencies can use to administer alignment. Before tools are implemented, they should be explained to the team and modified for the project conditions or agency context. The alignment phase helps build a foundation of trust and collaboration that can serve the team throughout the project. Clear communication from the start is important to foster a collaborative environment. The primary goal of these tools is to help project participants communicate, document, plan, and execute the project efficiently. This list of tools may inspire agencies to develop new tools or adapt some of the tools in this guidebook based on the needs of a particular project or the organizational structure of their agency.

CHAPTER 5

Design Phase Administration

5.1 Introduction

This chapter discusses the design phase and presents tools that contribute to design development. This chapter addresses

- D-B Design Process Overview and
- Design Phase Contract Administration Tools.

D-B contracting places the responsibility and risk for design in the hands of the D-B entity. However, the agency plays a key role in keeping communication channels open during design by providing timely feedback and verification related to performance specifications in the contract. Design should proceed in a way that achieves a safe and functional facility, meeting acceptable standards that benefit from constructability input. The design–builder and agency should develop engineering drawings to provide adequate guidance for construction as opposed to bidding, as well as to meet the agency's as-built requirements.

5.2 Design–Build Contract Administration Process

D-B requires the agency and design–builder to manage design under what is essentially a construction contract. The D-B engineer must design to the requirements of the RFP. The agency needs to integrate all design requirements into the RFP and cannot interject preferences into the design process that extend beyond what is stated in the RFP. In the design phase, the most important contract administration activities involve the agency's review of the design work packages for overall compliance with the requirements. The outputs of the design are the design completion paperwork; environmental, utilities, and permitting restrictions; added scope; and work packages required to perform the construction services. Key agency activities in the design phase include the following:

- Ensure design compliance,
  - Ensure environmental compliance,
  - Manage utilities and permits,
  - Manage right of way and temporary construction easements,
  - Ensure functional requirements,
  - Ensure schedule requirements,
- Manage work package coordination,
- Review design package,
- Approve design invoice,
- Manage design documentation, and
- Enact a contract modification that impacts design.

5.3 Agency Contract Administration Tools

In this phase, the agency seeks to facilitate design for construction. This action requires the project team to have a clear understanding of the contract project goals. The agency and the D-B entity need to work collaboratively to fulfill project goals. This collaboration requires an understanding of the D-B roles and processes relating to design. D-B delivery can offer opportunities for innovation, but the agency and the D-B entity need to be open to thinking outside the routine standards. They must focus on making rapid design decisions that achieve the project goals while maintaining safety and quality in a cost-effective and timely manner.

Agency administration tools should facilitate innovation that achieves project goals while maintaining safety and quality in a cost-effective and timely manner.

After executing the D-B contract and before further developing the design, it can be helpful for the agency to implement the tool 19 Scope Validation Period. This tool designates a given time period when the D-B entity can perform a thorough review of the RFP documents to check for defects, errors, or inconsistencies. If scope issues are discovered during this period, the D-B presents these issues to the agency and the D-B and agency work together to resolve the issues. This process helps the project avoid problems later in design and construction.

To promote innovation, D-B teams can use a tool called 13 Deviations from Agency Standards, which provides a means to document and approve solutions that are outside of an agency's routine standards. By clearly articulating this approach, the D-B team can more easily focus on project goals and select suitable standards—perhaps from other states—or create project-specific specifications that will meet the agency's goals. The D-B team needs to know when to interact with FHWA on federally funded projects. The 10 FHWA involvement overview clarifies when FHWA staff are invited to meetings and when they are to receive the required design documents.

D-B partnering can go beyond the agency and design–builder to include FHWA and regulatory agencies and ensure that all stakeholders have input in key design decisions.

Collaboration between the agency, D-B entity, and FHWA on federally funded projects can be structured and strengthened with 8 D-B–Specific Partnering. Partnering can help bring people together and keep them in communication during the design process. 6 Regulatory Agency Partnering can promote good working relationships between the regulatory agencies and the D-B team during design. This can save time because the parties can review site constraints and design options together before a permit application is prepared and submitted. An 11 Permit Commitment Database can be developed during design to help ensure that commitments made during the design phase are carried out during construction.

When different jurisdictions, utilities, and other stakeholders are involved, a 7 External Stakeholder Management plan can be implemented so that their feedback can be considered in design as early as possible. 20 Public Announcements is a tool to keep the public informed about the project scope, schedule, budget, and about how the D-B delivery method will benefit the project.

Continuity of team members should be viewed as a tool for success rather than just a goal or process.

Research for this guidebook found that agencies view 9 Continuity of Key Team Members as a tool for project success, rather than just a process. Continuity means that the agency and design–builder staff who worked on the project during procurement and alignment continue to work on the project during design. These staff members help ensure continuity so that

issues that have been decided previously are not discussed again and so the project understanding that was built during alignment allows the design to proceed smoothly.

5 Co-Location of Key Personnel involves physically locating key team members from the agency and the D-B entity in a single location. Design can require significant interface between many disciplines, and having everyone physically nearby helps facilitate timely communication. As design issues are being discussed, decisions need to be made. 21 Delegation of Authority is a tool that puts decision-making authority into the hands of the agency engineer in charge of the project. This brings confidence to the team that people knowledgeable about the project will make decisions in a timely manner.

A number of tools serve to bring relevant team members together during the design process. A 14 Discipline Task Force brings together team members from the agency and the D-B entity to advance the design related to a specific discipline. 17 In-Progress Design Workshops bring together team members from different disciplines so multiple perspectives and factors can be taken into account during design. Whereas 17 In-Progress Design Workshops are meant to develop and discuss design options, 18 Over-the-Shoulder Reviews focus on obtaining review comments on a specific design option without directing design or formally approving a solution. To supplement agency labor and expertise, some agencies use 15 Independent Party Design Reviews to help keep the design process moving forward in a timely manner. Another tool to streamline the design process is 12 Plan Standards, which focuses on plans that contain content that the agency will need for as-built drawings rather than contract drawings required for bidding a project.

Schedule acceleration is perhaps the most common D-B project goal, so agencies must support an accelerated design process through team-oriented tools.

One benefit of D-B is contractor input regarding constructability during design. These constructability reviews are a D-B task, so no agency tool is labeled "constructability review." However, agencies do implement tools that help facilitate constructability input. For example, tools such as 18 Over-the-Shoulder Reviews, 14 Discipline Task Force meetings, and 17 In-Progress Design Workshops help to ensure that constructability input is occurring on projects during design development. Because D-B includes contractor input into design, D-B projects do not implement formal value engineering. Therefore, FHWA does not require value engineering on federally funded D-B projects (*Federal Register* 2014).

Innovative ideas can be generated when designers and builders work together in the design phase. A 16 Cost–Savings Matrix is a tool that helps the team document innovative ideas and track their possible application on the project until a decision is made to use or not to use the ideas.

Design phase tools are initiated in either the alignment or design phases. Tools for the design phase can help team members understand their roles during the design phase and encourage communication and collaboration. Some of the tools in this phase help move the design process forward while minimizing the need for iteration and rework. Tools to integrate feedback during design can facilitate project progress and provide a form of quality control. Tools that clarify how to handle deviations from plan standards and agency design standards can help keep the project team focused on project goals and contract requirements. Establishing patterns of strong communication and collaboration during design can support a strong construction phase.

Table 5.1 lists the design phase tools. It also includes recommendations for tool use with different levels of project size and complexity. The tool descriptions in Appendix A elaborate on the tools and their applicability by project complexity and size.

Table 5.1. Summary of design–build design phase tools.

Tools for Design–Build Contract Administration	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	**Noncomplex**	**Moderately Complex**	**Complex**	**≤ $10 million**	**$10 million–$50 million**	**> $50 million**
Phase 2. Administer Design of Design-Build Project										
5 Co-Location of Key Personnel	✓	✓			○	◗	●	○	◗	●
6 Regulatory Agency Partnering	✓	✓			○	●	●	◗	●	●
7 External Stakeholder Coordination Plan	✓	✓			◗	●	●	◗	●	●
8 Design–Build–Specific Partnering	✓	✓	✓	✓	◗	●	●	◗	●	●
9 Continuity of Team Members	✓	✓	✓	✓	◗	●	●	◗	●	●
10 FHWA Involvement Overview	✓	✓	✓	✓	●	●	●	●	●	●
11 Permit Commitment Database	✓	✓	✓	✓	◗	●	●	●	●	●
12 Plan Standards		✓			◗	◗	●	◗	●	●
13 Deviations from Agency Standards		✓			◗	●	●	◗	●	●
14 Discipline Task Force		✓			○	◗	●	◗	●	●
15 Independent Party Design Review		✓			○	●	●	○	●	●
16 Cost–Savings Matrix		✓			◗	●	●	◗	●	●
17 In-Progress Design Workshops		✓			◗	●	●	●	●	●
18 Over-the-Shoulder Reviews		✓			◗	●	●	●	●	●
19 Scope Validation Period	✓	✓			●	●	●	●	●	●
20 Public Announcements		✓	✓	✓	○	●	●	◗	●	●
21 Delegation of Authority		✓	✓	✓	●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

5.4 Summary

The design phase of a project is a joint effort between the agency and the design–builder. This chapter highlights tools that agencies can use to administer design. Approximately half of the tools for this chapter were initiated in the alignment phase. Therefore, team members should already be familiar with using these tools. The agency will introduce the team to any new tools that begin in the design phase. The primary goal of these tools is to help project participants communicate, document, plan, and execute design efficiently. This list of tools may inspire agencies to develop new tools or adapt some of these tools based on the needs of a particular project or the organizational structure of their agency. Appendix A provides additional information on tools that were identified for this guidebook by leading agencies.

CHAPTER 6

Construction Phase Administration

6.1 Introduction

This chapter discusses agency administration of the D-B construction phase and presents tools that contribute to successful construction administration. This chapter addresses

- D-B Construction Process Overview and
- Construction Phase Contract Administration Tools.

Due to their participation in the design phase, the D-B firm has in-depth knowledge of the design and the design intent. The agency's construction phase administration ensures that the team is making adequate construction progress and achieving all quality requirements. Other tasks include dispute resolution and the measurement and payment for work. D-B projects are often fast-tracked, so the agency should staff accordingly—with adequate assignment of internal or consultant staff—to participate in contract administration activities during construction. For example, with the changing roles and responsibilities for D-B projects, the agency should ensure that agency staff understand when they are performing quality acceptance versus quality verification.

6.2 Design–Build Construction Process Overview

D-B construction administration shares many similarities with traditional D-B-B construction administration. Ultimately, the same technical requirements are met using the same basic materials in both delivery methods.

Key differences revolve around risk allocation and the shifting of roles and responsibilities. Specifically, the agency can choose to shift some traditional QA-QC roles to the D-B firm. On small, noncomplex D-B projects, the process can closely resemble D-B-B. On large, complex D-B projects, where much of the design and construction risk has been assigned to the design–builder, the roles and responsibilities for control and inspection of work shift to the design–builder and the agency takes an assurance and compliance role. In almost all D-B projects, the method of payment changes from unit price to lump sum with a schedule of values.

Another primary difference in D-B construction administration revolves around the use of discrete work packages to facilitate faster construction. Administration of these work packages can be more demanding and resource intensive than D-B-B processes.

Key activities for the construction phase include the following:

- Manage legal relations;
- Manage public relations;

- Manage materials;
  - Sample and verify materials;
  - Test materials;
  - Certify materials;
- Control and inspect work;
  - Inspect work for conformance to plans and specifications;
  - Review completion of punch list items;
  - Document the daily work, compliance, and quality;
  - Manage the request for information process;
  - Manage the submittal process;
  - Monitor D-B QA-QC;
  - Manage nonconformances;
  - Review nonconformance design solutions;
- Execute supplemental agreements;
  - Receive change orders;
  - Estimate cost and time adjustments;
  - Negotiate cost and time adjustments at site level;
  - Review change orders;
  - Execute change orders;
- Resolve disputes;
- Measure progress and pay contractor;
  - Receive contractor invoices;
  - Review payment invoices;
  - Execute payments;
- Acquire project completion documentation; and
- Ensure as-builts are being developed by design–builder.

6.3 Construction Phase Contract Administration Tools

D-B projects frequently take advantage of more contractor involvement in QC.

In this phase, the agency facilitates construction progress. The D-B firm should have a thorough understanding of the project—from design through execution. A significant portion of innovative ideas should have been vetted by the agency via ATC during procurement and the design phase. However, additional innovation can still originate from subcontractors and suppliers who propose on—and build—portions of work. A key goal of the construction phase is ensuring quality. The agency can encourage quality construction through using tools such as electronic management of quality data and quality-based incentives. The D-B entity has responsibility for both the design and construction; thus, design issues that arise during construction are the responsibility of the D-B firm.

Some tools from previous phases can add value to construction. For example, 8 D-B–Specific Partnering strengthens relationships and builds communication channels that can help the agency and D-B entity work through issues that arise during construction. 9 Continuity of Team Members carry forward project knowledge from the design phase to the construction phase. 11 Permit Commitment Database is a tool that records commitments the project team made during the design phase to help ensure that permit commitments are not forgotten or violated during construction. The 21 Delegation of Authority tool facilitates timely decision making so that construction can proceed without unnecessary

delay. Typically, the public is not familiar with the D-B process and potential benefits, so 20 Public Announcements can help inform the public about the benefits D-B is bringing to this particular project.

A number of tools specifically relate to promoting quality during construction. Many agencies are able to use their standard QA-QC processes on D-B projects, especially small, noncomplex D-B projects. However, a number of tools have been developed to take advantage of opportunities that D-B delivery offers. For example, a 24 Incentive–Disincentive Program for Superior Quality allows the agency and D-B entity to agree on construction tasks that are prone to rework and establish a quality incentive program to exceed quality requirements for these agreed-upon areas. In addition to incentivizing quality, this tool helps reduce rework and can have a significant effect on project schedule. Incentives can also be established for other performance metrics, such as superior safety, access, or cost performance.

The three tools—Contractor-Controlled QC Testing, Contractor Involvement in Establishing QC Standards, and Dual Construction Engineering Inspector Roles—provide for more timely QC processes during construction without the loss of quality in the constructed project.

Agencies can adjust their standard D-B-B quality program to the context of a specific project using the tool 23 Contractor Involvement in Establishing QC Standards. Additionally, the tool 22 Contractor-Controlled QC Testing puts the responsibility for QC testing into the hands of the D-B entity—or a third party that the D-B contracts with—instead of the agency itself. This added responsibility can keep the D-B entity more alert to QC requirements and test results so that construction processes can adjust more quickly to quality needs. The 26 Dual Construction Engineering Inspector Roles tool adds quality control to the D-B entity's responsibilities and allows the agency to perform quality control checks. These tools keep both the agency and the D-B alert to quality matters during construction.

Construction projects generate a substantial amount of data and paperwork, especially relating to quality. The 25 Real-Time Electronic Quality Management Information tool can be used for efficient quality data management and record tracking. 27 Witness and Hold Points is another quality tool that helps the team avoid construction errors or rework. It brings team members together at critical points to witness the work completed up until those points before continuing with the work. Meeting or exceeding construction quality is an important task for a D-B entity. Any of the aforementioned tools that address quality should be part of a broader quality program. Additional guidance on quality programs can be found in *NCHRP Report 808* (Molenaar et al. 2015).

Throughout construction the D-B entity will be submitting invoices for completed work. A structured pay request process helps the agency receive the necessary information in the appropriate format for efficient reviews and enables the D-B entity to get paid promptly. The 28 Payment Checklist tool is used to identify which party is responsible for each task in the payment process.

Some of the tools used by the agency in the construction phase are initiated in the alignment or design phases; other tools are intended for the construction phase only. Many of these tools focus on achieving quality requirements. Table 6.1 summarizes the construction phase tools that can help the project team work collaboratively and efficiently. It also includes recommendations for tool use with different levels of project size and complexity. The tool descriptions in Appendix A elaborate on the tools and their applicability by project complexity and size.

Table 6.1. Summary of design–build construction phase tools.

Tools for Design–Build Contract Administration	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	**Construction**	Closeout	**Noncomplex**	**Moderately Complex**	**Complex**	**≤ $10 million**	**$10 million–$50 million**	**> $50 million**
Phase 3. Administer Construction of Design–Build Project										
8 Design–Build–Specific Partnering	✓	✓	✓	✓	◗	●	●	◗	●	●
9 Continuity of Team Members	✓	✓	✓	✓	◗	●	●	◗	●	●
10 FHWA Involvement Overview	✓	✓	✓	✓	●	●	●	●	●	●
11 Permit Commitment Database	✓	✓	✓	✓	◗	●	●	●	●	●
20 Public Announcement		✓	✓	✓	○	●	●	◗	●	●
21 Delegation of Authority		✓	✓	✓	●	●	●	●	●	●
22 Contractor-Controlled QC Testing			✓		●	●	●	●	●	●
23 Contractor Involvement in Establishing QC Standards			✓		◗	●	●	◗	●	●
24 Incentive–Disincentive Program for Superior Quality			✓		◗	●	●	●	●	●
25 Real-Time Electronic Quality Management Information			✓		●	●	●	●	●	●
26 Dual Construction Engineering Inspector Roles			✓		◗	◗	●	◗	●	●
27 Witness and Hold Points			✓		◗	●	●	◗	●	●
28 Payment Checklist			✓	✓	●	●	●	●	●	●

Note: CEI = construction engineering inspector; ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

6.4 Summary

The construction phase of a project is a joint effort between the agency and the design–builder. The tools introduced in this chapter are ones that agencies can use to administer construction. About half of the tools for this phase were used in one or more of the earlier project phases. Therefore, the project team should already be familiar with using these tools. This allows for continuity between the D-B project phases.

The agency should introduce the team to any new tools that will be implemented in the construction phase, especially the quality-related tools. The primary goal of these tools is to help project participants communicate, document, plan, and execute construction efficiently. The list of tools presented in this chapter may inspire agencies to develop new tools or adapt some of these tools based on the needs of a particular project or the organizational structure of their agency. The descriptions in Appendix A elaborate on the tools and their applicability by project complexity and size.

CHAPTER 7

Closeout Phase Administration

7.1 Introduction

This chapter introduces the closeout phase and presents tools that facilitate administering D-B project closeout. This chapter addresses:

- D-B Closeout Process Overview and
- Closeout Phase Contract Administration Tools.

Due to the typically larger size of D-B projects and the possible use of multiple construction packages, the closeout phase may be spread out over a longer time compared to a traditional D-B-B project. This chapter describes tools to help agencies complete closeout activities in a timely and efficient manner.

7.2 Design–Build Contract Administration Process

The final phase of D-B contract administration is closeout. This phase ensures that the project scope is complete and all activities are well documented.

In general, the D-B closeout process is similar to the D-B-B closeout process. There are only a few differences for D-B closeout. For example, the engineers may provide less detail in some of their designs because they only needed to design for one builder's interpretation. So, in some cases, as-built plans may need additional detail to comply with agency requirements for record drawings. As previously stated, the volume of closeout activities is also generally larger than D-B-B because of the possible use of multiple construction packages and the larger scale of the D-B projects. Key activities in the closeout phase include the following:

- Conduct final inspection,
  - Perform inspection,
  - Review punch list work,
- Review final turnover documentation,
  - Review as-built plans,
  - Review contractor turnover documentation,
  - Review contractor payments,
- Review invoice for final payment,
- Review corrective action completion,
- Execute contractor release,
- Conduct contractor evaluation and lessons learned, and
- Execute warranties.

7.3 Closeout Phase Contract Administration Tools

In this phase, the agency seeks to ensure the completion of construction and to facilitate the transfer of ownership of the facility to the agency's asset management and maintenance staff. These actions include conducting final inspections, receiving turnover documentation, and reviewing corrective actions. Project teams should address these activities leading up to closeout so that the appropriate project documentation can be made available in the closeout phase.

Successful project closeout is the culmination of effective construction administration and documentation throughout the project.

Construction challenges and the push to closeout a project can strain relationships. The 9 Continuity of Team Members tool can help support closeout activities since the same key people working on the project during early alignment, design, and construction also remain through closeout. Continuing involvement from key team members supports decisions and agreements made earlier in the project. Moreover, 8 D-B–Specific Partnering during the project—from procurement until closeout—can provide a team with a framework for working collaboratively and efficiently.

Federally funded projects will have FHWA requirements at the closeout phase, and a 10 FHWA Involvement Overview can help the team keep track of these requirements. Likewise, some permit commitments with regulatory agencies may be part of closeout, and an 11 Permit Commitment Database can serve as a tool to facilitate compliance.

The 21 Delegation of Authority tool facilitates timely decision making when questions arise related to payment, punch list items, claims, warranties, and other documentation. The 28 Payment Checklist tool clarifies the steps for invoicing and final payment, as well as responsibilities for each activity. By closeout, the public has lived through a period of construction, and a 20 Public Announcements tool can help communicate the benefits—such as access, time, cost, and safety—that were achieved by the project.

Closeout is a continuation and culmination of the construction phase, with the added requirements of finalizing documentation and payments. Some of the tools used in earlier phases can and should continue to be used during closeout. This research found no new closeout-specific tools that were not already included in the previous construction administration phases. Table 7.1

Table 7.1. Summary of design–build closeout phase tools.

Tools for Design–Build Contract Administration	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
Phase 4. Administer Closeout of Design–Build Project										
8 D-B–Specific Partnering	✓	✓	✓	✓	◗	●	●	◗	●	●
9 Continuity of Team Members	✓	✓	✓	✓	◗	●	●	◗	●	●
10 FHWA Involvement Overview	✓	✓	✓	✓	●	●	●	●	●	●
11 Permit Commitment Database	✓	✓	✓	✓	◗	●	●	●	●	●
20 Public Announcement		✓	✓	✓	○	●	●	◗	●	●
21 Delegation of Authority		✓	✓	✓	●	●	●	●	●	●
28 Payment Checklist			✓	✓	●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

lists closeout tools to help the project team fulfill project goals, permit requirements, and contract requirements. It also includes recommendations for tool use with different levels of project size and complexity. The tool descriptions in Appendix A elaborate on the tools and their applicability by project complexity and size.

7.4 Summary

The closeout phase of a project is a joint effort between the agency and the design–builder. This chapter highlights tools agencies can use to administer D-B project closeout. The primary goal of these tools is to help project participants communicate, document, plan, and execute closeout efficiently. The descriptions in Appendix A elaborate on the tools and their applicability by project complexity and size.

CHAPTER 8

Guidebook Implementation

8.1 Introduction

Implementation of D-B contract administration occurs in the context of the larger organization. This chapter provides guidance on identifying

- Strategies for meeting implementation goals at the organizational level,
- Tools for meeting implementation goals at the project level,
- Personnel and resources for implementation at both organizational and project levels, and
- Aspects of organizational culture important to D-B contract administration.

Table 8.1 summarizes implementation goals at the organization and project levels. Strategies discussed here are those presented in Chapter 2, and tools discussed here are those presented in Chapters 3 to 7 of this guidebook.

8.2 Organizational-Level Goals

The organizational level goals focus on introducing and embedding new D-B contract administration tasks and processes into the organization.

Organizational Goal 1. Commit to Long-Term Implementation

When an agency adopts an alternative contracting method such as D-B, new goals and new strategies are required to achieve those goals. A long-term commitment by the agency to embrace D-B processes prevents the agency from reverting to processes and tools used for traditional delivery. In many cases, it is not a matter of making minor adjustments to existing D-B-B processes but of implementing totally new processes. Adopting, disseminating, and explaining organizational goals and strategies such as those presented here help to demonstrate long-term commitment. Additionally, an agency demonstrates long-term commitment when implementing a plan of continuous improvement with the D-B–related organizational strategies. This continuous improvement involves evaluation of the D-B strategy by tracking implementation and measuring performance.

Strong commitment at the organizational level helps provide a framework for D-B to be successfully implemented at the project level.

Organizational Goal 2. Assign Roles and Responsibilities

An organization can make progress on strategies when people within the organization know their roles and responsibilities relating to those strategies. The roles and responsibilities of leaders within a D-B project include the following:

Table 8.1. Implementation goals.

Agency Level	Implementation Focus	Implementation Goals
Organization	Strategies	1. Commit to long-term implementation. 2. Assign roles and responsibilities. 3. Assess and adjust current strategy. 4. Communicate agency direction for D-B contract administration. 5. Train organizational team members. 6. Develop a method to measure and evaluate performance.
Project	Tools	1. Assess existing tools. 2. Identify appropriate tools based on project characteristics. 3. Train project team members. 4. Test new tools. 5. Evaluate the performance of tools.

- **D-B coordinator**—A D-B coordinator is involved in the procurement of every D-B project within the agency.
- **Alternative contracting method officer**—An alternative contracting method officer supports project managers in all aspects of procurement and contract administration.
- **Discipline-specific leads**—These agency-level leaders should understand how the D-B process will change reviews into an iterative process that incorporates contractor feedback on cost and schedule.
- **Upper-level administrators**—Upper-level administrators can incentivize staff performance by emphasizing the implementation of D-B processes on D-B projects.
- **D-B champion**—This agency staff member advocates for proper implementation of D-B practices on a project. The D-B champion could be a designated agency staff member on the project team or the alternative contracting method officer.

Creating and improving strategies require a commitment of time and resources. The most efficient way to ensure success is for the agency leaders to assign and train team members to direct and monitor implementation. Agency staff should be involved throughout this process to incorporate varying ideas, opinions, and areas of expertise. However, team members taking the lead should be clearly identified. Assigning roles and responsibilities minimizes confusion and ensures that strategies needed to reach the implementation goals are being actively managed.

> Successful D-B construction administration will require agencies to assign champions who have adequate time and resources to be successful.

Organizational Goal 3. Assess and Adjust Current Strategies

Assessment can occur at two times. The first time is before D-B processes or policies are in place. The second time is after implementing D-B processes. In either case, agency leaders want to understand the current organizational environment, which will help reveal opportunities for improvement.

Assessment areas are current policies, procedures, and guidance documents that affect D-B contract administration. It is also important that the leader determines if the written agency guidance is being followed or if there are unwritten rules that are being used. Feedback from agency personnel can reveal what is working well and what needs improvement.

Document review and feedback from agency personnel will identify areas of strength and areas for improvement. The assessors should look for D-B-B delivery processes that do not fit the goals of a D-B project, as this becomes a primary area for innovation and change. Once D-B

processes are in place, the leader's assessments focus on whether agency personnel are effectively using the new D-B processes, if there are obstacles to effective implementation, or if agency personnel are reverting back to D-B-B processes.

An assessment can show changes in the procurement process to strengthen alignment during contract administration. Alternatively, an assessment can show a gap in responsibilities or an overlap in roles. If processes are not implemented consistently, guidance may not be clear and training may be needed.

After evaluation of the existing strategies, the leader can begin incorporating new information and ideas from this guidebook. Ideas for improvement may come from the strategies for contract administration in Chapter 2 or from the tools presented in Chapters 3 to 7 and Appendix A. Updating existing policies, procedures, and guidance documents with new strategic approaches will convey long-term commitment and will promote a consistent approach to D-B projects.

Organizational Goal 4. Communicate Agency Direction for Design–Build Contract Administration

Gaining the support of agency personnel is an important step to successfully implement new strategies. This involves establishing a clear understanding of the new strategies and their benefits.

The strategies in Chapter 2 provide a roadmap for an agency's D-B direction. These strategies provide a framework for the creation of agency-specific goals. For example, the Alignment Strategy can provide for a group of programmatic goals that focus on the types, sizes, and levels of complexity of projects for which an agency will use D-B. The Design Quality Strategy can provide for direction reviews and analysis of alternatives and innovations.

Agency leaders can host agency-wide workshops as an effective way to communicate an agency's new or evolving approach to D-B contract administration. Workshops should focus on informing agency members of forthcoming internal changes and expected long-term benefits. Interagency memos and newsletters are other ways to communicate information and reinforce the agency's goals. The specific roles and responsibilities among individuals and team members will vary throughout the agency, as discussed below.

Organizational Goal 5. Train Organizational Team Members

When agency members have been informed about why new strategies are being introduced, they need to understand how to participate and contribute. Training can cover goals, approach, processes, benefits, and differences from D-B-B. Agency personnel involved in training at the organizational level include personnel involved in procurement, contract administration, payment, and compliance.

D-B training—at the organizational and project level—will increase the probability of successful project delivery.

Procurement personnel will need to understand about ATC processes, the time commitment involved in one-on-one meetings, how to respond based on performance specifications, and confidentiality. Personnel involved in contract administration need to know their role during design and construction to ensure design quality and construction quality. Personnel involved in payment must understand how measurement and payment applies to lump sum payments and how to document compliance with federal requirements for federally funded projects.

The training discussed here is at the organizational level. Agency personnel at the organizational level are frequently the first to be involved with a D-B project, and it is important that

they implement the correct approach at the earliest stages. Individuals at the organizational level may not adopt as many tools as those at the project level. To achieve effective D-B delivery, organizational-level personnel must understand and implement the agency's D-B approach as consistently as personnel at the project level.

Organizational Goal 6. Develop a Method to Measure and Evaluate Performance

It is crucial for the agency to develop a method to measure and evaluate the D-B program's performance to ensure goals are met and continuous improvement occurs. In developing a performance measurement methodology, an agency should consider the following:

- What will be measured?
- How will it be measured?
- Who will perform the measurement?
- When will the measurement occur?
- What will be done with the results?

Agency leaders can use multiple performance criteria to measure the effectiveness and success of the D-B program. These performance criteria include measuring whether projects are being completed on budget, on schedule, and with minimal disputes. Current performance can be compared with the historical performance of the D-B program or with the performance of the traditional D-B-B program.

In any performance analysis, decision makers should understand the context of the data. Projects of similar size and complexity should be compared. Any unusual circumstances regarding environmental issues, utility conflicts, right-of-way acquisition, and political issues should be factored into the analysis.

Assessments can include a cost performance evaluation, comparing the original agency-estimated costs to the awarded and final costs. This allows the agency to observe and potentially minimize the percentage growth of project costs throughout the various stages. However, data must be analyzed in light of many variables. For example, during a time when there is a rise in construction prices, an agency estimate developed from historical prices may not provide an accurate estimate.

Much like the project costs, the agency should strive to minimize or eliminate the schedule growth of a project to reduce overhead costs and road user costs. Schedule-variation analysis should take into account the agency's method and assumptions in estimating a schedule compared with a contractor's method and assumptions. Additionally, the effects of unknown conditions, agency change orders, or situations outside the contractor's control should all be considered when analyzing schedule data.

Performance assessments can include a dispute evaluation that can provide the agency with feedback on the quality of project documents and communication with the D-B team. Measuring the number, type, and cost of disputes will help agencies identify opportunities to improve project delivery.

Other performance criteria include safety, quality, mobility, and environmental impacts. Measuring and evaluating D-B performance can help an agency continuously improve D-B contract administration.

Agency leaders must assign the responsibility of performance measurement and evaluation to an individual or a team to ensure that it is being conducted consistently. Adequate time and resources must be dedicated to this function, which can be performed internally or contracted out to an independent evaluator.

The agency also must determine the frequency of evaluation. Frequency options include continuous or cyclical—monthly, quarterly, annually, or end of project—measurement. Monthly assessments could include partnering evaluations. Monthly, quarterly, and annual evaluations can provide data on how a project is progressing with regard to budget, schedule, and changes. End-of-project evaluations allow the project team to compare their project to benchmarks or other projects. The frequency of evaluation will vary from agency to agency, depending upon program maturity and need. But it is important to select a time frame and to remain consistent. It is difficult to go back to collect data; so, at the beginning of each project, a decision should be made on what data will be collected and how frequently that data will be gathered. Measurements becomes useful when they are followed up by analysis and actions that lead to continuous improvement.

8.3 Project-Level Goals

The project-level goals focus on introducing and embedding new tasks and processes into a project. During data collection of this study, one agency summarized their D-B project goals as:

- Be goal oriented. Make decisions based on goals.
- Be flexible. Be open to new ideas; not prescriptive.
- Be an empowered team. Team members should have authority to make decisions.
- Be confidential. It promotes trust and competition during procurement.
- Be bold. Don't just administer contracts; be a partner in solving problems.

In this spirit, this guidebook describes project goals for implementing the strategies and tools described within.

Project Goal 1. Assess Existing Tools

Agencies have a vast institutional knowledge of D-B-B tools. The purpose and implementation of these tools are sometimes documented and sometimes unwritten. These tools have benefited from years of use and improvement. Familiarity makes their implementation second-nature in many agencies. Some D-B-B tools can be used with D-B. However, when D-B processes and goals differ from D-B-B, then specific D-B tools should be used. Cost, schedule, quality, and other benefits of D-B can be lost when D-B-B tools are misapplied to the D-B process. Therefore, a project team must work collaboratively to implement D-B contract administration tools to achieve the full benefits of D-B delivery.

If an agency has never implemented a D-B project, agency leaders and project managers should first identify contract administration functions that differ from D-B-B. An agency can select, develop, or adapt tools to perform those D-B contract administration functions. If an agency has implemented D-B projects, tools currently being used on D-B projects should be identified and reviewed. Even if these practices are not currently referred to as tools, they may be considered tools. A definition of a tool repeated from Chapter 1 is provided to help clarify what constitutes a D-B contract administration tool:

> A **tool** is used to perform an operation. In this guidebook, it is a tactic or process relating to D-B contract administration, such as checklists, spreadsheets, guidelines, and structured meetings.

When the project team has a list of available tools from past agency experience, a comparison can be made between the tools currently in use and those included in this guidebook. Project team members should ask questions about existing tools such as:

- Can the purpose and implementation of existing tools be described better?
- Can existing tools be improved to perform better?

- Is an existing tool suited for D-B-B, but not for D-B? And should it be removed from the D-B tool kit?

Project team members should ask questions about tools from the guidebook, such as:

- Should we adopt this tool from the guidebook?
- Are there tools in the guidebook that we can adapt to better meet our project needs?

Improvements to D-B contract administration can occur by improving existing tools and adopting or adapting new tools. An agency should investigate all of these options during the tool assessment.

Project Goal 2. Identify Appropriate Tools Based on Project Characteristics

To effectively deliver D-B projects, the agency and D-B project team should select tools that fit the project characteristics. The tool descriptions in this guidebook include recommendations regarding the appropriateness of the tool for various project sizes and complexity levels. Some tools are widely applicable; other tools may be most appropriate for a project of a certain size or complexity. For example, the tool that identifies roles and responsibilities—2 Roles and Responsibilities—is appropriate for all project sizes, whereas the 4 External Stakeholder Coordination Plan tool is most applicable to project sizes over $10 million. The 12 Plan Standards tool is most appropriate for complex projects, but the 17 In-Progress Design Workshops tool is most appropriate for moderate to complex projects.

Typically, tools that are appropriate for small and noncomplex projects are appropriate for larger and complex projects, as well. However, tools appropriate for large and complex projects may not make sense with regard to cost–benefit for small, noncomplex projects.

Project Goal 3. Train Project Team Members

When D-B goals, approaches, processes, benefits, and changes have been communicated to agency personnel, the agency project manager needs to introduce training programs to cover these topics. Project team members need to understand their specific roles and responsibilities for implementing tools for D-B contract administration.

Project team members should be trained on the D-B contract administration tools they will be using and the details for their proper implementation. Training should extend to project managers, as well as to field and office staff. Training also should be provided to consultant staff who represent the agency during contract administration as if they were a part of the agency. Training may need to occur at various times during the life of a project as new individuals are on-boarded or as weaknesses in tool implementation are observed. These can include lack of tool use, incorrect tool use, or inconsistent tool use. Specific topics to include in the training to implement tools for D-B contract administration include the following:

- Tool Purpose (Why is it used?),
- Tool Function (What does it do?),
- Tool Timeline (When is it implemented?), and
- Tool Resources (Who is involved?).

The use of new tools for D-B contract administration is effective only if tools are implemented properly throughout the life of the project. Training is the foundation for proper and consistent implementation of tools for D-B contract administration.

Project Goal 4. Test New Tools

An agency should test new tools for D-B contract administration before incorporating them. New tools can be tested on a pilot project to help team members analyze and better understand each tool and how the tool can be customized to fit the agency's processes.

For example, the 5 Co-Location of Key Personnel tool may occur daily in a physical location for agencies with a high volume of D-B projects in urban areas where engineers and contractors are located. In contrast, an agency with many D-B projects in rural areas may redefine co-location to happen through regular Internet meetings supplemented with weekly face-to-face meetings.

The agency can also test new tools in parallel with similar tools already in use. Such a side-by-side comparison of performance can facilitate the identification of strengths and weaknesses. In summary, it is important to analyze, test, and modify a tool on an agency's projects prior to including that tool in policy, procedure, or guidance documents.

Project Goal 5. Evaluate the Performance of Tools

The agency project manager should evaluate performance of project tools on a regular basis, and those evaluations should be incorporated into the project team's "lessons learned" summary, typically at the end of the project. This allows all team members to provide insight and perspectives on how the tools functioned and how they can be improved. This ensures that the tools evolve if an agency's project delivery needs change. Regular evaluation for continuous improvement can help the tools perform to their maximum potential.

8.4 Agency Design–Build Contract Administration Training

Training related to D-B delivery and tools for D-B contract administration can occur through formal training sessions, workshops, meetings, manuals, written materials, and informal interactions with people experienced in D-B contracting methods. D-B contract administration will convey to project personnel knowledge about roles and responsibilities, tool implementation, and documentation. Training should always distinguish D-B goals and processes from D-B-B. Initial training will occur early in the project development. Additional training can be provided during later project phases as new team members join the project or as the need for refreshers on D-B tool implementation become apparent.

Time and effort is required to develop a good training meeting. An agenda should be designed to address training goals, and handout materials and visual aids should be gathered to support the agenda objectives. People with experience with D-B contracting should be involved in delivering the training. At a meeting or workshop, short scenarios can be provided to small groups to discuss the roles of various team members. For example, a scenario regarding the QA activities for a bridge deck can be shared and the responsibilities of each stakeholder reviewed. The intent is to provide everyone with a bigger picture about what is trying to be achieved by seeing an activity through the eyes of multiple stakeholders. Additionally, this can highlight how all tasks associated with QA may get done but with different team members performing different roles than in a traditional delivery method.

All project team members—as well as agency management involved in approvals—should be invited to the training. Upper-level support for the training should be visible. Everyone in the agency should see that the organization has a culture with a long-term commitment to successful D-B contract administration.

Agency D-B manuals can be used to train agency staff and others to provide a uniform understanding on how the agency intends to implement D-B projects. When D-B delivery is new within an agency, the agency project manager of a D-B project may need to meet with individuals within functional groups to provide information on D-B roles, responsibilities, and processes. As an agency gains experience with D-B, training should not stop but get more targeted to reveal more details of D-B delivery. Additionally, agencies should use their experience to fine-tune tools for D-B contract administration based on the specific context of each project.

8.5 Summary

This chapter introduces the recommended approach to integrating and implementing the concepts found it this guidebook at both the organizational and project level. Establishing and achieving these implementation goals will assist in improving the agency's execution of D-B projects. There is no one perfect strategy or tool that will lead to success. Each agency must develop their own approach to fit within their organizational and project needs. To consistently achieve project success agencies are encouraged to integrate and implement the concepts found in this guidebook and provide training to agency personnel and project stakeholders. Additionally, agencies should develop a culture that is open to change and supports innovation in order to fully realize the benefits of D-B and other alternative contracting methods.

References and Bibliography

AASHTO. *AASHTO Guide to Quality in Preconstruction Engineering*, Washington, D.C., 2003.

AASHTO. *AASHTO Consultant Contracting Guide*, Washington, D.C., 2008a.

AASHTO. *AASHTO Guide for Design–Build Procurement*, Washington, D.C., 2008b.

AASHTO. *AASHTO Partnering Handbook,* 2nd Edition (draft). Washington, D.C., 2017.

Alleman, D., A. Antoine, D. Papajohn, and K. Molenaar. Desired Versus Realized Benefits of Alternative Contracting Methods on Extreme Value Highway Projects. In *Proceedings of the Resilient Structures and Sustainable Construction, International Structural and Engineering Society* (E. Pellicer, J. M. Adam, V. Yepes, A. Singh, and S. Yazdani, eds.), ISEC Press, Fargo, North Dakota, 2017.

American Bar Association. Dispute Resolution Processes: What is Dispute Resolution? n.d. https://www.americanbar.org/groups/dispute_resolution/resources/DisputeResolutionProcesses.html. Accessed June 2, 2018.

Anderson, S., K. R. Molenaar, and C. J. Schexnayder. *NCHRP Report 574: Guidance for Cost Estimation and Management for Highway Projects during Planning, Programming, and Preconstruction.* Transportation Research Board of the National Academies, Washington, D.C., 2007. https://www.doi.org/10.17226/14014.

Arizona Department of Transportation. *Design–Build Procurement and Administration Guide,* 3rd edition. December 2007. https://azdot.gov/docs/default-source/construction-group/designbuildguide.pdf?sfvrsn=0. Accessed February 10, 2018.

Arizona Department of Transportation. Design–Build Projects Satisfy the Need for Speed (and Save Money, Too). July 11, 2011. https://uat.azdot.gov/media/blog/posts/2011/07/07/design-build-projects-satisfy-the-need-for-speed-(and-save-money-too). Accessed September 23, 2017.

Arizona Department of Transportation. CMAR Method Is Beneficial for Certain Projects. May 22, 2013. https://www.azdot.gov/media/blog/posts/2013/05/22/cmar-method-is-beneficial-for-certain-projects. Accessed September 23, 2017.

California Department of Transportation. *Quality Control Manual for Hot Mix Asphalt for the Quality Control Quality Assurance Process*. June 2009. http://www.dot.ca.gov/hq/construc/publications/qcqaman1.pdf. Accessed February 18, 2018.

California Department of Transportation. *I-15/I-215 Interchange Improvements (Devore), Project Requirements, Book 2*. April 17, 2012. http://www.dot.ca.gov/design/idd/db/devore/rfp/Devore-Project-Requirements.pdf. Accessed July 26, 2018.

California Department of Transportation. *Design–Build Demonstration Program Quality Manual* Outline. July 2013. http://www.dot.ca.gov/design/idd/db/sac50-5/rfp/03-2F21U4-Exhibit-2A-Quality-Manual-Template.pdf. Accessed February 12, 2017.

Capers, H., H. Ghara, K. C. Rehm, N. Boyd, T. Swanson, C. Swanwick, R. J. Healy, R. W. Dunne, and R. S. Watral. NCHRP Project 20-68A, Scan 09-01: Best Practices in Quality Control and Assurance in Design. Transportation Research Board, Washington D.C., 2011. http://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp20-68a_07-01.pdf. Accessed April 13, 2018.

Chung, H. W. *Understanding Quality Assurance in Construction: A Practical Guide to ISO 9000*. E & FN Spon, London, UK, 1999.

Colorado Department of Transportation. *Innovative Contracting (Design–Build and CM/GC).* 2015. https://www.codot.gov/business/designsupport/innovative-contracting-and-design-build. Accessed July 31, 2017.

Colorado Department of Transportation. *Design–Build Manual: Innovative Contracting Program*. September 2016. https://www.codot.gov/business/designsupport/innovative-contracting-and-design-build/2016-cdot-d-b-manual. Accessed February 10, 2018.

Connecticut Department of Transportation. *Rehabilitation of Bridge Nos. 03761, 03762, 03764, & 03765 Route 8 in Bridgeport*. October 2014. http://www.ct.gov/dot/lib/dot/documents/dconstruction/designbuild/bridgeport_project_15-363_rfp_part_1.pdf. Accessed February 14, 2018.

Design–Build Contracting: Final Rule. *Federal Register*, Vol. 67, No. 237, Tue., Dec.10, 2002, pp. 75902–75935.

Design–Build Institute of America. Design–Build Done Right: Universally Applicable Best Design–Build Practices, Vol. 2, DBIA. February 2014. https://www.dbia.org/resource-center/Pages/Best-Practices.aspx. Accessed February 17, 2018.

Design–Build Institute of America. Design–Build Done Right: Federal Sector Best Design–Build Practices, November 2015. https://www.dbia.org/resource-center/Pages/Best-Practices.aspx. Accessed February 17, 2018.

Ellis, R. D., Z. Herbsman, and A. Kumar. *Evaluation of the FDOT Design/Build Program*, Final report. Department of Civil Engineering, University of Florida, Gainesville, 1991.

FHWA. Design–Build: FHWA's Role in the Design–Build Program Under Special Experimental Project No. 14. U.S. Department of Transportation, Washington, D.C. 1996.

FHWA. *Contractor Quality Control Plans, Contractor Guidelines, and Example Quality Control Plan*. U.S. Department of Transportation, Washington, D.C. February 1998. https://flh.fhwa.dot.gov/resources/construction/documents/contractor-qc-plans.pdf. Accessed February 18, 2018.

FHWA. *Planning and Environmental Linkages Partnering Agreement*. U.S. Department of Transportation, 2009. http://environment.fhwa.dot.gov/integ/final_signed_partnering_agreement_June09.pdf.

FHWA. *Guidance on QC/QA in Bridge Design in Response to NTSB Recommendation (H-08-17)*. U.S. Department of Transportation, August 2011. https://www.fhwa.dot.gov/bridge/h0817.pdf. Accessed April 14, 2018.

FHWA. Every Day Counts: An Innovation Partnership with States. U.S Department of Transportation, Washington, D.C. 2016a. http://www.fhwa.dot.gov/innovation/everydaycounts/. Accessed December 31, 2016.

FHWA. *Construction Program Guide: Special Experimental Project No. 14—Alternative Contracting*. U.S Department of Transportation, Washington, D.C. 2016b. http://www.fhwa.dot.gov/construction/cqit/sep14.cfm. Accessed December 21, 2016.

FHWA. *Alternative Contracting Method Performance in U.S. Highway Construction*. FHWA-HRT-17-100. Washington, D.C., 2017.

FHWA. *Federal-Aid Program Administration*. 2018. https://www.fhwa.dot.gov/federalaid/stewardship/. Accessed August 20, 2018.

FHWA. Alternative Contracting Methods (ACM) Library. n.d. https://www.fhwa.dot.gov/construction/contracts/acm/. Accessed June 2, 2018.

FHWA Minnesota Division and Minnesota Department of Transportation. Stewardship & Oversight Agreement. 2015. https://www.fhwa.dot.gov/mndiv/stewardship.cfm. Accessed August 20, 2017.

Florida Department of Transportation. *Plans Preparation Manual, Volume 1: Design Criteria and Process.* January 2017. http://www.fdot.gov/roadway/ppmmanual/2017/Volume1/2017Volume1.pdf. Accessed February 11, 2018.

Ford, M. L. *NCHRP Web Document 39: Managing Change in State Departments of Transportation: Scan 7 of 8: Innovations in Public–Public Partnering and Relationship Building in State DOTs*. Transportation Research Board, Washington, D.C., 2001. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w39-7.pdf. Accessed April 13, 2018.

Gad, G. M., D. D. Gransberg, and M. Loulakis. Submittal and Evaluation Procedures for Alternative Technical Concepts. *Transportation Research Record: Journal of the Transportation Research Board*, No. 2504, 2015, pp. 10–18. http://dx.doi.org/10.3141/2504-02.

Georgia Department of Transportation. *Design–Build Manual*, Revision 4.2, October 3, 2016. http://www.dot.ga.gov/PS/DesignManuals/DesignGuides. Accessed November 25, 2017.

Gransberg, D. D., J. Datin, and K. R. Molenaar. *NCHRP Synthesis 376: Quality Assurance in Design–Build Projects*. Transportation Research Board of the National Academies, Washington D.C., 2008. https://dx.doi.org/10.17226/23222.

Gransberg, D. D., J. Shane, J. Schirholz, S. Anderson, A. Hessami, C. Lopez del Puerto, K. Strong, D. Pittenger, and J. McMinimee. NCHRP Project 10-85: A Guidebook for Construction Manager-at-Risk Contracting for Highway Projects. Transportation Research Board of the National Academies, Washington, D.C., 2013.

Gransberg D. D., M. C. Loulakis, and G. M. Gad. *NCHRP Synthesis 455: Alternative Technical Concepts for Contract Delivery Methods*. Transportation Research Board of the National Academies, Washington, D.C., 2014. https://dx.doi.org/10.17226/22419.

Hoyle, D. *ISO 9000 Quality Systems Handbook: Using the Standards as a Framework for Business Improvement*, 6th Edition, Elsevier, Oxford, UK, 2009.

International Partnering Institute. *Collaborative Partnering Best Practices Guide*. Livermore, CA, 2017.

Jie, Y., C. Nan Fu, and G. W. Raba. Implementation of a Web-Based Electronic Data Management System for the Construction Material Quality Assurance Program of a Highway Mega-Project. Presented at 85th Annual Meeting of the Transportation Research Board, Washington, D.C., 2006.

Lane, L. B. *NCHRP Synthesis 373: Multi-Disciplinary Teams in Context-Sensitive Solutions.* Transportation Research Board of the National Academies, Washington D.C., 2007. https://dx.doi.org/10.17226/23123.

Migliaccio, G. C., G. E. Gibson, and J. T. O'Connor. Procurement of Design–Build Services: Two-Phase Selection for Highway Projects. *Journal of Management in Engineering*, Vol. 25, No. 1, 2009. pp. 29–39.

Minchin, E., L. Ptschelinzew, G. C. Migliaccio, U. Gatti, K. Atkins, T. Warne, G. Hostetler, and S. Asiamah. *NCHRP Report 787: Guide for Design Management on Design–Build and Construction Manager/General Contractor Projects.* Transportation Research Board of the National Academies, Washington, D.C., 2014. https://dx.doi.org/10.17226/22273.

Minnesota Department of Transportation. *Design–Build Manual*. August 2011. http://www.dot.state.mn.us/designbuild/. Accessed October 1, 2017.

Minnesota Department of Transportation. *Benefits of the Construction Manager/General Contractor (CMGC) Delivery Method*. n.d. www.dot.state.mn.us/winonabridge/docs/benefits-of-cmgc.pdf. Accessed July 30, 2017.

Minnesota Department of Transportation. *Benefits of the Construction Manager/General Contractor (CMGC) Delivery Method*. 2015. http://www.dot.state.mn.us/winonabridge/docs/casestudies/casestudy8.pdf. Accessed December 21, 2017.

Minnesota Department of Transportation. *Case Study Work Package #1: Early Piling Procurement*. n.d. www.dot.state.mn.us/winonabridge/docs/package1.pdf. Accessed July 30, 2017.

Missouri Department of Transportation. Safety Improvements Design–Build St. Charles and Franklin Counties, MO, Request for Proposals, Project No. J6P3194. January 20, 2017. Chesterfield, MO.

Molenaar, K., D. Gransberg, S. Scott, D. Downs, and R. Ellis.: Recommended AASHTO Design–Build Procurement Guide. Final report, NCHRP Project 20-07, Task 172. University of Colorado, Denver, 2005.

Molenaar, K. R., C. Harper, and I. Yugar-Arias. *Guidebook for Selecting Alternative Contracting Methods for Roadway Projects: Project Delivery Methods, Procurement Procedures, and Payment Provisions*. FHWA and Colorado Department of Transportation, 2014.

Molenaar, K. R., D. Gransberg, and D. N. Sillars. *NCHRP Report 808: Guidebook on Alternative Quality Management Systems for Highway Construction*. Transportation Research Board of the National Academies, Washington, D.C., 2015. https://dx.doi.org/10.17226/22128.

Molenaar, K. R. and D. Tran. *NCHRP Synthesis 471: Practices for Developing Transparent Best Value Selection Procedures*. Transportation Research Board of the National Academies, Washington, D.C., 2015. https://dx.doi.org/10.17226/22192.

Nevada Department of Transportation. Partnering Program. n.d. https://www.nevadadot.com/doing-business/about-ndot/ndot-divisions/operations/construction/partnering-program. Accessed April 14, 2018.

New York State Department of Transportation. Wellwood Avenue over Route 27, Request for Proposals, Instruction to Proposers, General Instructions. 2015. https://www.dot.ny.gov/main/business-center/designbuildproject20/repository/D900032%20Instructions%20To%20Proposers%20DRAFT%2020151014.pdf. Accessed February 7, 2017.

Pennsylvania Department of Transportation. *Innovative Bidding Toolkit*. 2013. http://www.penndot.gov/_layouts/pa.penndot.formsandpubs/formsandpubs.aspx. Accessed September 17, 2017.

Texas Department of Transportation. Design–Build Agreement, Version 1. August 11, 2017. https://ftp.dot.state.tx.us/pub/txdot-info/spd/design-build/agreement-template.pdf. Accessed July 23, 2018.

Transportation Research Board. *Transportation Research Circular E-C137: Glossary of High Quality Assurance Terms.* Transportation Research Board of the National Academies, 2009. http://www.trb.org/Publications/Blurbs/162259.aspx. Accessed June 2, 2018.

Utah Department of Transportation. Change Orders UDOT 08B-10. Revised August 17, 2017. https://www.udot.utah.gov/main/uconowner.gf?n=10539014823834013. Accessed July 23, 2018.

Value Engineering. *Federal Register*, Vol. 79, No. 172, September 5, 2014, pp. 52972–52977.

Vermont Agency of Transportation. *Alternative Technical Concepts*. March 2015. http://vtrans.vermont.gov/sites/aot/files/contractadmin/documents/designbuild/Alternative%20Technical%20Concepts_0.pdf. Accessed February 7, 2018.

Virginia Department of Transportation. *Design–Build Standard Template Documents*. November 2016. http://www.virginiadot.org/business/resources/APD_Docs/APD_Office_Page/2016_VDOT_Design-Build_Standard_Template_Documents_Parts_3,_4_5.pdf. Accessed February 7, 2018.

Washington State Department of Transportation. *Guidebook for Design–Build Highway Project Development*. June 2004. http://www.wsdot.wa.gov/NR/rdonlyres/46196EB8-F9D0-4290-8F55-68786B1DA556/0/DesignBuild_GuidebookJun2004.pdf. Accessed April 13, 2018.

Washington State Department of Transportation. I-405/NE 6th Street to I-5 Widening and Express Toll Lane Project, Request for Proposal. July 25, 2011. Appendix A, Z2. http://www.wsdot.wa.gov/biz/contaa/ProjectContracts/DESIGNBUILDCONTRACTS/NE%206TH%20ST%20TO%20I-5/Default.htm. Accessed December 16, 2017.

Washington State Department of Transportation. Payment Checklist. Email correspondence. January 3, 2018.

Glossary

Acceptance: The process of deciding, through inspection, whether to accept or reject a product, including what pay factor to apply. [Where contractor test results are used in the agency's acceptance decision, the acceptance process includes contractor testing, agency verification, and possible dispute resolution (Transportation Research Board 2009)].

Alternative contracting method (ACM): A system used—instead of the traditional design–bid–build (D-B-B) method—to procure those parties, materials, lands, and means necessary to execute the completion of a construction project (Minchin et al. 2014). Common alternative contracting methods include design–build (D-B) and construction manager–general contractor (CM-GC) (FHWA 2018). Other synonymous terms are innovative contracting method and alternative project delivery method.

Alternative technical concepts (ATC): The design–builder's proposed changes to agency-supplied basic configurations, project scope, design, or construction criteria. These changes provide a solution that is equal to or better than the requirements in the RFP. ATCs provide flexibility to the proposers in order to enhance innovation and achieve efficiency (AASHTO 2008b).

Best value: A procurement process where price and other key factors are considered in the evaluation and selection process (AASHTO 2008b).

Construction Manager–General Contractor (CM-GC): A project delivery system that entails a commitment by the construction manager to deliver the project within a guaranteed maximum price (GMP), in most cases. The construction manager acts as consultant to the owner in the development and design phases and as the equivalent of a general contractor during the construction phase. [When a construction manager is bound to a GMP, the general nature of the working relationship is changed. In addition to acting in the owner's interest, the construction manager must manage and control construction costs to avoid exceeding the GMP, which would be a financial loss to the construction manager (Transportation Research Board 2009)].

Design–bid–build (D-B-B): A project delivery system in which the design is completed either by in-house professional engineering staff or a design consultant before the construction contract is advertised. [The D-B-B method is sometimes referred to as the traditional method (Transportation Research Board 2009)].

Design–build (D-B): A project delivery system in which both the design and the construction of the project are simultaneously awarded to a single entity. [The main advantage of the D-B method is that it can decrease project delivery time (Transportation Research Board 2009)].

Dispute resolution: Processes that are used to resolve a conflict, dispute, or claim. The traditional method of dispute resolution includes litigation. Dispute resolution techniques that include other techniques—such as arbitration, mediation, and negotiation—may also be referred to as

alternative dispute resolution or appropriate dispute resolution (ADR). ADR techniques can be either binding (e.g., arbitration) or nonbinding (e.g., mediation). Also called conflict resolution.

Early work package (EWP): A work package, which—in this context—typically includes a design package, scope documents, and a guaranteed maximum price construction contract that is released for a notice to proceed prior to all the design work for the overall project being complete. Multiple early work packages can be implemented to complete the overall project (Alleman et al. 2017).

Guaranteed maximum price (GMP): Also known as "construction agreed-upon price" (CAP), is a pricing provision in which the CM-GC stipulates a target price above which the owner is not liable for payment if the project's scope does not change after the target price is established (Gransberg et al. 2013).

Independent assurance (IA): A management tool that requires a third party—not directly responsible for process control or acceptance—to provide an independent assessment of the product or the reliability of test results, or both, obtained from process control and acceptance. [The results of independent assurance tests are not to be used as a basis of product acceptance. Independent assurance gives management an unbiased evaluation of its construction QA system and provides assurance of the effectiveness and proficiency of QC and acceptance (Transportation Research Board 2009)].

Inspection: The act of examining, measuring, or testing to determine the degree of compliance with requirements [and to assess the amount of work completed (Transportation Research Board 2009)].

Partnering: A structured process that creates an owner–contractor relationship focused on achieving mutually beneficial goals (Transportation Research Board 2009).

Pre-Award: A period of time in the life of a project prior to the establishment of a signed contract that can include activities related to contract development, issuance of the request for proposal, and bid evaluations. For D-B, this is prior to signing the D-B contract.

Preconstruction services: These tasks are performed by the contractor for the agency and can include almost anything the agency desires from its CM-GC contractor. The range of possibilities include typical estimating and scheduling assistance, managing public relations, and preparing and submitting environmental permits (Gransberg et al. 2013).

Post-Award: A period of time in the life of a project after the establishment of a signed contract and can include activities related to project execution, administration, and closeout. For D-B, this is after signing the D-B contract.

Qualifications-based selection: A process of procuring a service provider—such as a designer or contractor—using experience and ability in the decision-making criteria. An RFQ is submitted by the agency, followed by a statement of qualifications provided by the designer or contractor. The RFQ typically requires an organizational chart, corporate project experience, key personnel experience, required management plans, and other submittal requirements (adapted from Gransberg et al. 2013).

Quality assurance (QA): Planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service. [QA addresses the overall problem of obtaining the quality of a service, product, or facility in the most efficient, economical, and satisfactory manner possible. Within this broad context, QA involves continued evaluation of the activities of planning, design, development of plans and specifications, advertising and awarding contracts, construction, maintenance, and the interactions of these activities (Transportation Research Board 2009)].

Quality control (QC): Those QA actions and considerations necessary to assess and adjust production and construction processes so as to control the level of quality being produced in the end product (Transportation Research Board 2009).

Request for Proposal (RFP): Advertisement requesting proposals for work in accordance with the requirements outlined in the project criteria package (AASHTO 2008b).

Request for Qualifications (RFQ): Advertisement requesting statements of qualifications. It contains at least the desired minimum qualifications of the design–builder (or CM-GC), a scope of work statement, and general project requirements (AASHTO 2008b).

Strategy: A plan of action for accomplishing specific goals. In this guidebook, strategies address goals relating to D-B administration, such as team alignment, construction quality, or construction efficiency.

Tool: A tool is used to perform an operation. In this guidebook, it is a tactic or process relating to D-B contract administration, such as checklists, spreadsheets, guidelines, and structured meetings.

Validation: The process of confirming the soundness or effectiveness of a product—such as a model, a program, or specifications—thereby indicating official sanction. [The validation of a product often includes the verification of test results (Transportation Research Board 2009)].

Value engineering: The systematic review by qualified agency and/or contractor personnel of a project, product, or process so as to improve performance, quality, safety, and life-cycle costs (Transportation Research Board 2009).

Verification: The process of testing the truth—or of determining the accuracy of test results—by examining the data or providing objective evidence, or both. [Verification sampling and testing may be part of an independent assurance program (to verify contractor QC testing or agency acceptance) or part of an acceptance program (to verify contractor testing used in the agency's acceptance decision) (Transportation Research Board 2009)].

Work package: Developed primarily by breaking down the project scope of work into bid packages that include material, labor, and equipment and by reviewing the design documents that go with each package to ensure that sufficient information is contained in them to draw competitive pricing (Gransberg et al. 2013).

APPENDIX A

Contract Administration Tools

This appendix contains descriptions of all the contract administration tools discussed in this guidebook. Tools may be used in one or more phases, as indicated in Table A.1, presented later in this section. These tools were identified through D-B project case studies with numerous agencies and a state of practice review of all existing state DOT D-B guidebooks. Each tool description is organized according to the format listed here:

- Tool number and name
  - The number is for quick identification of the tool in this guidebook, and the name is intended to reveal the nature of the tool.
- Brief description
  - This short description includes one or two sentences to give the reader a quick overview of what to expect in the remaining description.
- What is it?
  - This section contains an expanded description of the tool.
- Why use it?
  - This section explains the purpose of the tool and lists its potential benefits. It also discusses the contract administration strategies that the tool addresses. The five contract administration strategies were first presented in Chapter 2 with their unique graphics.

- When to use it?
  - This section includes a table that indicates the contract administration phase(s) in which the tool could be used. The table also summarizes guidance from as many as 16 experts—including industry and academic professionals, as well as agency leaders and practitioners—who reviewed each tool. These D-B experts provided feedback on the tools' usefulness (e.g., recommended, considered case by case, or not recommended) for various D-B project sizes (e.g., <$10 million, $10 million–50 million, and >$50 million) and complexities (e.g., noncomplex, moderately complex, and complex). Note that "recommended" does not mean required; an agency should use its own discretion on whether a tool is appropriate for a particular project.
- How to use it?
  - This section provides information about how to implement the tool successfully in your project.
- Synthesis of Examples
  - This section summarizes tips and implementation guidance found when analyzing the case study project examples and is included when applicable.

Table A.1. Tools for agency use in design–build contract administration.

Tools for Design–Build Contract Administration	Contract Administration Phase				Page Number
	Alignment	Design	Construction	Closeout	
1 Kickoff Meeting	✓				46
2 Roles and Responsibilities	✓				49
3 Confidential One-on-One Meeting	✓				55
4 Glossary of Terms	✓				63
5 Co-Location of Key Personnel	✓	✓			65
6 Regulatory Agency Partnering	✓	✓			68
7 External Stakeholder Coordination Plan	✓	✓			71
8 Design–Build–Specific Partnering	✓	✓	✓	✓	75
9 Continuity of Team Members	✓	✓	✓	✓	79
10 FHWA Involvement Overview	✓	✓	✓	✓	85
11 Permit Commitment Database	✓	✓	✓	✓	88
12 Plan Standards		✓			91
13 Deviations from Agency Standards		✓			94
14 Discipline Task Force		✓			97
15 Independent Party Design Review		✓			100
16 Cost–Savings Matrix		✓			103
17 In-Progress Design Workshops		✓			106
18 Over-the-Shoulder Reviews		✓			108
19 Scope Validation Period		✓	✓		112
20 Public Announcements		✓	✓	✓	116
21 Delegation of Authority		✓	✓	✓	122
22 Contractor-Controlled Quality Control Testing			✓		124
23 Contractor Involvement in Establishing Quality Control Standards			✓		126
24 Incentive–Disincentive Program for Superior Quality			✓		128
25 Real-Time Electronic Quality Management Information			✓		135
26 Dual Construction Engineering Inspector Roles			✓		138
27 Witness and Hold Points			✓		143
28 Payment Checklist			✓	✓	147

- Examples
  - The examples are real projects that have used the tools. They include text and tables that show how an agency used the tool on a recent project. Sometimes multiple examples are provided to show alternative ways of implementing a tool. This variety is intended to encourage the reader to adapt the basic tool to meet their own agency and project needs.
- References
  - This section provides a list of written and web resources where the reader can find more information about the tool. Since some of these tools are relatively new, there may not be many resources beyond this guidebook.

Each tool description begins with a head in bold font. The footer includes the tool name and number to remind the reader what tool description they are in.

1 Kickoff Meeting

This meeting introduces the project participants to the project and to each other. Aspects relevant to a D-B project are discussed, including roles and responsibilities, quality management processes, review processes, schedule, schedule of values, and payment processes.

What Is It?

The kickoff meeting is the first team meeting. For a D-B project, it is an opportunity to introduce the agency's team and discipline specialists to the D-B team members. Other project stakeholders who may participate include FHWA (if it is a federally funded project) and representatives from other entities that are associated with the project, such as cities and counties, utility companies, and regulatory agencies. Discussion topics typically include a project overview with an emphasis on project challenges and constraints. Even when team members are experienced with D-B, it is important to review the changed roles and responsibilities associated with the D-B process to help align everyone's understanding. QM processes, review processes, time constraints, potential innovations, risks, and pricing may also be discussed.

Why Use It?

The kickoff meeting provides an opportunity to create early team alignment around project goals and processes. It creates a time and a place for team members to discuss how they will execute the D-B project. The meeting is an opportunity to set up a project framework that assists the team in being successful. For example, the team can develop and communicate project processes, such as ensuring design quality. For federally funded projects, the team can discuss FHWA involvement. Regulatory constraints and permit requirements can also be reviewed.

Potential benefits include setting the stage for construction input in design to encourage constructability, innovation, and risk mitigation; flexibility during design and construction; developing a basis for a shared risk allocation; and facilitating the resolution of third-party issues (e.g., utilities and permits).

A kickoff meeting addresses the Alignment Strategy and the Scope Strategy. It helps establish clear project goals and create productive relationships within the agency and between the agency and D-B team members. The meeting allows project stakeholders to begin communication during the early stages of the project, developing effective lines of communication and working relationships early on. The meeting also helps ensure that the project scope—as described in the RFP—and responsibilities are understood and agreed upon by all parties. During the meeting, any discrepancies or areas of uncertainty can be identified and resolved.

When to Use It?

The kickoff meeting should take place a few weeks after the notice to proceed (NTP) of the D-B project. Even when project team members have worked on D-B projects, the kickoff meeting is valuable for generating a common understanding of *this* project's team so that team members are operating on a commonly agreed-upon process rather than assumptions. Kickoff meetings are recommended for projects of all sizes and complexities (Table A.2).

Table A.2. Recommended uses for kickoff meeting.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
1 Kickoff Meeting	✓				●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

The agency and D-B project manager plan the 1-day workshop together. Everyone involved in the project from the design, construction, and agency sides should be invited. Documents should be prepared in advance to present the scope of work, potential project issues, proposed schedule, proposed schedule of values, and documents for any other relevant tasks. A meeting summary should be prepared and distributed afterwards. A partnering meeting can be paired with the kickoff meeting or held separately.

Synthesis of Examples

The kickoff meeting brings together project team members from the agency, the D-B firm, consultants, and outside stakeholders, such as FHWA, the Army Corps of Engineers, U.S. Fish and Wildlife, local jurisdictions, and utility representatives. Agency personnel include the D-B program liaison, the project manager, resident engineer, field and office personnel, discipline reviewers, inspectors, and other project team members. Team members from the agency, consultants, and the D-B firm are expected to remain with the project through all project phases.

The facilitator of the kickoff meeting varies. It could be the agency's D-B program manager or project manager, or it could be co-led with the D-B project manager. The kickoff meeting may last 4 to 8 hours or longer, depending on project complexity. Typical items on the agenda for a kickoff meeting include the following:

- Provide introductions.
- Identify key participants in the delivery process, and discuss their roles and responsibilities.
- Introduce key elements of the scope and innovations.
- Provide project background information, such as current status; goals; right-of-way acquisition; available studies and reports; and unique issues, including environmental concerns or utility conflicts.
- Discuss the overall design and construction schedules, major activities, milestones, and phasing.
- Discuss the project budget, schedule of values, and payment processing.
- Discuss communications protocol, team meetings, change management processes, and issue resolution processes.
- Discuss design reviews.
- Discuss potential D-B risks and possible mitigation strategies.
- Discuss partnering meeting objectives, if combined with the kickoff meeting.

Example

Georgia Department of Transportation (Georgia DOT) *Design–Build Manual*

Georgia DOT used the project kickoff meeting to establish a culture of partnering and to introduce project participants to one another and to the project. An outline of the agenda for a kickoff meeting is provided in Georgia DOT's D-B manual as follows:

> The innovative delivery project manager is responsible for facilitating the post-award kickoff meeting. This partnering meeting plays an important role in the success of the project. Typical participants include the [innovative delivery project manager] and representatives from the D-B team, FHWA (for project of division interest projects) and [Georgia DOT's] District Construction Office. Other participants may include key stakeholders, as necessary, from the Office of Bridge Design, Office of Right-of-Way, Office of Utilities, Traffic Operations, Utilities, the local government, and any affected utility owners. This meeting is intended to:
>
> - Provide introductions,
> - Identify key participants in the delivery process,
> - Discuss key elements of the scope,
> - Provide any project background information,
> - Discuss the overall schedule,
> - Discuss anticipated submittals,
> - Discuss the Schedule of Value and payment processing,
> - Discuss communications protocol(s), and
> - Discuss potential Design–Build risks and possible mitigation strategies.

References

Georgia Department of Transportation. *Design–Build Manual*, Revision 4.2, October 3, 2016. http://www.dot.ga.gov/PS/DesignManuals/DesignGuides. Accessed Nov. 25, 2017.

2 Roles and Responsibilities

This tool is a description of roles and responsibilities for D-B.

What Is It?

Clearly defining the roles and responsibilities of project participants in alternative contracting methods is a significant aspect of defining each participant's expected scope of work. It could take the form of a table or a list. When parties share responsibility, primary, secondary, and collaborative responsibility may be indicated for the contractor, designer, agency, or other entity. This document can also be referred to as a Responsible, Accountable, Consulted, and Informed (RACI) chart (Figure A.1). The responsible person performs the activity, the accountable person makes the decision, the consulted person provides feedback, and the informed person receives updates.

Why Use It?

Defined roles and responsibilities can help clarify who is involved in a project and who is responsible for various activities. This can facilitate better understanding of project expectations between the contractor and designer. It also helps ensure that each task has a team member taking responsibility for it. Responsibility is also associated with risk, so it helps clarify who owns what risk.

RACI Chart (Roles and Responsibilities Matrix)

Process Name / Description: *Sample Project*

Created On: *1-Jul-18* Revision: *None*

Created by: *Project Manager*

	Res. Engr	Distr. Engr.	Utility	ROW	Project Mgr
Task 1	C	-	-	-	R
Task 2	I	-	-	-	R
Task 3	A	I	I	-	R
Task 4	I	I	-	-	R
Task 5	I	I	R	I	I
Task 6	I	-	A	R	I
Task 7	A	I	I	-	R

R = Responsible, A = Accountable, C = Consulted, I = Informed

Figure A.1. Sample RACI chart.

Defining roles and responsibilities helps the D-B better quantify the level of effort and costs of work D-B is responsible for. Similarly, it helps the agency identify tasks it will be undertaking for the project so it can plan for adequate resources to perform those tasks.

The potential benefits include construction input in design to encourage constructability, innovation, and risk mitigation.

The Roles and Responsibilities tool addresses the Alignment Strategy and the Scope Strategy. The Scope Strategy includes a clear understanding of responsibilities and the alignment built toward productive relationships as team members fulfill their responsibilities.

When to Use It?

A clarification of roles and responsibilities is included in the RFQ, RFP, and preconstruction and construction contracts. This tool is recommended for projects of all sizes and for moderately complex to complex projects (Table A.3). It can be considered for use for noncomplex projects, as needed.

How to Use It?

The agency defines roles and responsibilities that can be summarized in a matrix to include in the RFQ and RFP. This way, all proposers are working off the same assumptions regarding roles and responsibilities. One role would be the D-B champion, who trains new team members on the distinctive D-B aspects of the project and keeps the team on track with applying the D-B process throughout the project. Another role is the D-B document specialist, who serves as the agency's point of contact to receive, distribute, store, and organize project documents. The document specialist also reminds agency staff and the D-B what documents are needed and when and what reviews are needed and when. Upper-management support for a D-B is critical to success. Therefore, the role of upper management is to support D-B projects and processes tangibly and visibly, for example, with D-B training and the appropriate level of staffing. D-B projects frequently move on fast schedules. Therefore, review times become critical. Reviewers must be made aware of the contractual review times, which are frequently shorter than standard review times. Also, 18 Over-the-Shoulder Reviews must be attended by reviewers who are authorized to make project decisions to keep the design advancing. For projects with performance specifications, reviewers must understand their role in checking that performance specifications are met and avoid introducing their own preferences into the review comments.

Table A.3. Recommended uses for roles and responsibilities.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	**Moderately Complex**	**Complex**	**≤ $10 million**	**$10 million–$50 million**	**> $50 million**
2 Roles and Responsibilities	✓				◗	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

Synthesis of Examples

Clearly defining each project participant's roles and responsibilities communicates the expectation of each party, which ultimately improves the overall effectiveness of the project. How this information is conveyed takes many formats. A very general approach is the RACI chart, which identifies which party is responsible, accountable, consulted, or informed with regard to different project responsibilities. Other formats use a variation of this approach, such as defining which party has primary, secondary, or no responsibility for simply identifying which party is or is not responsible. Some agencies develop a responsibility chart(s) that is released with a project's RFP so that outside consultants can plan accordingly when submitting their bid for a project. Other agencies develop responsibility charts that are used for internal control purposes. Finally, responsibility charts can be used to define roles and responsibilities for an overall project or for specific phases of a project, depending on the project's overall complexity.

Example 1

I-405, NE 6th Street to I-5 Widening and Express Toll Lanes Project Washington State Department of Transportation

A responsibility matrix was included in the project RFP. This matrix highlights responsibilities for the design–builder, the agency, and the toll vendor for the three phases of design, procurement, and construction.

Responsibility Matrix

Item	Element/Task/ Component/ Subsystem Description	Design–Builder			Washington State DOT	Toll Vendor			Comment and Other Responsibility Notes
		Design	Procurement	Installation–Construction	All Phases	Design	Procurement	Installation–Construction	
1	Toll gantry	P	P	P	S	S	N	S	Design–builder shall design, furnish, and install overhead structures. Toll vendor will review and comment on all designs related to toll equipment.
2	Toll equipment plus mounting hardware	S	N	S	S	P	P	P	Toll vendor will design specifications for equipment mounts and furnish and install all mounting brackets, hardware, and toll equipment. Toll vendor will be responsible for all hardware and cabling for the toll equipment.
3	All signage, sign supports, and mounting	P	P	P	S	N	N	N	Design–builder shall be responsible for all signage-related activities.

(continued on next page)

Item	Element/Task/ Component/ Subsystem Description	Design–Builder			Washington State DOT	Toll Vendor			Comment and Other Responsibility Notes
		Design	Procurement	Installation–Construction	All Phases	Design	Procurement	Installation–Construction	
4	Roadside toll cabinets and foundation	P	P	P	S	S	N	S	Design–builder shall be responsible for design, procurement, and installation of all roadside toll cabinets.
5	Toll-reader equipment cabinets (if required)	P	P	P	S	S	N	S	Design–builder shall be responsible for design, procurement, and installation of the toll-reader equipment cabinet, if required.
6	Stub-out for vehicle detection	P	P	P	S	S	N	S	Design–builder shall provide a stub-out at each toll zone for toll vendor use as needed for vehicle detection.
7	Loop lead-ins and in-pavement elements for vehicle detection	S	S	S	S	P	P	P	Toll vendor will design and install lead-ins and in-pavement vehicle detection as needed.
8	Transformer and cabinet (including foundation)	P	P	P	S	S	N	S	Design–builder shall be responsible for providing the prime power and the electrical connectivity—including conduit and panels—to all roadside toll cabinets.

Item	Element/Task/ Component/ Subsystem Description	Design–Builder			Washington State DOT	Toll Vendor			Comment and Other Responsibility Notes
		Design	Procurement	Installation–Construction	All Phases	Design	Procurement	Installation–Construction	
9	Washington State DOT fiber optic network connection to the roadside toll cabinet	P	P	P	S	S	N	S	Design–builder shall design, procure, and install necessary equipment, conduit, and wiring from the Washington State DOT fiber optic backbone to the network switch inside the roadside toll cabinet. Design–builder shall provide and install a network switch in all roadside toll cabinets.
10	Conduits	P	P	P	S	S	N	S	Design–builder shall provide conduits between the roadside toll cabinet and the toll gantries and to the vehicle detection stub-outs in the lane(s).
11	Toll equipment and cable wiring	S	N	S	S	P	P	P	Toll vendor will furnish and install all cables and wiring required to fully connect and operate the toll system between the roadside toll cabinet, toll-reader equipment cabinet, and all toll equipment.

Note: P = primary responsibility: The identified party has the primary responsibility for completion of the item. S = support or coordination: The identified party provides support to or coordination with the party responsible for primary completion of the item. N = no responsibility: The identified party has no action for the item.

Example 2

Lahaina Bypass 1B-2 Project, Hawaii Department of Transportation and FHWA Central Federal Lands Highway Division (CFLHD)

The design–build contract included the following description of the responsibilities of the design–build team and the agency:

> **Contract Terms and Conditions**
>
> **Description of Work Responsibilities**
>
> Design–Builder (Contractor) responsibilities—The Contractor shall be responsible for all work as described in these RFP documents. The scope of work includes design, construction, maintenance during construction, project management, project scheduling, QC-QA for design and construction, material sampling and testing, obtaining permits, and coordination with other governmental agencies and entities including federal, state, local governments, and communication with the public regarding ongoing and upcoming construction activities.
>
> CFLHD responsibilities—CFLHD is the representative for the owner, the Hawaii Department of Transportation. CFLHD will perform management activities and oversight of the Contractor's construction and design operations and end products to satisfy the Government that the Contractor meets the contract requirements. Included in the oversight activities will be design reviews, oversight of quality management plan, construction acceptance, independent verification testing activities, and oversight of maintenance of traffic and environmental compliance as outlined in this RFP.
>
> Hawaii DOT responsibilities—The Hawaii DOT will provide input to CFLHD to assure that the project design and construction conforms to Hawaii DOT standards, as outlined in this RFP.

References

Washington State Department of Transportation. I-405/NE 6th Street to I-5 Widening and Express Toll Lanes Project, Request for Proposal, July 25, 2011, Appendix A, Z2. http://www.wsdot.wa.gov/biz/contaa/ProjectContracts/DESIGNBUILDCONTRACTS/NE%206TH%20ST%20TO%20I-5/Default.htm. Accessed December 16, 2017.

3 Confidential One-on-One Meeting

A meeting held with the agency and contractor during the RFP stage, typically used in discussing ATCs.

What Is It?

A confidential one-on-one meeting is a conference between the agency and the contractor in which the contractor presents potential ATCs. The agency then provides general feedback on whether the ATC will be considered during the proposal process. Although this tool is implemented prior to contract administration, it is an important tool for establishing a foundation of alignment that the project team can further build upon throughout design and construction.

Why Use It?

Confidential one-on-one meetings allow contractors to present potential ATCs. These help facilitate alignment of contractor proposals with the agency's project goals. The confidentiality of the meeting is necessary to facilitate innovation and open communication. Additionally, the contractor saves resources by not pursuing ATCs of no interest to the agency.

The potential benefits include innovative design solutions, more constructable project designs, more appropriate risk allocation, and enhanced value engineering.

Confidential one-on-one meetings guide the contractor to a better understanding of project characteristics, including—but not limited to—the agency's project-specific goals, potential project risks, and the type and magnitude of innovations the agency is interested in considering. These meetings aid agencies in understanding what ATCs—such as methods of construction based on experience or equipment, standardized design elements to eliminate waste, and design or processes to permit winter work—they are likely to receive from proposers. This understanding allows the agency to recognize whether additional clarifications are required for proposers, to prepare potential RFP amendments, and assist in the eventual determination of "equal or better," which is pivotal in the ATC process. Confidential one-on-one meetings allow both parties to clearly express ideas and constraints. They also can create alignment between the agency and the contractor. These meetings can initiate the foundation of trust and demonstrate an agency's desire for innovation and willingness for collaboration.

Confidential one-on-one meetings address the Alignment, Scope, and Construction Efficiency strategies. The Scope Strategy includes a clear understanding of responsibilities as team members fulfill their responsibilities. The discussion of ATCs in one-on-one meetings will almost always result in more efficient means and methods of construction.

When to Use It?

Confidential one-on-one meetings are used during the procurement phase, typically for projects in which ATCs are being considered (Table A.4). Agencies normally only have one meeting per contractor, though some require one meeting and then provide as many meetings as desired by the contractor.

Confidential one-on-one meetings are part of the larger ATC process, as shown in Figure A.2. This figure gives a visual representation of when the confidential one-on-one meetings should be held in relation to the entire ATC process.

Table A.4. Recommended uses for confidential one-on-one meetings.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	**Moderately complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
3 Confidential One-on-One Meetings	✓				◗	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

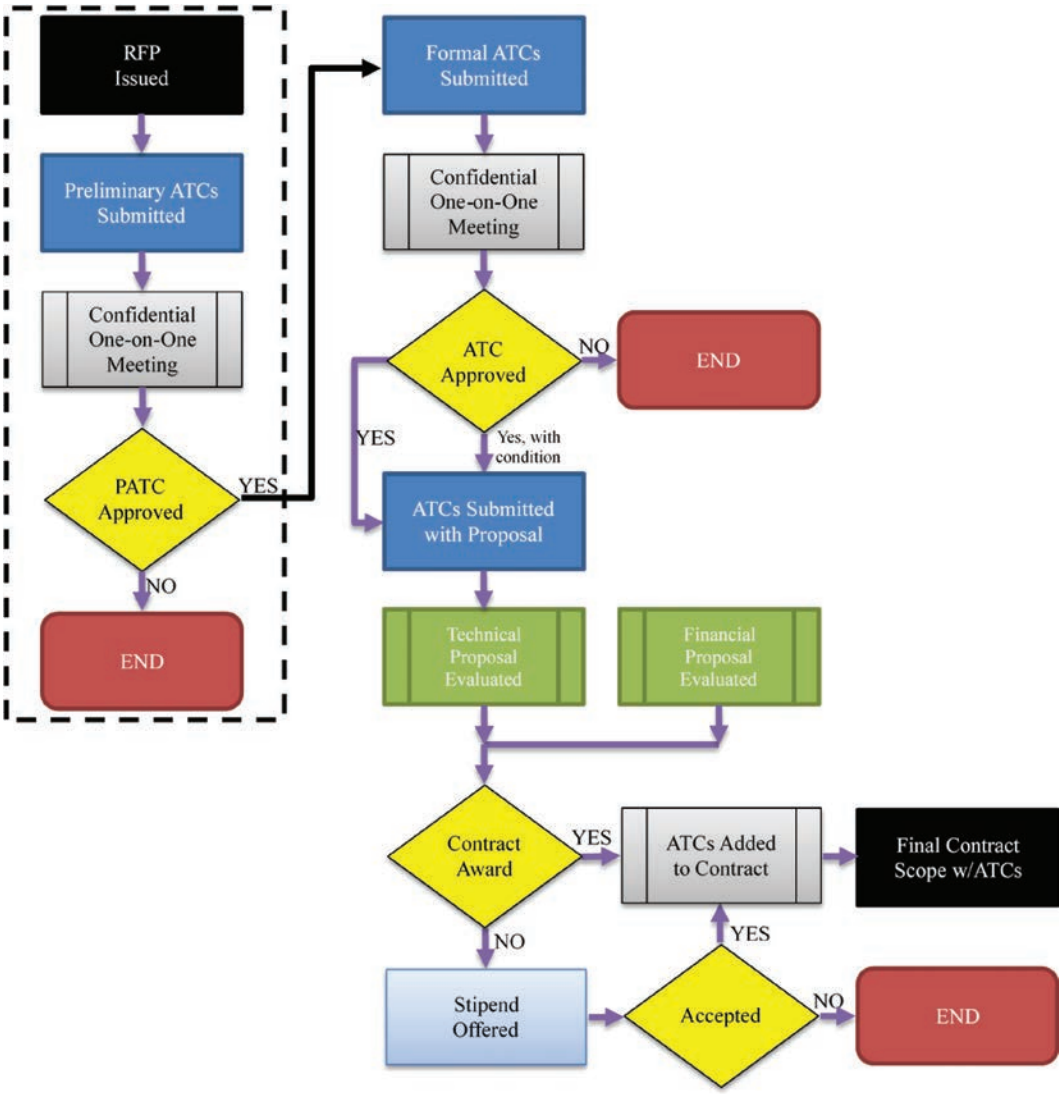


Figure A.2. ATC process (PATC = preliminary ATC) (Adapted from Gransberg et al. 2014).

How to Use It?

The RFQ and RFP should include guidelines for confidential one-on-one meetings. To execute these meetings, the agency must acquire a meeting space of sufficient size to fit all attendees and that is equipped to allow presentation of potential ATCs. Attendees can include a facilitator familiar with the process (usually from the agency), agency representatives involved with procurement and future contract administration, and people of specialties that may be impacted by the ATCs presented (e.g., environmental officer, structural engineer, and designers). All attendees should be invited in advance. The specialty representatives may attend via phone or online conferencing if they are not located locally.

Confidentiality of these meetings is critical. All agency attendees should be notified that no information from an ATC meeting is to be shared and all documentation—including any notes and meeting minutes—are not to leave the meeting. These rules should also be reiterated at the initiation of the meeting. When the contractor presents potential ATCs, the agency should only comment on the ability of the agency to consider the ATC presented; no RFP clarifications, ATC guidance, or ATC rating discussions should occur. Having the meeting in a third-party location is suggested, but not required, as it may further encourage open discussion and collaboration.

Synthesis of Examples

The general meeting agenda is as follows:

1. Introduction
   a. Ensure confidentiality,
   b. Review flow and duration of meeting,
   c. Review types of questions that should be asked, and
   d. Review agency-allowed responses.
2. Contractor presentation of ATC
3. Agency response to ATC
   a. Cannot be entertained,
   b. Can be entertained, and
   c. Requires more clarification (Attempt to resolve all clarifications during meeting, if possible).
4. Repeat 2 and 3 until all ATCs have been presented.

Example 1

MD 404–US 50 to East of Holly Road Project, Maryland State Highway Administration

This project used confidential one-on-one meetings to review ATCs developed by the D-B team proposers. Guidelines for these meetings were presented in the project RFP as follows.

> **2.08.02 Pre-Submittal Requirements**
>
> **2.08.02.1 Mandatory One-on-One Meetings**
>
> The Administration will require mandatory one-on-one meetings with the Reduced Candidate List. The purpose of these meetings will be to discuss

(continued on next page)

issues and clarifications regarding the RFP and/or the Proposer's potential ATC submittals. The Administration reserves the right to disclose to all Proposers any issues raised during the one-on-one meetings, except to the extent the Administration determines that, in its sole discretion, such disclosure would impair the confidentiality of an ATC or would reveal a Proposer's confidential business strategies. Each meeting will be held independently with each Prospective Proposer on the [reduced calendar list].

The one-on-one meetings are subject to the following:

a. The meetings are intended to provide Proposers with a better understanding of the RFP.
b. The Administration will not discuss any Proposal or ATC with any Proposer other than its own.
c. Proposers are not permitted to seek to obtain commitments from the Administration in the meetings or otherwise seek to obtain an unfair competitive advantage over any other Proposer.
d. No aspect of these meetings is intended to provide any Proposer with access to information that is not similarly available to other Proposers, and no part of the evaluation of Proposals will be based on the conduct or discussions that occur during these meetings.

The Administration reserves the right to disclose to all Proposers any issues raised during the one-on-one meetings that require addenda to the RFP. The Administration, however, will not disclose any information pertaining to an individual Proposer's Proposal, ATCs, or other technical concepts to other Proposers.

Example 2

Wellwood Avenue over Route 27 Project, New York State Department of Transportation

The RFP for this project contained detailed descriptions of confidential one-on-one meetings. These guidelines can help set expectations about the meetings and consistency in executing the meetings.

A9.0 One-on-One Meetings

Prior to and/or after submission of Proposals, the Department may conduct one-on-one meetings with Proposers as described below. If one-on-one meetings are held, they will be offered to each Proposer. The Department reserves the right to disclose to all Proposers any issues raised during one-on-one meetings. However, the Department will not disclose to other Proposers any information pertaining to an individual Proposer's technical concepts, Proposal, or ATCs. The Department will hold one-on-one meetings on matters it deems appropriate.

A9.1 Meetings During Proposal Period

If the Department decides that one-on-one meetings should be held, they will be held between the Department and each Proposer. The period indicated in this [inspection and testing plan] ITP Appendix A for these meetings is subject to change. Specific meeting dates will be confirmed in advance of each meeting by the Department to each Proposer's Representative. At least five (5) business days prior to the first scheduled meeting, each Proposer may submit suggested agenda items for each one-on-one meeting to the Department's Designated Representative. The Department will advise the Proposer of the location, final agenda, and the protocol for the meeting at least two (2) business days before the meeting. ATCs may be discussed at one-on-one meetings. Each Proposer may request one-on-one meeting(s) with the Department to discuss general concepts for potential ATCs or obtain preliminary feedback from the Department, to be held prior to the ATC submittal deadline. Should a one-on-one meeting be scheduled with a Proposer, the Department will offer the opportunity for a one-on-one meeting with the other Proposers. The Department may also schedule one-on-one meetings with any Proposer that has submitted ATC(s) to allow the Department to fully understand the ATC(s) and to request clarifications. At any meeting, the Department may seek clarifications regarding previously submitted ATCs. If a Proposer requests additional meetings, or if the Department considers it desirable or necessary to schedule additional meetings, the Department may, in their discretion, schedule any such additional meetings. The Department may, in its sole discretion, issue one or more Addenda to address any issues raised in the one-on-one meetings.

A9.2 Post-Proposal Meetings

The Department does not currently anticipate the need for post-Proposal discussions but reserves the right to enter into discussions and request revised Proposals. If interviews or presentations occur, Proposers shall not modify their Proposals or make additional commitments regarding Proposals at such meetings. The Department anticipates engaging in limited negotiations with the selected Proposer prior to Contract award regarding such matters as are deemed advisable for negotiations by the Department. The selected Proposer shall have no right to open negotiations on any matter that has not been raised by the Department.

A9.3 Statements at Meetings

Nothing stated at any meeting will modify the Instructions to Proposers or any other part of the RFP unless it is incorporated in an Addendum or, in the case of an ATC, approved in writing.

Example 3

Minnesota Department of Transportation (Minnesota DOT)
Design–Build Manual

Minnesota DOT uses confidential one-on-one meetings to enhance communication and build alignment. The department's D-B Manual provides guidance on conducting confidential one-on-one meetings.

One-on-one meetings between Minnesota DOT and design–build teams are used to improve communication during the procurement process. The primary purpose of these meetings are to allow design–build teams to discuss potential ATCs and Pre-Accepted Elements (PAEs) with Minnesota DOT prior to making a formal submittal. This minimizes effort on both Minnesota DOT and design–build firms drafting ATCs and PAEs that have a limited chance of being approved.

The one-on-one meetings should not be used to discuss clarifications or have the design–build teams gain additional insight into the process. Clarification questions need to be submitted to Minnesota DOT in writing via the clarification process.

The number and frequency of the one-on-one meetings will depend on the size and complexity of the project. The Project Manager (PM) and Design–Build Project Manager (D-BPM) will jointly determine the number and frequency. Each design–build team will be offered the same one-on-one opportunity.

Listed below are the procedures and protocols for conducting one-on-one meetings. This procedure outlines the one-on-one meeting process with design–build teams.

1. The PM will schedule all one-on-one meetings. Minnesota DOT staff should be limited to the PM, D-BPM, and a select group of key experts. On full federal oversight projects, the PM will invite the FHWA to all one-on-one meetings. The size of the Minnesota DOT staff (total) should be limited to three or four individuals. Design–build teams may ask for key experts to attend certain one-on-one meetings to discuss draft ATC or PAE concepts.
2. The content of the one-on-one meeting is confidential to each design–build team and should not be discussed with other design–build teams.
3. The PM will instruct the teams that the purpose of the one-on-one meetings are to provide design–build teams an opportunity to discuss draft ATC or PAE concepts.
4. After a team discusses the draft concept, the PM will inform the team if the ATC/PAE has potential to be accepted or if Minnesota DOT will not entertain that concept.
5. If a team asks clarification questions beyond those related to an ATC or PAE, the PM will not answer the question and will inform the team that the question needs to be submitted as a written clarification.
6. No formal meeting minutes will be taken.
7. Do not provide any handouts.
8. If design–build teams provide handouts, return all handouts to them at the conclusion of each meeting.

Example 4

Vermont Agency of Transportation (VTrans) *Alternative Technical Concepts* Document

VTrans alternative technical concept document provided guidance on how confidential one-on-one meetings should be conducted for their projects. In addition, it provided guidance on scheduling the meeting in advance and how the time during the meeting should be allocated.

VTrans may conduct confidential one-on-one ATC meetings with each Bidder to discuss proposed ATCs as determined during the Conceptual and Detailed ATC Submittal. The purpose of the one-on-one ATC meetings are to provide each Bidder with an opportunity to informally discuss potential ATCs and obtain preliminary feedback from VTrans.

At least five (5) working days before the scheduled one-on-one ATC meeting, the Bidder shall submit the following information to the VTrans point of contact in electronic format:

- A list of personnel who will be attending the one-on-one ATC meeting and their function on the Design-Build Team (No more than five members may attend the meeting).
- A specific meeting agenda presented in outline format. The meeting agenda must be specific in identifying all topics of the meeting that are intended to be presented and/or discussed.
- A list of specific questions pertaining to the ATCs. Bidders must submit a list of specific questions that will be discussed at the one-on-one ATC meeting.

If Bidders are presenting a PowerPoint, one (1) CD copy shall be left with VTrans. Bidders shall use their own equipment for the presentation.

Each team will be contacted in advance by the VTrans point of contact to schedule their one-on-one ATC meeting on the date set forth in the RFP.

Meeting Schedule (Conceptual ATCs)

The one-on-one conceptual ATC meeting for each Bidder will be 1 hour and 45 minutes:

- 45 minutes for presentation of submitted conceptual ATCs and questions/discussion,
- 30 minutes break for VTrans internal discussion, and
- 30 minutes for VTrans feedback and general ATC discussion.

Meeting Schedule (Detailed ATCs)

The one-on-one detailed ATC meeting for each Bidder will be 2 hours:

- 1 hour for presentation of submitted conceptual ATCs and questions/discussion,
- 30 minutes break for VTrans internal discussion, and
- 30 minutes for VTrans feedback and general ATC discussion.

(continued on next page)

Meeting Guidelines

VTrans will not discuss with any Bidder the contents of any ATCs other than its own. Bidders shall not seek to obtain approval from VTrans in the meetings or otherwise seek to obtain an unfair competitive advantage over any other Bidder. Bidders are prohibited from discussing any ATCs with VTrans personnel or VTrans consultants outside of the confines of the one-on-one ATC meetings.

Discussions during the one-on-one ATC meeting will solely focus on ATCs presented and the manner in which they may affect the Base Technical Concept. Any general clarifying RFP questions should be submitted to the point of contact as described in the RFP.

VTrans reserves the right to change or clarify the RFP based on information or issues raised during the one-on-one ATC meetings.

No electronic recording of any kind will be allowed during the one-on-one ATC meetings.

One-on-One ATC Meeting Attendees

Bidders attending the meetings shall have the proper expertise and authority to present ATCs and answer VTrans' ATC questions. Persons attending the one-on-one ATC meetings will be required to sign an acknowledgment of the foregoing rules and identify all participants. The Bidder shall bring the signed form to their meeting. All participants must attend in person; conference calls will not be permitted.

VTrans meeting attendees may include Technical Evaluation Committee (TEC) members, representatives from VTrans Attorney General's Office, FHWA, as well as any appropriate technical experts.

References

Gransberg D. D., M. C. Loulakis, and G. M. Gad. *NCHRP Synthesis 455: Alternative Technical Concepts for Contract Delivery Methods.* Transportation Research Board of the National Academies, Washington, D.C., 2014. https://dx.doi.org/10.17226/22419.

Minnesota Department of Transportation. *Design–Build Manual*, Office of Construction and Innovative Contracting. August 2011. http://www.dot.state.mn.us/designbuild/. Accessed October 1, 2017.

New York State Department of Transportation. Wellwood Avenue over Route 27, Request for Proposals, 2015. https://www.dot.ny.gov/main/business-center/designbuildproject20/repository/D900032%20Instructions%20To%20Proposers%20DRAFT%2020151014.pdf. Accessed February 7, 2017.

Vermont Agency of Transportation, *Alternative Technical Concepts*, 2015. http://vtrans.vermont.gov/sites/aot/files/contractadmin/documents/designbuild/Alternative%20Technical%20Concepts_0.pdf. Accessed February 7, 2018.

4 Glossary of Terms

A glossary of terms provides definitions of terms related to activities associated with the D-B contracting method.

What Is It?

A glossary of terms is a collection of words and phrases related to activities associated with D-B. The glossary provides context and definitions for the terms that are not used in a traditional Design–Bid–Build (D-B-B) project.

Why Use It?

A glossary of terms facilitates communication because it provides team members a common vocabulary and understanding of key D-B terms. This is helpful initially for D-B firms proposing on the agency's projects, and—even more importantly—to ensure that the whole project team is aligned once the D-B firm has been selected. A glossary supports correct interpretation of project communication during all phases of the project, which builds team unity and cooperation. A project glossary also minimizes misunderstandings that can cause unnecessary problems and tension between project team members.

Potential benefits of this tool include aligning project stakeholders so everyone involved in the project is "speaking the same language." Even when team members are experienced with D-B, it is important to review the agency's—or project's—glossary of terms to help align everyone's understanding.


ALIGNMENT

A glossary of terms addresses the Alignment Strategy. It helps establish a clear terminology and create clear expectations between the agency, consultants, and D-B team members. The glossary helps ensure the project scope (as described in the RFP) and responsibilities are clearly understood by all parties.

When to Use It?

A glossary of terms is recommended for projects of all sizes and complexities (Table A.5).

How to Use It?

It is useful to include a glossary of terms in the RFQ and RFP so that firms will have a more accurate understanding of the stated scope of work that is being requested by the agency.

Table A.5. Recommended uses for glossary of terms.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
4 Glossary of Terms	✓				●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

Similarly, the glossary can be included in the preconstruction services contract and the construction contract.

Synthesis of Examples

Examples of terms that can be included in a D-B project glossary can be found in this guidebook's glossary. Some agencies, such as the California Department of Transportation (Caltrans), include a glossary of terms in the contracts. Other agencies, such as Minnesota DOT, include the glossary in their organization's manuals. Variations of this tool include agencies dividing the glossary into categories or sections (e.g., Design, Cost, Schedule, and Administrative).

Example

West 4th Street Bridge Project, Pennsylvania Department of Transportation

A glossary of terms helped the team members on this design–build project have a common vocabulary to communicate with each other. The glossary of terms was included in the Pennsylvania Department of Transportation's *Innovative Bidding Toolkit*.

References

Pennsylvania Department of Transportation. *Innovative Bidding Toolkit,* 2013. http://www.penndot.gov/_layouts/pa.penndot.formsandpubs/formsandpubs.aspx. Accessed September 17, 2017.

5 Co-Location of Key Personnel

This tool involves all key personnel being located at the same facility during specific phases of the project—particularly early phases—or for the duration of the project.

What Is It?

Co-location of key personnel requires important project team members to be located at the same facility during agreed-upon phases of a project. This tool brings project resources together at one location, creating the opportunity for increased communication, improved project quality, greater efficiency, and enhanced project understanding.

Why Use It?

When project team members are located in the same facility it improves the availability and communication of the project team members. Such co-location allows a better understanding of expectations between parties and expedites problem solving and conflict resolution, when needed. When using this tool, work is completed more efficiently and with fewer communication-related delays. When co-location does not occur, parties are often disconnected, which can cause confusion and miscommunication that leads to delays. Telecommunication can enhance communication among project team members, but in-person communication and team building cannot be replicated by technology. For example, with co-location, impromptu hallway conversations can make positive impacts that regularly scheduled teleconferences cannot replicate.

Potential benefits include actively engaging the contractor in the design phase to encourage constructability, innovation, and risk-mitigation feedback. Co-location can also lead to schedule acceleration and the ability to fast-track, since frequent communication with key team members allows for faster decision making.

Co-location promotes both the Alignment Strategy and the Design Quality Strategy by bringing the team together to work in one location and encouraging frequent interaction during design.

When to Use It?

Co-location is a useful tool for any project that requires a high level of collaboration between project team members. This tool can be utilized throughout the entirety of the project but especially during design. Because of the expense and time commitment associated with co-location, it is recommended primarily for large, long-duration, complex projects (Table A.6). Though

Table A.6. Recommended uses for co-location of key personnel.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	**Construction**	Closeout	Noncomplex	Moderately complex	**Complex**	≤ $10 million	$10 million–$50 million	**> $50 million**
5 Co-Location of Key Personnel	✓	✓	✓		○	◗	●	○	◗	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

co-location is ideal over the life of the project, using it during single phases of the project can be beneficial. During design, co-location can aid in constructability and innovation, and during construction it can benefit decision making and conflict resolution.

How to Use It?

Co-location involves some or all of the project team working in the same facility. This requirement would be specified by the agency in the RFP. The team can be located at the agency's facility or in a temporary facility at or near the project site.

Synthesis of Examples

When setting up expectations for co-location in the contract, an agency should consider the following:

- The location, which could be the agency's office, the project location, within a certain radius of the project, or in a designated region or metropolitan area;
- The minimum key personnel expected to be co-located;
- The phases when co-location is required, such as design, or design and construction; and
- The responsible party for providing, furnishing, and maintaining the space.

Example

I-15/I-215 (Devore) Interchange Improvements Project, Caltrans

For this project, Caltrans required co-location for project members. The purpose of the co-location was described in the Project Requirements Book 2 document, as follows.

> **Co-Location**
>
> **Integrated Project Office**
>
> The Design–Builder shall provide space, facilities, and support elements necessary to establish and maintain a co-location office within four weeks of the Notice to Proceed [NTP] for the Department's Project staff to co-locate with the Design–Builder's Project staff in accordance with the Contract.
>
> The co-location office shall be used to prepare, submit, review, and process project plans and working drawings in the shortest and most efficient manner possible. The Department will make its personnel assigned to the Design–Build phase of the project available at the office for consultation and "over-the-shoulder reviews" on site with the Design–Builder's engineers, detailers, and other staff who are preparing the plans and working drawings.
>
> The facilities shall remain the property of the Design–Builder. The Design–Builder shall furnish, maintain, and service the facilities with fuel, electrical power, sanitary services, access roads, and other necessary items.
>
> **Location**
>
> **xxx**

Facilities and Space Requirements—Office Staff

Co-location office facilities for the Design–Builder and the Department oversight personnel shall provide for locating Design–Builder personnel and the Department personnel in the same building.

The Design–Builder shall provide and supply the office space and equipment from four weeks after NTP until at least 30 days after Final Acceptance. The Department staff will be subject to [a] 40-hour work week and working days and holidays in accordance with the State Personnel Administration.

General Office Requirements

xxx

Requirements for Computers and Network Equipment

xxx

Note: xxx = to be determined.

References

California Department of Transportation. *I-15/I-215 (Devore) Interchange Improvements Project, Project Requirements, Book 2.* April 17, 2012. http://www.dot.ca.gov/design/idd/db/devore/rfp/Devore-Project-Requirements.pdf. Accessed July 26, 2018.

Migliaccio, G. C., G. E. Gibson, and J. T. O'Connor. Procurement of Design–Build Services: Two-Phase Selection for Highway Projects, *Journal of Management in Engineering*, Vol. 25, No. 1, 2009. pp. 29–39.

6 Regulatory Agency Partnering

Regulatory agency partnering involves improving the communication between the project team and regulatory agencies, leading to a smoother permitting process.

What Is It?

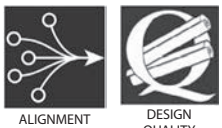
Regulatory agency partnering involves regular meetings and specified channels of communication. This arrangement provides a forum for open and honest communication between regulators, the state transportation agency, and the design–builder assisting with the permit application. These discussions help explain the ramifications of alternatives to meet permit requirements and help create agreement on possible solutions at the conceptual level prior to submitting detailed permit applications. The goal is to avoid a cycle of back-and-forth exchanges of permit applications, reviews, and denials.

Why Use It?

The purpose of partnering with regulatory agencies is two-fold. First, it helps regulators understand the impacts of construction, rather than leave it up to the regulators to interpret what the impacts will be. This is crucial as contractors can sometimes have a better understanding of the ramifications of various construction options than the regulators who are reviewing the permit applications. Likewise, regulators may have a perspective on environmental or other issues that the contractor needs to hear firsthand. Often, there is no perfect solution to meeting regulations. The goal of partnering is to get the project team and the regulators working together toward a common goal of determining a solution with the least negative impact and one that upholds the spirit of the applicable regulations. Second, by encouraging a dialogue between regulators and contractors, streamlining the permitting process can save time in the project schedule.

Partnering and the associated dialogue establish a working relationship between contractors (who develop construction means and methods) and the regulators (who evaluate those means and methods for permit compliance). By explaining the process and allowing contractors to address the concerns and questions of regulators, the back-and-forth submission of permit proposals and permit denials can be avoided. Permits can be obtained faster and regulators can be assured that the best measures possible are being taken to satisfy their regulations.

Potential benefits include cost savings; schedule acceleration; ability to fast track; construction input in design to encourage constructability, innovation, and risk mitigation; and facilitated resolution of third-party issues.



Regulatory agency partnering addresses the Alignment Strategy and the Design Quality Strategy. Meetings with regulatory agencies help the team build alignment between project goals and required regulations. The construction input during D-B–provided design engages the D-B actively with the project and the regulatory agencies.

When to Use It?

Partnering is most appropriate on projects involving contractors with a demonstrated commitment to fulfilling project goals, meeting contract obligations, and providing high-quality solutions in favor of the lowest-cost alternatives. Partnering requires that the contractor have intimate knowledge of the design and is engaged in the permitting process.

This tool is generally recommended for mid- to large-size projects that are moderately complex to complex (Table A.7).

Table A.7. Recommended uses for regulatory agency partnering.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	Noncomplex	**Moderately Complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
6 Regulatory Agency Partnering	✓	✓			○	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

Agencies should first evaluate the design–builder's ability and willingness to work directly with regulators to develop the optimal—though not necessarily the lowest-cost—permitting solutions. Then, the agency schedules and hosts meetings of all three parties. Initial meetings introduce the regulators to the scope and goals of the project, followed by sharing construction alternatives. Regulators are provided an opportunity to present their concerns about the construction plans. The contractor can respond to the regulators concerns and questions and work with the regulator to develop an acceptable solution for permitting. The permit application still needs to be prepared in a complete manner, but the background knowledge gained by the regulator and the early input received from the regulator helps the review process proceed more smoothly.

Synthesis of Examples

Partnering with a regulatory agency can be designed to simply inform the agency on a specific aspect of a project or to seek input on any issue related to project development. Engaging the regulatory agency early in the project development process will make the approval process more efficient by clarifying critical regulatory issues that are important to the project and the agency, which will benefit the regulatory approval process.

Example

Lahaina Bypass 1, B2 Project

On this D-B project, FHWA as the project manager met with permitting agencies to educate them on the D-B process and why the contractor is involved before design is completed and the permit is issued.

References

FHWA. Planning and Environmental Linkages Partnering Agreement, 2009. http://environment.fhwa.dot.gov/integ/final_signed_partnering_agreement_June09.pdf.

Ford, M. L. *NCHRP Web Document 39: Managing Change in State Departments of Transportation: Scan 7 of 8: Innovations in Public–Public Partnering and Relationship Building in State DOTs*, Transportation Research Board, Washington, D.C., 2001. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w39-7.pdf. Accessed April 13, 2018.

Molenaar, K. R., D. D. Gransberg, and D. N. Sillars. *NCHRP Report 808: Guidebook on Alternative Quality Management Systems for Highway Construction*, Transportation Research Board of the National Academies, Washington, D.C., 2015.

Nevada Department of Transportation. Partnering Program. n.d. https://www.nevadadot.com/doing-business/about-ndot/ndot-divisions/operations/construction/partnering-program. Accessed April 14, 2018.

7 External Stakeholder Coordination Plan

This table identifies which external stakeholders to involve at various project milestones. It ensures that accurate information is conveyed and that stakeholder concerns are considered.

What Is It?

This tool provides a plan that outlines stakeholder interaction. The timing of interactions is predetermined, which helps prevent key milestones from passing without adequate interaction with stakeholders. The plan also describes who the relevant external stakeholders are for various milestone activities. This ensures that the appropriate people are being contacted about the right topics. The plan also identifies who is responsible for coordinating each particular milestone. Also within the plan, the goal for each stakeholder-coordination event is stated so that the team can develop interactions that meet those goals.

Why Use It?

Good communication between the project team and the external stakeholders will help the project define important goals and stay on track in meeting those goals. When the project team is proactive in sharing information, it helps prevent the spread of misinformation. Effective external stakeholder coordination can enhance the project and generate public support.

This tool provides a plan for the project team to obtain stakeholder feedback at designated times during planning and design when feedback would be most beneficial to the team. When stakeholder feedback is not obtained, stakeholders can become disgruntled. Also problematic is when stakeholder feedback is obtained after a design milestone and then the feedback is either ignored or the team loses time and money in revising the design to incorporate the feedback.

Potential benefits include cost savings, schedule acceleration, and owner control of design.


ALIGNMENT


SCOPE

The external stakeholder coordination plan addresses the Alignment Strategy and the Scope Strategy. Stakeholder coordination works to align the project with the stakeholder needs and the stakeholders with the project goals. Early coordination with stakeholders can help define the scope, and regular communication can help prevent scope creep.

When to Use It?

This tool should be developed at the beginning of the project and can be used from planning through design. It is recommended for medium-to-large project sizes and for moderate complex-to-complex projects (Table A.8). Smaller and noncomplex projects may benefit if there is a significant external stakeholder contingent to manage.

How to Use It?

At the beginning of a project, the project team identifies key external stakeholders and identifies key milestones when those key stakeholders should be contacted. Contact with stakeholders could include actions such as sending information or holding a meeting. External stakeholder

Table A.8. Recommended uses for external stakeholder coordination plan.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	Noncomplex	**Moderately complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
7 External Stakeholder Coordination Plan	✓	✓			◗	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

coordination can be included in the project schedule and discussed at project meetings so that the plan is effectively carried out.

Synthesis of Examples

An external stakeholder is any outside entity with an interest in a project and who can either affect—or by affected by—the project's outcomes. External stakeholders include (but are not limited to) the traveling public, local businesses, local government agencies, regulatory agencies, and advocacy groups. Developing an external stakeholder plan ensures that these outside parties are kept in proper communication with the correct information when information is expected to be available. The proper action can either involve one-way communication (e.g., sending a memo or design submittal) or two-way communication (e.g., a meeting or webinar). Most external stakeholder plans define specific milestones when communication occurs during pre- or post-award phases.

Example

Business 40 (Salem Parkway) Project, North Carolina Department of Transportation (North Carolina DOT)

This D-B project is in an urban area of Winston–Salem and entails a shutdown of US 421/Business 40. There are many external stakeholders, including commuters, local businesses, hospitals, the city, and the city beautification nonprofit. The coordination plan divides actions into pre-let and post-let phases. A table identifies project milestones, the coordination action, responsibility, meeting invitees, and goals.

Design–Build External Stakeholder Coordination Plan

The goal of the External Stakeholder Coordination Plan is to systematically engage external stakeholders at the appropriate time in the project delivery process so that their input can be obtained, considered, and incorporated, as appropriate.

Coordination Plan Project Milestones

Phase	Milestone	Action	Unit or Person Responsible	Meeting Attendees	Goal
Pre-Let	1. Start of study letter	Send external scoping table to external stakeholders	Project manager within Central Project Management Unit	na	Obtain the external stakeholders' input on the External Scoping Table items they would like to be included in the project. The table can be a living document that is filled in and adjusted as the project and external coordination progresses.
	2. Prior to scoping meeting	Set up meeting with external stakeholders to discuss their External Scoping Table response and design–build process.	Project manager within Central Project Management Unit	• External stakeholders • Central project manager • Division • Design–build • Any other [North Carolina DOT] staff that may be needed, based upon scoping table information obtained	Discuss the External Scoping Table, determine cost-sharing responsibilities, and establish the list of items/betterments to be included in the preliminary design for the project. Educate the external stakeholders on the design–build process and the Design–Build External Stakeholder Coordination Plan.
	3. Preliminary design complete	Send the preliminary design and External Scoping Table with quantities and cost estimate for the list of items/betterments included in the project to external stakeholders.	Project manager within Central Project Management Unit	na	Provide the preliminary design and External Scoping Table that identifies items/betterments, quantities, and costs so stakeholders can see costs and coordinate internally to refine the list of items/betterments to be included in the project.
	4. 1 to 3 months after sending information noted in No. 3	Set up a follow-up meeting with appropriate external stakeholders to discuss External Scoping Table items, preliminary design, and design–build process.	Project manager within Central Project Management Unit	• External Stakeholders • Central project manager • Division • Design–build • Programs Management Office • Any other [North Carolina DOT] staff that may be needed based upon scoping table information obtained	Verify that the cost share and betterment items agreed to at the scoping meeting are still valid and/or discuss any revisions that may be needed. Leave meeting with a clear understanding of the items to be included in the Municipal Agreement and design–build RFP. Also ensure that the external stakeholders understand the design–build process and the need to meet all upcoming deadlines.
	5. 1 year before design–build let **(Only needed if it has been more than 1 year since the follow-up meeting noted in No. 4)**	Set up a refresh meeting with external stakeholders to discuss External Scoping Table items, preliminary design, and design–build process.	Design–Build Unit	• External stakeholders • Central project manager • Division • Design–build • Programs Management Office • Any other [North Carolina DOT] staff that may be needed based upon scoping table information obtained	Verify that the items/betterments agreed to at the follow-up meeting are still valid and/or discuss any revisions that may be needed. Leave with a clear understanding of the items to be included in the Municipal Agreement and design–build RFP. Also verify that the external stakeholders understand the design–build process and the need to meet all upcoming deadlines.

(continued on next page)

Phase	Milestone	Action	Unit or Person Responsible	Meeting Attendees	Goal
	6. Technical proposal submittal	Invite external stakeholders to review and comment on design elements and Municipal Agreement items shown in each team's technical proposal.	Division	• External stakeholders • Division	Obtain external stakeholder comments on design elements and Municipal Agreement items included in each team's technical proposal. The division will relay this information to the Technical Review Committee during the technical proposal evaluations.
	7. Technical proposal presentation **(Optional opportunity)**	Determine if it is beneficial to invite external stakeholders to attend technical proposal presentations.	Design–Build Unit in consultation with the division	• External Stakeholders • All other technical proposal presentation attendees.	Obtain external stakeholder comments on the technical proposal for each team. External stakeholders will give the Technical Review Committee comments immediately following the last technical presentation.
Post-Let	8. Award of project **(Optional opportunity)**	Set up a meeting with external stakeholders to discuss any anticipated post-award design changes to be requested by the division or department.	Division	• External stakeholders • Division	Obtain external stakeholder input on post-award design changes to be requested by the division or department. Division has final call on what changes, if any, will be made to the design.
	9. Design–build team's preliminary roadway plan submittal	Send a copy of the design–build team's preliminary roadway plan submittal to external stakeholders. or Invite external stakeholders to review the design–build team's preliminary roadway plan submittal.	Division	• External stakeholders • Division	Provide opportunity for external stakeholders to verify that agreed-upon design elements and Municipal Agreement items are shown in the design–build team's preliminary roadway plans. Ensure that the stakeholders are aware of the review period duration (usually a maximum of 10 days) and that any comments must be provided to the division before the deadline. Division has final call on what changes, if any, will be made to the design.
	10. Any other design submittals deemed appropriate, based upon coordination above	Send a copy of the design submittal to external stakeholders. or Invite external stakeholders to review the design submittal.	Division	• External stakeholders • Division	Provide opportunity for external stakeholders to verify that agreed-upon design elements and Municipal Agreement items are shown in the design submittal. Ensure that the stakeholders are aware of the review period duration (usually a maximum of 10 days) and that any comments must be provided to the division before the deadline. Division has final call on what changes, if any, will be made to the design.

Note: na = not applicable.

References

Design–Build Institute of America. Design–Build Done Right: Federal Sector Best Design–Build Practices, November 2015. https://www.dbia.org/resource-center/Pages/Best-Practices.aspx. Accessed February 17, 2018.

Design–Build Institute of America. Design–Build Done Right: Universally Applicable Best Design–Build Practices, Vol. 2, February 2014. https://www.dbia.org/resource-center/Pages/Best-Practices.aspx. Accessed February 17, 2018.

8 Design–Build–Specific Partnering

D-B–specific partnering involves team members and other stakeholders collaborating to form alignment on D-B project goals, issues, roles, and processes to enhance the delivery of the project.

What Is It?

D-B–specific partnering usually starts with an initial meeting that brings team members and stakeholders together to begin collaborative discussions on project goals, issues, roles, and processes. Standard partnering tools can be adapted for D-B–specific use, such as a roles matrix, issue resolution ladder, project charter, champion, and partnering evaluations.

Why Use It?

D-B–specific partnering helps establish a framework for team alignment, communication, and collaboration. Collaborative relationships are based on trust, and trust is based on clear, honest communication. D-B–specific partnering helps team members know how to function on the D-B project. The partnering and goal-setting sessions clarify any disconnects or discrepancies in what is to be achieved on the project, as well as introduce efficiencies.

D-B–specific partnering helps communicate and remind project team members of the unique aspects of the roles, responsibilities, and processes in a D-B. For example, the agency's functional reviewers may need to be introduced to the accelerated review times stipulated in the contract. Additionally, the agency's field inspectors may need to be introduced to the differences in the role of quality verification versus QA. By the same token, the contractor may need to review their role in having QA performed in addition to QC. In a D-B project, the contractor may need to be reminded that constructability review during design precludes value engineering during construction. The communication and collaboration that flows from partnering can help a team deal with these differences in a way that enhances project performance.

Potential benefits include cost savings, schedule acceleration, construction input in design to encourage constructability, innovation, risk mitigation, and flexibility during design and construction.

D-B–specific partnering addresses strategies related to alignment, scope, and design quality. Partnering brings project team members together to discuss and clarify goals and responsibilities and helps build productive relationships.

When to Use It?

D-B–specific partnering is useful in instances where the agency transfers construction quality responsibilities to the contractor. To create a high level of trust, team partnering exercises can be beneficial for establishing a foundation for the working relationships between the parties.

D-B–specific partnering should be developed by the agency prior to selecting a contractor. Then, once the contractor is selected, the agency and contractor need to establish team-partnering and goal-setting procedures before construction begins. This is helpful to avoid any issues that could arise during construction that were not addressed in previous phases. Partnering meetings and partnering assessments can be used throughout design and construction.

This tool is most beneficial on projects of medium to large size and projects that are moderately complex to complex (Table A.9). Small, noncomplex projects could benefit if there is existing friction among team members before the project begins.

Table A.9. Recommended uses for design–build–specific partnering.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
8 Design–Build–Specific Partnering	✓	✓	✓	✓	◗	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

Partnering is best begun early in the project development cycle. This tool is most effective when the agency develops the D-B–specific partnering process before the contractor is selected. This allows the agency to require partnering as part of the RFP or contract. To fulfill the contract, the selected contractor must fully participate in the D-B–specific partnering program that the agency establishes. An initial partnering meeting may be a standalone meeting, or it may be paired with the project kickoff meeting. Larger and more complex projects may use an outside partnering facilitator familiar with the distinct aspects of D-B. Subsequent partnering meetings and partnering evaluations can be reviewed by the project team and used to improve the project delivery.

Synthesis of Examples

Partnering for a D-B project is typically initiated with a meeting or workshop at the beginning of a project or at the beginning of significant project phases (e.g., design or construction). Participants should include all project stakeholders, including leadership from the agency and the contractor. The initial partnering engagement should address the following aspects of the project:

- Project mission,
- Project staffing,
- Expectations of the agency and D-B staff,
- Issue resolution,
- Schedule of the follow-up partnering engagements, and
- Other key issues.

A project team plan that summarizes the above items so that it can be referred to when needed during the course of the project should be one outcome of the initial partnering meeting.

Example 1

US 60 (Grand Avenue) and Bell Road Interchange Project, Arizona Department of Transportation (Arizona DOT)

On this D-B project, Arizona DOT held a partnering meeting at the beginning of the design phase and at the beginning of the construction phase. Monthly partnering evaluations helped reveal whether the team was providing timely review of design documents. The Arizona DOT *Design–Build Procurement and Administration Guide* provides guidance on partnering, as described by the following:

> **6.1 ROLES, PROJECT COMMUNICATION, AND THE WINNING TECHNICAL PROPOSAL**
>
> An Initial Partnering Workshop, with all key stakeholders, should commence immediately after the award of the contract. A goal of the workshop is to develop a Project Team Plan. This plan describes the roles, interactions, and responsibilities of [Arizona DOT's] and the Design–Builder's key project Team members including the Project Manager, the Resident Engineer the Design Quality Manager, technical sections, the general consultant, and the Design–Builder. One of the primary goals of the document is to determine how the [Arizona DOT] Team makes decisions and how it interacts with the Design–Builder's Team.
>
> **6.6 ISSUE RESOLUTION**
>
> On a D-B project, the issue resolution process is the same as for other projects. Subsections of the Standards Specifications are all applicable unless a special dispute resolution procedure has been included in the D-B Package. Please refer to the [Arizona DOT's *Construction Manual*] and the Department's Partnering Management Section for additional information. It is advisable for the [resident engineer] and [project manager] to streamline the issue resolution process on a D-B project due to the fast-track nature of the work and the expensive overhead costs of the Design–Builder.

Example 2

Colorado Department of Transportation (Colorado DOT) *Design–Build Manual*

Colorado DOT requires partnering on all significant D-B projects, and their *Design–Build Manual* provides guidance—as follows—on what partnering does, why it is important, and how it should be conducted.

> **Partnering**
>
> [Colorado DOT] has established a best practice of having a formal, facilitated partnering meeting at the start of all significant Design–Build projects. As can be seen from the organization chart, a Design–Build team is a combination of the owner's oversight team and the Contractor's design and construc-

(continued on next page)

tion team. For the project to be successful, it is imperative that these two teams work together to achieve the common goal of successfully completing the project. The goal of the partnering session is to foster the development of an integrated and cohesive team, which is essential to the success of any Design–Build exercise. It is important to not overlook or marginalize this step, as a united Design–Build team that is focused on common goals for the project is much more successful than a team that relies on the traditional adversarial roles played by the owner and the Contractor. The executive management from both [Colorado DOT] and the Contractor must participate to show support and solidarity with the newly formed unified Design–Build team. A well-executed partnering process enhances teamwork and helps build the relationships that are essential for an effective project team. Potential items for an initial partnering meeting include the following:

- [Colorado DOT] executive's opening remarks;
- Contractor executive's opening remarks;
- [Colorado DOT] and Contractor Project Manager's expectations;
- Project charter (mission statement);
- Issue resolution process (i.e., counterparts, escalation ladder, and timelines);
- Continued partnering evaluation, monitoring, and accountability (report cards); and
- Key issue discussions and initial action items.

References

AASHTO. *AASHTO Partnering Handbook,* 2nd Edition (draft). Washington, D.C., 2017.

Arizona Department of Transportation. *Design–Build Procurement and Administration Guide,* 3rd Edition. December 2007. https://azdot.gov/docs/default-source/construction-group/designbuildguide.pdf?sfvrsn=0. Accessed February 10, 2018.

Colorado Department of Transportation. *Design–Build Manual: Innovative Contracting Program.* September 2016. https://www.codot.gov/business/designsupport/innovative-contracting-and-design-build/2016-cdot-d-b-manual. Accessed February 10, 2018.

International Partnering Institute. *Collaborative Partnering Best Practices Guide*. Livermore, CA, 2017.

9 Continuity of Team Members

The contractor and key team members from the agency must remain involved throughout the design and construction phases to enhance project understanding, consistency, and communication.

What Is It?

D-B projects can take advantage of collaboration to seek efficient and innovative design and construction solutions. Collaboration is enhanced when trust exists, and trust is built through ongoing relationships. By keeping key team members involved during design and construction, project knowledge and communication channels are leveraged for efficient project management.

Why Use It?

Continuity of team members can help a team avoid misunderstandings and mistakes since key team members have a strong knowledge of project background and decisions and the intent behind those decisions. Continuity of team members creates ownership and understanding of design intent. Replacing a key member of the team during construction can lead to situations where past design decisions are rediscussed because of a lack of history and knowledge with the project. Additionally, if unexpected conditions occur in the field, the response to those decisions may not be consistent with the project intent. This can happen when new team members have not been fully immersed in the project from the design phase.

Potential benefits include schedule acceleration and construction input in design to encourage constructability, innovation, and risk mitigation.

Continuity of team members addresses the Alignment Strategy and the Design Quality Strategy. Key team members develop relationships through the life of the project, which fosters alignment. The quality of preconstruction services is enhanced when team member involvement is consistent.

When to Use It?

The continuity of key team members should begin in planning and progress through project closeout. The larger and more complex a project is, the more potential benefit there is from fostering continuity in the team members (Table A.10).

Table A.10. Recommended uses for continuity of team members.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
9 Continuity of Team Members	✓	✓	✓	✓	◗	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

Assign team members in planning and design who will continue their involvement with the project through construction and closeout. This is true of D-B and design staff, as well as agency staff. Although many agencies include statements about retaining key personnel, these requirements can sometimes be difficult to enforce. There are times when team members cannot be assigned to a project, like when a project is delayed and personnel are reassigned to other projects. During a project, a team member might be promoted, become ill, resign, or retire. In these situations, assigning new team members is unavoidable. Every effort should be made to assign personnel with appropriate qualifications and to provide briefings for new personnel so that they understand and are knowledgeable about project background. Bringing new lead construction personnel on during construction puts them at a disadvantage because they do not have history with the project and they lack an understanding of how risks have been assigned and mitigated. Without this background knowledge, they may default to treating a risk like they would for a D-B-B project, instead of the way the D-B team has agreed to approach the risk. It is also important for agency personnel to have continuity on a project. An agency should think through the ramifications of assigning an agency staff member primarily to a designated project to provide team continuity. This can take an agency staff member away from other assignments and commitments that will need to be covered by others.

Synthesis of Examples

An agency should first consider which team members it will be dedicating to a project. The time commitment should be estimated and other responsibilities adjusted to allow the team members to fulfill their roles throughout the entire project. If an agency expects the contractor to maintain continuity of team members, then this expectation should be clearly communicated in the contract. The roles in which continuity is expected should be identified, and the process to replace they people should be described. The project team should plan for onboarding new team members during the project, whether these are subcontractors or replacements of key personnel. Onboarding should provide an overview of project scope, goals, decisions, roles and responsibilities, and project issues and challenges.

Example 1

US 60 (Grand Avenue) and Bell Road Interchange Project, Arizona Department of Transportation (Arizona DOT)

This D-B project specifies in the following RFP that changing key personnel is not allowed between the submittal of qualifications and the D-B proposal unless a formal request is submitted and approved.

> **Changes in Proposer's Organization or Key Personnel**
>
> Proposers are advised that, in order for a Proposer to remain qualified to submit a Proposal after it has been placed on the short list, unless otherwise approved in writing by [Arizona DOT], Proposer's organization and Key Personnel as identified in the Statement of Qualifications (SOQ) must remain intact for the duration of the procurement process through award of the Design–Build Contract. Accordingly, following submittal of the SOQs, the following actions may not be undertaken without [Arizona DOT's] prior written consent:

a) Deletion or substitution of a Proposer team member identified in its SOQ and
b) Deletion or substitution of Key Personnel identified in its SOQ.

Should a Proposer wish to make such a change, it shall notify [Arizona DOT] and request its consent in writing and shall provide, for any new or substitute team member or personnel, the same information required under the Request for Qualifications RFQ for such team member or personnel had it, he, or she been part of the Proposer team as of the SOQ submission. If a Proposer wishes to delete a team member or change Key Personnel, the Proposer shall provide [Arizona DOT] with information establishing that the Proposer remain qualified for short-listing as contemplated under the RFQ. Any such request shall be sent via e-mail or in writing addressed to [Arizona DOT's] Authorized Representative described in this Section. For a change in Key Personnel, the request shall be accompanied with the same information as requested under RFQ for Key Personnel.

If the Preferred Proposer requests any such change or any change in any other team members or personnel identified in its Proposal, after evaluation of Proposals and before execution of the Design–Build contract, it shall submit such information as may be required by [Arizona DOT] to demonstrate that the proposed deletions, substitutions, and changes meet the RFP criteria and would not change the outcome of the Proposal rankings.

[Arizona DOT] intends to respond to requests for changes within the reasonable time period. [Arizona DOT] is under no obligation to approve requests for changes in the Proposer's organization, Key Personnel, or other identified personnel and may approve or disapprove in writing a portion of the request or the entire request [at] its sole discretion. Any such change made without the written consent of [Arizona DOT] may, at [Arizona DOT's] sole discretion, result in the Proposer being disqualified.

Example 2

Lahaina Bypass 1B-2 Project, Hawaii Department of Transportation (Hawaii DOT) and FHWA Central Federal Lands Highway Division (CFLHD)

For this project, language about retaining key personnel is included in the D-B contract. Proposers were required to identify key personnel in the response to the RFQ, as follows.

Key Personnel, Subcontractors, and Outside Associates or Consultants

In connection with the services covered by this contract, any in-house personnel, subcontractors, and outside associates or consultants will be limited to the key individuals or firms that were specifically identified and agreed to during the RFQ submittal process. The Contractor shall obtain the Contracting Officer's written consent before making any substitution for these designated in-house personnel, subcontractors, associates, or consultants.

Example 3

MD 404–US 50 to East of Holly Road Project, Maryland State Highway Administration

For this D-B project, language about retaining key personnel is included in the RFP, as follows. Unapproved changes in key personnel is not allowed. When personnel continuity cannot be achieved, guidance on approved replacements is provided.

Design Personnel Identified in Proposal

The designer and design subcontractors shall utilize the key personnel identified in their Statement of Qualification (SOQ) to manage the project and supervise engineers and technicians in completing the design in a timely manner to permit construction activities. Changes in key staff identified in the SOQ must be approved in writing by the Administration, and replacement personnel must have equal or better qualifications than the key personnel identified in the proposal. The format for replacement staff resumés must be in the same format as required for the SOQ, including requirements thereof. The Administration shall be the sole judge as to whether replacement staff members are acceptable.

Construction Personnel Identified in Proposal

The Design–Build Team, all key staff and construction-related key personnel, and all other Major Participants identified in the proposal shall be utilized in the same manner and to the same extent set forth in the SOQ and for the duration of the project. Changes regarding the Design–Build Team shall not be allowed. Changes regarding key staff, construction-related key personnel and all other Major Participants require prior written approval by the Administration. Requests for such changes must be submitted to the Administration in writing, and replacement personnel must have equal or better qualifications than the key personnel identified in the SOQ. The format for replacement staff resumés must be the same format as required for the SOQ, including the requirements thereof. The Design–Build Team acknowledges that any such changes are for the convenience of the Design–Build Team alone and shall not increase the Design–Build Team's Price or change the project schedule. The Administration will approve such requests only if it determines that such change will not detrimentally affect the long-term quality, durability, maintainability, and timeliness of the Work.

Example 4

Route 8 in Bridgeport Bridge Rehabilitation Project, Connecticut Department of Transportation

This project utilized continuity of team members, and the requirements were described in the project RFP, as follows.

> **Summary of the Design–Build Proposal Process**
>
> In its SOQ, each Proposer identifies Key Personnel that it has assigned or will assign to the Project, stating the specific role that each person would play in the Project work. Those identifications will be deemed a binding commitment that if the Proposer should receive the Contract, those identified team members will, in fact, play the designated roles in the Project design construction. Proposers are precluded from substituting, replacing, or removing any of the Key Personnel without written consent of the Department to do so. If a Proposer believes that a substitution for any identified Key Personnel is warranted at any time (due to an intervening event), the Proposer shall notify the Department in writing, providing details of the proposed change and the reasons for it. The Department shall not withhold such consent unreasonably. Proposed substitutions for each identified Personnel shall have equal or better credentials than the Personnel that they would be replacing. Should the substituted Personnel, in the opinion of the Department, prove to not meet or exceed the experience and training that the original team member possessed, the Evaluation Committee may reevaluate the Proposer's Qualifications score accordingly, if the substitution is proposed before the award of the Contract.

Example 5

Texas Department of Transportation (Texas DOT)

The Texas DOT design–build agreement template has a table for identifying key personnel and assigning liquidated damages when an agreed-upon person is not in place.

7.4 Key Personnel Change Liquidated Damages

As deemed compensation to [Texas DOT] for Losses described in Section 8.3.1 of the General Conditions, the D-B Contractor agrees to pay to [Texas DOT] the following Key Personnel Change Liquidated Damages amounts in accordance with such section for each day that the relevant Key Personnel role is not filled by an approved individual:

Texas Department of Transportation Design–Build Agreement Template

Position	Key Personnel Change Liquidated Damages (dollars per day)
Project Manager	$[ ]
Construction Manager	$[ ]
Design Manager	$[ ]
Independent Quality Firm Manager	$[ ]
Professional Services Quality Services Manager	$[ ]
Environmental Compliance Manager	$[ ]
Safety Manager	$[ ]
Revise and insert others as applicable	$[ ]

Note: $[ ] indicates dollar amount to be determined.

References

Connecticut Department of Transportation. *Rehabilitation of Bridge Nos. 03761, 03762, 03764, & 03765 Route 8 in Bridgeport*. October 2014. http://www.ct.gov/dot/lib/dot/documents/dconstruction/designbuild/bridgeport_project_15-363_rfp_part_1.pdf. Accessed February 14, 2018.

Texas Department of Transportation. Design–Build Agreement, Version 1. August 11, 2017. https://ftp.dot.state.tx.us/pub/txdot-info/spd/design-build/agreement-template.pdf. Accessed July 23, 2018.

10 FHWA Involvement Overview

This tool is a table or list that briefly describes the way a project interfaces with FHWA on a federally funded project. This interface is often determined based on FHWA local division interest defined in stewardship and oversight agreements.

What Is It?

FHWA must be involved on federally funded projects. This level of involvement may vary by project determination. Sometimes project teams have a difficult time keeping track of when to interface with FHWA. This tool provides a succinct overview of FHWA involvement on federally funded projects. It also summarizes FHWA involvement in a federally funded project based on FHWA's final rule and agency agreements with FHWA. FHWA involvement overview lists the project activities in which FHWA is involved and specifies the role or action needed, such as consult, invite, authorize, review, approve, or concur.

Why Use It?

A description of FHWA involvement provides an overview of all the processes and procedures in which FHWA must be included. This includes project selection, administration, procurement, design, and construction. A summary of FHWA involvement helps the agency fulfill federal requirements by involving FHWA in processes and procedures when required. Without this summary, the level of FHWA involvement and required actions can become a source of confusion. Delays may result because of revisiting decisions when FHWA involvement has been overlooked. In some cases, delays may cause rework.

Potential benefits include schedule acceleration and owner control of design. Involving FHWA at the right time helps avoid delays caused by revisiting decisions when FHWA has been accidentally bypassed. Keeping track of FHWA requirements helps the agency and the federal government stay in control of design and keep momentum with decision making.

FHWA involvement overview addresses the Alignment Strategy and the Scope Strategy. This tool clearly explains the expectations of FHWA involvement and reinforces the scope of that involvement and the responsibilities the project team has in order to keep FHWA involved.

When to Use It?

A description of FHWA involvement should be developed at the initial project development phase and is referenced throughout the project. This tool is recommended for projects of all sizes and complexity, whenever FHWA is involved in a project (Table A.11).

How to Use It?

A description of FHWA involvement is used by the project team to appropriately inform, consult, and invite FHWA as required to attend meetings and review documents. When considering a project for federal funding, the agency should contact its local FHWA division to determine whether the project is a project of division interest. This status will determine the level of FHWA project involvement according to the agency's FHWA stewardship and oversight agreement.

Synthesis of Examples

It is critical for an agency to work closely with FHWA on a federally funded project. The first step is to determine whether the project is a project of division interest. One or a few team

Table A.11. Recommended uses for FHWA involvement overview.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
10 FHWA Involvement Overview	✓	✓	✓	✓	●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

members may be responsible for coordinating with FHWA, but all team members should be made aware of the project elements that FHWA needs to have input on. Time should be allotted in the project schedule for this coordination.

Example

West 4th Street Bridge Project, Pennsylvania Department of Transportation (Pennsylvania DOT)

Pennsylvania DOT uses a submittal review checklist that clearly identifies the submittals that FHWA, as well as Pennsylvania DOT's district office, central office, and others need to receive. This submittal review responsibility checklist was included as Appendix B in Pennsylvania DOT's *Innovative Bidding Toolkit*.

Submittal Review Responsibility Checklist

Plan Set	✓	District	Central Office	FHWA	Other
Roadway Design					
Quality Plan					
Pavement Design					
Environmental/Permits					
Erosion and Sediment Pollution Control Plan					
NPDES Permit					
Draft Exploration Plan and Schedule of Borings					
Geotechnical Design					
Permanent Pavement Marking Design and Signing					
Pre-Final Plans					
Final Roadway Plans					
As-Built Roadway Plans					
Hydrologic and Hydraulic Report					
Final TS&L					
Waterway Permits/Permit Amendments					
Foundation Submission					

(continued on next page)

Plan Set	✓	District	Central Office	FHWA	Other
Roadway Design					
Final Structure Plans					
As-Built Plans					
Hydrologic and Hydraulic Report					
Final TS&L					
Waterway Permits–Permit Amendments					
Foundation Submission					
Final Structure Plans					
As-Built Plans					
Maintenance and Protection of Traffic Design					
Incident Management Plan					
Preliminary Plan					
Final Plan					
Transportation Management Plan					
Utility Coordination					
Utility Relocation Highway Occupancy Permits					
Utility Reimbursement Documentation					
Right-of-Way Acquisition					
Preliminary Right-of-Way Plan					
Appraisals					
Final Right-of-Way Plans					
Modified Final Right-of-Way Plans					
ADA Curb Ramp Design					
Traffic Signal Permit Plan Revisions					
Technical Infeasibility Form					
Curb Ramp Designs					

NOTE: From Appendix B in the Pennsylvania Department of Transportation *Innovative Bidding Toolkit*.
NPDES = National Pollutant Discharge Elimination System. TS&L = type, size, and location;
ADA = Americans with Disabilities Act.

References

Colorado Department of Transportation. *Innovative Contracting (Design–Build and CM/GC)*. 2015. https://www.codot.gov/business/designsupport/innovative-contracting-and-design-build. Accessed July 31, 2017.

FHWA. *Federal-Aid Program Administration*. 2018. https://www.fhwa.dot.gov/federalaid/stewardship/. Accessed August 20, 2017.

FHWA Minnesota Division and Minnesota Department of Transportation. Stewardship & Oversight Agreement. 2015. https://www.fhwa.dot.gov/mndiv/stewardship.cfm. Accessed August 20, 2017.

Pennsylvania Department of Transportation. *Innovative Bidding Toolkit,* 2013 Edition. http://www.penndot.gov/_layouts/pa.penndot.formsandpubs/formsandpubs.aspx. Accessed September 17, 2017.

11 Permit Commitment Database

This database is a summary of all commitments included in the permits and agreements, which helps the project team keep track of all commitments.

What Is It?

Every project requires some kind of permit. Projects that cross multiple jurisdictions may require many permits. Permit requirements may cover a number of issues that can be difficult for project teams to keep track of. This database serves as a handy reference that summarizes key information about all the permit commitments on a project.

Why Use It?

A permit commitment database keeps the project team focused on meeting all permit requirements. This tool guards against overlooking a permit commitment made on the project. Potential benefits include cost and schedule savings, as well as resolving third-party issues that can affect cost and schedule. Identifying the permits and their responsible parties early on may also allow for additional input to the design.

A permit commitment database helps address all of the Alignment, Scope, and Construction Efficiency strategies. It helps establish clear permitting goals and responsibilities for the agency and the D-B team members. The database allows project stakeholders to begin communicating about permits during the early stages of the project and establishing clear expectations so that the construction phase can later proceed smoothly.

When to Use It?

The permit commitment database can be included with the RFP and can state whether the owner has already obtained specific permits. This can help a D-B firm during the proposal stage to better understand and plan for all permit commitments from the beginning. Permit commitments must be met throughout the duration of the project. If the D-B firm is obtaining permits, then the agency can request that the D-B firm create the permit commitment database.

A permit commitment database is recommended for projects of all sizes, especially moderately complex-to-complex projects (Table A.12). For projects that are not complex, the project team can consider using this tool on a case-by-case basis.

Table A.12. Recommended uses for permit commitment database.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
11 Permit Commitment Database	✓	✓	✓	✓	◗	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

The permit commitments database is prepared by whoever is responsible for obtaining the majority of permits—either the agency or the D-B firm. The permit commitment database can be used as a checklist to make sure all commitments are made and maintained. The database provides information such as the name of the jurisdiction issuing the permit, the permit number, a description of the topic, who is responsible, and where to locate the requirements within the permit.

Synthesis of Examples

Good practice for this tool follows the points identified below:

- The RFP summarizes the required permits, possibly as part of an appendix.
- Conditions from each of the required permits are identified and summarized in a table that serves as a database throughout the project (Table A.13).
- The table has columns for the permit number, permit ID, topic, requirements, responsibility, source reference details, and page numbers for ease of navigation.
- A status column can be added to indicate when requirements are fulfilled or on track to being fulfilled.
- The database is searchable based on requirements, topic, a certain party's responsibility, permit status, and so on.

Table A.13. Summary of conditions from required permits.

Permit Number	Unique ID No.	Topic	Requirement	Responsibility	Source Reference Heading	Source Reference Page	Status	Check-In Date
	1							
	2							
	3							
	. . .							

Note: . . . = continuation of Unique ID No.

Example

I-405, NE 6th Street to I-5 (Bellevue to Lynnwood) Widening and Express Toll Lanes Project, Washington State Department of Transportation (Washington State DOT)

This project crossed a number of jurisdictions and required permits from multiple agencies. The RFP summarized these permits in an appendix. Conditions from each of these permits were identified and summarized in a table that served as a database throughout the project. The table includes a column for the permit, topic, requirements, responsibility, and source reference details. This database can be searched for all requirements for one type of permit. Alternatively, it can be searched for all requirements that are the responsibility of a certain party.

I-405, NE 6th to I-5 Widening and Express Toll Lanes Project Commitments List

Permit Number	Unique ID No.	Topic	Requirement	Responsibility	Source Reference Details	
					Heading	Page
ESA–National Marine Fisheries-1	1	Stormwater Facilities, Stormwater	The Design–Builder shall reconfigure and/or enlarge existing facilities so as to provide flow control to address the estimated 19.2 acres of impervious surface that falls within the basins that are outside the [. . .] Sammamish River basin, which is exempt from flow control [Washington State Department of Transportation 2006]. This target flow control catchment area includes the project's new impervious surface as well as restoration of any flow control facilities that are in place prior to the project. Flow control will be provided by infiltration ponds, detention ponds, detention vaults, and combined stormwater treatment wetlands/detention ponds according to [Washington State DOT] guidelines. Up to 17 flow control facilities will be needed for the project. Several of these existing facilities are being increased in size to accommodate the current project. See RFP Appendix H1 for a detailed breakdown and additional hydraulic information.	Design–Builder	Treating Storm Water	3
ESA–National Marine Fisheries- 2	2	Stormwater Facilities, Stormwater	The Design–Builder shall provide stormwater runoff treatment for 13.89 acres of new impervious surface and will complete a stormwater retrofit for an additional 4.69 acres of existing impervious surface (out of the approximately 323 acres of existing impervious surface). Stormwater in the area currently discharges to the Sammamish River, North Creek, Juanita Creek, Forbes Creek, Yanow Creek, and local tributaries within the North Bellevue basin. See RFP Appendix H1 for a detailed breakdown and additional hydraulic information.	Design–Builder	Treating Storm Water	2
ESA–National Marine Fisheries-3	3	Work in the Sammamish River	The Design–Builder shall place up to a total of 450 square feet of riprap [to] be installed below the Ordinary High Water Mark (OHWM) for the two new stormwater outfalls to the Sammamish River. The outfalls are above OHWM of the Sammamish River, but the riprap will be placed below the outfall to protect against streambank erosion. In-water work on the Sammamish River will also include installing Large Woody Debris (LWD) and round rock within the river. In addition to the riprap installation, Best Management Practices (BMP) installation will temporarily impact up to a total of 400 square feet. Installation of LWD and round rock will occur within the same 450 square feet as the riprap. Bank stabilization methods will incorporate recommendations from the Integrated Streambank Protection Guidelines [Washington State Department of Transportation 2007].	Design–Builder	Work in the Sammamish River	4

Note: ESA = Endangered Species Act.

12 Plan Standards

Plan standards are adapted to the goal of developing plans and specifications for building a project, rather than for bidding a project.

What Is It?

Instead of preparing plans for bidding by multiple contractors who have not participated in the design phase, designers prepare plans to be used by the D-B entity who has been participating in the design phase. Thus, when there is a strategic reason, plans can deviate from standard formatting and still communicate the needed information to the contractor without creating ambiguity. The owner still needs a complete set of as-built drawings, so plans should be prepared for the purposes of building the project and for documenting as-built conditions.

Adjustments to plan standard address the Alignment Strategy and the Design Quality Strategy. Agreeing on adjusted plan standards helps bring the team into alignment on what the design deliverable will look like, based on what the contractor will need to build the project. Ensuring that the plans contain the information needed by the contractor to build the project requires active participation of the contractor during design, thus promoting design quality.

Why Use It?

Implementing D-B–specific plan standards can expedite the design phase. This is possible because the contractor is participating in the design phase and has in-depth project background to draw from when interpreting and using the plans. Potential benefits attributed to this flexibility during design plan development are primarily cost savings and schedule acceleration from a more streamlined plan development.

When to Use It?

Plan standards development occurs during the design phase. It is recommended for mid-to-large size complex projects (Table A.14). It may be used in other projects, but the scale of the project reduces the impact of the benefit for the project team. On smaller projects that will not last a long time, the agency may feel it is easier to stick with the typical plan standards than to try to adjust to a revised plan standard for such a short project.

Table A.14. Recommended uses for plan standards.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	Noncomplex	**Moderately complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
12 Plan Standards		✓			◗	◗	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

As design plans are being developed, the project team discusses the best way to convey information for construction and the requirements for as-built drawings. If the most efficient way deviates from the standard formatting, the project team seeks approval from the agency to deviate. The agency should think ahead to what information they want on the as-built plans. Some details for construction—such as the survey data or materials specifications found on summary sheets—may be able to be communicated through tables of data apart from the plans. But, if this information is needed by the agency on the as-built plans, then it should be incorporated into the project plans.

A common example of a plan standard deviation relates to removals. If a utility such as a communications cable must be removed through the length of the project, the removal information can be placed on one plan sheet rather than on every plan sheet. Alternatively, roll plots can be used instead of plan sheets. It may be convenient for a contractor to have a roll plot of pavement and utility removals rather than a high number of individual plan sheets. The plan sheets are convenient for bidding, but the roll plot is convenient for construction. Since the work is not being bid, the roll plot may be all that is needed. Typically, removals are not needed on as-built drawings, so the agency is not sacrificing any information for record keeping.

Synthesis of Examples

Adaptation of plan standards should be used to meet function, quality, safety, and any other standards the agency needs to maintain. This tool should not be used as a shortcut around needed standards. The appropriate application is when a general standard does not readily apply to a particular situation. Removals are a good example of this situation. Another example is when an agency's standard details jump over what is needed. For example, if a 4-feet-high reinforced box culvert is needed and the agency only has details for 3 feet and 5 feet, it may be appropriate to use a detail from a different agency for a 4-feet-high box.

Example

Florida Department of Transportation (Florida DOT) *Plans Preparation Manual, Volume 1: Design Criteria and Process*

Florida DOT uses this *Plans Preparation Manual* to describe the design criteria, as well as procedures for contract plans for all roadway and structure projects. The required procedure and how to identify when nonconventional projects deviate from this procedure are described as follows. Key to the success of this procedure is to clearly communicate to project team members when deviations to standards are occurring.

Procedure

The criteria in this manual represents requirements for the State Highway System [that] must be met for the design of [Florida DOT] projects unless approved Design Exceptions or Design Variations are obtained in accordance with procedures outlined in this manual.

(continued on next page)

Roadway and structures design is primarily a matter of sound application of acceptable engineering criteria and standards. While the criteria contained in this manual provides a basis for uniform design practice for typical roadway design situations, precise standards [that] would apply to individual situations must rely on good engineering practice and analyses.

Special requirements for Non-Conventional Projects, (e.g., Design–Build Projects and all Non-Design–Bid–Build, Public–Private Partnership Projects may be shown in a Modification for Non-Conventional Projects box, as shown in the following example):

Modification for Non-Conventional Projects:
Delete PPM 7.2.6 and replace with the following: **7.2.6 Signing Project Coordination** The Design–Build firm must submit a master signing plan with the Technical Proposal. The master signing plan can be on a roll plot.

These boxes are located at the beginning of the chapter or after a section, paragraph, or table [that] is to be modified. The requirements listed within these boxes are only applicable to Non-Conventional Projects.

References

Florida Department of Transportation. *Plans Preparation Manual, Volume 1: Design Criteria and Process.* January 2017. http://www.fdot.gov/roadway/ppmmanual/2017/Volume1/2017Volume1.pdf. Accessed February 11, 2018.

13 Deviations from Agency Standards

The agency allows deviations from standards on a specific project when it makes sense in the context of that project.

What Is It?

Instead of automatically following all standards, the project team evaluates project goals and project context and—when appropriate—suggests deviations from standards to better meet the agencies goals. This does not apply to safety standards.

Why Use It?

Standards are meant to apply to a wide variety of circumstances. The circumstances of a particular project may not be similar to the circumstances for which the standard was created.

A deviation from agency standards can help design decisions target project needs better and in a more efficient manner. Since each project has a unique set of goals and circumstances, some agency standards should be adjusted to accommodate a specific project. This removes any unnecessary barriers that could potentially prevent project goals from being reached.

Potential benefits include cost savings and schedule acceleration by eliminating the effort of complying with standards that do not apply. This flexibility of selecting appropriate standards also encourages contractor input during design, which enhances constructability, innovation, value engineering, and risk mitigation. The agency maintains control over design by determining what deviations from standards will be allowed.

Deviations from agency standards address the Alignment Strategy and the Design Quality Strategy. Clearly identifying what standards are to be met and what standards are to be modified helps create alignment among the project team. Active participation from the designer, contractor, and agency in determining what deviations from agency standards is part of design quality.

When to Use It?

This tool is used during design when design decisions are being made by the project team. The decision to accept a deviation from agency standards is made during the design phase. However, those decisions are implemented during the construction phase of the project. This tool is recommended for mid-to-large projects that are moderate to complex (Table A.15). It is not recommended for smaller, noncomplex projects, as it may not produce a big enough benefit to justify the time and expense of analyzing potential deviations from the standards.

How to Use It?

As the design team becomes thoroughly immersed in the project details, they can look for general standards that may not be meeting project goals efficiently. Then, the project team brainstorms alternatives to the standard, and a cost–benefit analysis can be done on the alternatives. A top alternative is then selected and presented to the agency as an alternate to the design standard. The agency has the authority to accept or reject the deviation from the agency standard.

For example, a culvert crossing may require a certain cross section for which the agency does not have a standard design. If another state has a standard for that cross section, the agency can

Table A.15. Recommended uses for deviations from agency standards.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	Noncomplex	**Moderately complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
13 Deviations from Agency Standards		✓			◗	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

adopt that standard. Both standards are approved by a structural engineer, but the deviation allows the sizing to better fit the need. Agencies might have regulations prohibiting work noise during certain hours or a requirement to keep a certain number of lanes of traffic open. An agency may consider a deviation from these regulations for a limited time if there is a justifiable benefit to the project and to the public.

In general, an agency will want to avoid accepting a deviation from agency standards that reduces scope or reduces function. For example, substituting a shorter life pavement for the standard with a longer life would not be a benefit to the life cycle cost of the facility.

Synthesis of Examples

This tool should not be used to avoid meeting functional, quality, safety, or other agency standards. Allowing deviation from a standard can be used to help manage risk but should not compromise the final constructed product. For example, an agency may typically place some risk as a responsibility of the contractor. Allowing a deviation and sharing and qualifying the risk can help reduce the cost of the work by reducing the contractor's contingency for the work. Any deviations under consideration should be carefully thought through and documented, if agreed upon. Deviations should bring a benefit to the agency and not just be a convenience for the construction.

Example

Winona Bridge Project, Minnesota Department of Transportation

Although this is a CM-GC project, it illustrates how the context of a project can be taken into account to meet the agency's objectives without sacrificing quality or safety. This project rehabilitated a historic bridge across the Mississippi River. The standards called for cofferdams to be at the 10-year flood elevation. Instead, the project team built the cofferdams to 1 foot above the 5-year flood elevation. By accepting this risk, the project saved $240,000, as summarized in the following project case study.

Mississippi River Spring Flooding

One of the main project goals is to place Trunk Highway 43 traffic on new Bridge 85851 by the fall of 2016. In order to accomplish this, the project team needed to devise a plan to mitigate the potential risk of Mississippi River flooding in the spring of 2015, which could cause a significant delay and [a] potentially unrecoverable schedule delay to the project. With recent river flooding in the spring and summer of 2014, this was a major concern for the project team.

The primary countermeasure to address this risk was an aggressive construction schedule for the new bridge river piers, to build them up out of harm's way before the spring 2015 flood season. The team worked proactively toward this common goal.

Several cost mitigation techniques were also deployed once the schedule details were worked out:

- The cofferdam elevations were set at a 5-year flood elevation, plus one foot, in lieu of a 10-year event level, resulting in the project savings of $240,000.
- A unique, shared risk marine idle equipment contract provision was deployed to pay the contractor for any idle marine equipment should flooding in 2015 impact the critical path of the construction schedule. This could save up to an additional $250,000 if the project stays on schedule and experiences no flooding delays in the spring.

When combined, these savings could lead to an overall cost savings of $490,000 for the project.

References

Minnesota Department of Transportation. *Benefits of the Construction Manager/General Contractor (CM-GC) Delivery Method*. 2015. http://www.dot.state.mn.us/winonabridge/docs/casestudies/casestudy8.pdf. Accessed December 21, 2017.

14 Discipline Task Force

A discipline task force is a group of individuals focused on one specific discipline. Discipline task forces are formed to ensure coordination across project disciplines.

What Is It?

Each discipline task force focuses on a specific discipline of work, such as structures, roadway, drainage, or environmental. Members of a task force include designers, key construction personnel, and the agency's discipline experts. Task forces generally meet weekly to discuss discipline-related design progress and issues and to plan phased action items, as necessary. The minutes from each task force meeting are recorded and distributed.

Why Use It?

This tool ensures that attention is given to every aspect of the project. Furthermore, implementing regular discipline-specific meetings ensures that any necessary action is taken in a timely manner.

The primary purpose of a discipline task force is to provide consistency and improve coordination across all project disciplines. Additionally, regular meetings on specific topics aid in the management and communication between all parties, project quality enhancement, and keeping the project on schedule.

Potential benefits include allowing for agency and construction input in design to encourage constructability, innovation, and risk mitigation; the ability to fast-track through phasing the project, as needed; and the ability to bid out early work packages, if desired.


SCOPE


DESIGN QUALITY

Discipline task forces address the Scope Strategy and the Design Quality Strategy. These task forces establish clear scopes within each project discipline. They also ensure the quality of design by allowing for the agency's active participation in design reviews and for the D-B firm to verify competitive pricing of estimates for each discipline's design.

When to Use It?

It is feasible for discipline task forces to hold meetings during any phase of a project, but they are most common during design. Additionally, there is potential for new task forces to form throughout the project as the need arises.

Discipline task forces for complex projects that are higher than $10 million are recommended (Table A.16). For smaller projects that are moderately complex, the project team can consider using this tool on a case-by-case basis. Discipline task forces are not recommended for non-complex projects because the benefits will probably be small and not justify the cost and effort.

How to Use It?

A discipline task force is composed of individuals representing each necessary party on a project. Task force members must be available to meet regularly to discuss their discipline and responsibilities in relation to the project. These individuals need to have the knowledge and authority to be able to address issues relating to their discipline. Task force members should be involved in more than one discipline task force in order to ensure consistent cross discipline coordination. Each discipline task force should have clear ground rules, scope, and deliverables; otherwise, there is a danger of getting out of alignment with the project goals.

Table A.16. Recommended uses for discipline task force.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	Noncomplex	Moderately complex	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
14 Discipline Task Force		✓			○	◗	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

Synthesis of Examples

When an agency wants to be involved in the development and review of a specific discipline that is particularly relevant or unusual on a project, the requirement of a discipline task force can be included in the RFP. When task force meetings are held or communications for the task force are circulated, all task force members need to be engaged in order to keep project progress on that discipline moving forward. If agency personnel assigned to a task force do not attend task force meetings or respond to task force communications, the project will lose the benefit of this tool. Since disciplines may overlap, there may be times when one discipline task force meets with members of another task force.

Example 1

I-405, NE 6th Street to I-5 Widening and Express Toll Lanes Project, Washington State Department of Transportation

Washington State DOT has experienced success with discipline task force meetings in the past. The RFP for this project required task force meetings for some disciplines, encouraged them for others, and discussed the potential benefits. Excerpts from Washington State DOT follow:

> **Task Force Meetings**
>
> The Design–Builder is encouraged to maintain close communication with [Washington State DOT] throughout the design and construction of the Project. It is anticipated that this close communication will expedite Project reviews, facilitate the incorporation of innovative project solutions, and facilitate Final Acceptance of the Project.
>
> On previous projects, [Washington State DOT] has found task force meetings between the Design–Builder and [Washington State DOT] to be an effective method of communication. Task force meetings are particularly effective when they are established for each design discipline, when they commence prior to starting design, and when they continue at regular intervals throughout the design. Task force meetings are required for specific disciplines, as noted in these Technical Requirements. Should the Design–Builder choose to hold task force meetings for other disciplines, [Washington State DOT] will be available on a weekly basis to attend them.

Example 2

California Department of Transportation *Design–Build Demonstration Program Quality Manual* Outline

Caltrans uses the following description of a task force in their *Design–Build Demonstration Program Quality Manual* Outline.

> **Design Documents Preparation**
>
> The design team prepares the design documents, using the established design criteria for the project and appropriate inter-discipline and Task Force coordination (via regular scheduled meetings, written communications, [and so on]). Task Forces (which include representatives from the Design–Builder, Department, and local agencies representatives, as needed) meet weekly or bi-weekly during the design phase and periodically thereafter. Some tasks forces may be added, combined, or eliminated as design progresses. The Task Force will generally be discipline specific.

References

California Department of Transportation. *Design–Build Demonstration Program Quality Manual* Outline. July 2013. http://www.dot.ca.gov/design/idd/db/sac50-5/rfp/03-2F21U4-Exhibit-2A-Quality-Manual-Template.pdf. Accessed February 12, 2017.

Lane, L. B. *NCHRP Synthesis 373: Multi-Disciplinary Teams in Context-Sensitive Solutions.* Transportation Research Board of the National Academies, Washington D.C., 2007. https://dx.doi.org/10.17226/23123.

15 Independent Party Design Review

This tool is a design review performed by a third-party consultant that the agency hires.

What Is It?

An independent party design review is a process in which the agency hires a third-party firm to provide quality inspections and verification reviews during design. The independent review team should be qualified consultants who can provide objective design reviews that are not biased by the contractual relationship that exists between the project's D-B firm and the agency. It is one way to provide additional resources for an agency.

Why Use It?

There are instances when an agency may not have the necessary resources or expertise to provide complete and thorough design reviews, especially in D-B projects where the agency does not perform the design in-house. In these cases, it can be beneficial for the project to hire a third-party independent review consultant to perform design reviews on behalf of the agency. This will place the design review responsibilities on the hired independent party, but the agency still controls how the reviews occur.

This tool supplements the resources and time that an agency needs to allocate to a project. Since the independent party performs the design reviews, the agency can reduce the staff and time dedicated to reviews. Also, the selected review consultant can be required to possess additional expertise to perform a more in-depth review than a typical agency reviewer could provide. By having a highly qualified independent reviewer perform reviews of complex and specialty projects, the risk related to technical requirements can be reduced.

Potential benefits include maintaining the agency's control of the design, while also reducing agency staff time devoted to reviews. This tool could also lead to cost benefits if technical requirement risks are reduced due to the expert reviews. Finally, this tool can provide schedule benefits in instances when the agency lacks the resources and time needed to meet specific design milestones.

An independent party design review addresses the Scope Strategy. This tool ensures the design meets the project scope and quality defined by the agency. It also helps ensure that the design is up to the agency's standards before the D-B firm starts expending significant effort working on preconstruction services, including cost estimating, constructability analyses of the design, and so on.

When to Use It?

Third-party independent reviews are most helpful on specialty projects, when the agency lacks the expertise needed to perform a detailed review, or when the agency lacks the necessary resources and time to meet specific design milestones (Capers et al. 2011).

An independent party design review is recommended for moderately complex and complex projects that are higher than $10 million in value (Table A.17). An independent party design review is not recommended for smaller projects and noncomplex projects because the benefits will probably not justify the cost.

Table A.17. Recommended uses for an independent party design review.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	Noncomplex	**Moderately Complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
15 Independent Party Design Review		✓			○	●	●	○	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

Before design begins, the agency needs to decide if design reviews can be performed internally. This decision is based on the availability and the expertise of agency staff. When a third-party independent review team is needed, they conduct the reviews based on the process and requirements developed by the agency. This includes reviewing all required quality aspects developed by the agency prior to starting design. In addition, the independent review team will provide reviews at all specified intervals agreed to by the agency and the design team.

Synthesis of Examples

When an agency brings in an independent party design reviewer, it should be sure to include the reviewer in partnering meetings, relevant project meetings, and the appropriate discipline-specific task forces. The agency should clarify with the D-B entity whether document distribution for the review will be the responsibility of the agency or the D-B entity. When the agency receives an independent party design review, it should read and assess the review to make sure it is in agreement with the independent reviewer's comments and that those comments are consistent with other comments prepared by others in the agency.

Example

SH 82 Grand Avenue Bridge Project, Colorado Department of Transportation (Colorado DOT)

Colorado DOT replaced a traffic bridge and a pedestrian bridge in this large, complex, and phased project located in an urban Colorado area. Colorado DOT contracted with consultants to perform independent party design reviews to supplement the work of agency staff. Although this project did not have federal funding, Colorado DOT also asked FHWA to perform an independent review in order to benefit from their expertise.

References

AASHTO. *AASHTO Guide to Quality in Preconstruction Engineering*. Washington, D.C., 2003.

AASHTO. *AASHTO Consultant Contracting Guide*. Washington, D.C., 2008a.

Capers, H., H. Ghara, K. C. Rehm, N. Boyd, T. Swanson, C. Swanwick, R. J. Healy, R. W. Dunne, and R. S. Watral. *NCHRP Project 20-68A, Scan 09-01: Best Practices in Quality Control and Assurance in Design*. Transportation Research Board, Washington D.C., 2011. http://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp20-68a_07-01.pdf. Accessed April 13, 2018.

FHWA. *Guidance on QC/QA in Bridge Design in Response to NTSB Recommendation (H-08-17)*. U.S. Department of Transportation. https://www.fhwa.dot.gov/bridge/h0817.pdf. Accessed April 14, 2018.

16 Cost–Savings Matrix

This tool is a table listing the innovations or cost-saving measures developed by the project team to enhance the project in a variety of ways, such as cost and schedule.

What Is It?

A cost–savings matrix is a table for tracking innovative ideas, their impact on the project, who is responsible, and the status of the innovation. Innovative ideas may be novel approaches or simply efficient ways to reach project goals. Impacts to the project may be cost savings, time savings, improved safety, quality, access, and so on. A responsible party for follow-up is designated to research the innovation and its affects. The information about the innovation is reviewed by the team so a decision can be made whether to accept and implement the innovation.

Why Use It?

The cost–savings matrix is a tool that reminds teams to think innovatively. The cost–savings matrix provides a single place to document innovative ideas that are under consideration and provides structure for investigating such ideas and tracking the status of each idea as it is explored. This tool provides a document that the agency can use to assess whether the D-B delivery method brought innovation to the project and to determine what benefits the project accrued. Innovations can be lessons learned for an agency, so the cost–savings matrix also provides documentation for lessons learned that can be applied to future projects.

The potential benefits of a cost–savings matrix include cost savings, schedule acceleration, and construction input in design to encourage constructability, innovation, and risk mitigation.

The cost–savings matrix addresses the Alignment Strategy, Scope Strategy, and Design Quality Strategy. Goals can be clarified and productive relationships built as a team explores innovations together. As options are analyzed, scope is constantly referred to. Identifying and researching innovative opportunities keep the contractor engaged throughout the design phase.

When to Use It?

The cost–savings matrix is used during the design phase (Table A.18). Since the contractor is involved during the design phase and shares preconstruction input, most innovation will be raised during design.

Table A.18. Recommended uses for cost–savings matrix.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	Noncomplex	**Moderately Complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
16 Cost–Savings Matrix		✓			◗	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

The cost–savings matrix can be created in a spreadsheet. This tool is a topic of discussion that can be placed on the agenda for project meetings. All team members must be open to innovation for the cost–savings matrix to be accepted and used effectively by the team.

Synthesis of Examples

The primary purpose of a cost–savings matrix is to document the innovation, its estimated cost, the schedule, or other benefits. In a D-B project, most of the innovation will be presented to the agency in the confidential one-on-one alternative technical concept meetings and in the D-B team proposals. When an agency provides a stipend for the D-B teams who are not selected, the agency may have the right to use the innovations those teams proposed. It is up to the design–builder and the agency to determine if any of those ideas are worth incorporating into the winning D-B team's proposal.

Discussion regarding innovation can occur any time during a project but most often during design. If an innovation is recommended, the matrix can also document the plan to implement it on a project. Agencies usually develop a standard table to document this information to help facilitate the decision about whether to implement the innovation. The format of an innovation matrix can vary, but the typical information on the matrix include the following:

- Description of the innovation,
- Identification of which area of the project would be impacted (e.g., phase and work type),
- Estimated cost savings,
- Estimated schedule savings,
- Estimated other types of benefits (e.g., reduction in risk),
- Costs or changes in other areas if the innovation were implemented,
- Recommendation, and
- Action items and responsible parties (if the innovation is recommended to be implemented).

Example 1

I-95/I-295 Interchange, Florida Department of Transportation

This D-B project modernizes and improves the existing interchange. Florida DOT uses a cost–savings initiative process that provides a forum for the D-B team to present the agency with innovations not already presented in the alternative technical concepts or proposal. This meeting occurs after the NTP but before design continues.

Example 2

I-70 Vail Underpass Project, Colorado Department of Transportation

Although this project is a CM-GC, the table template for a cost–savings matrix could be useful to a D-B team that is exploring additional innovations and cost savings. A few examples from an innovation matrix demonstrates how it can be used.

Innovation Matrix

Innovation Identification				Value Added			Action Items					
VE No.	VE Name	Date Initiated	Description	Estimated Cost Savings	Schedule Savings (Shifts)	Additional Value Added	Status	Action Required By	Action Required	Date Required	Final Decision	Final Decision Date
	Phasing		Utilize head-to-head traffic to maintain 100% mobility	$833,000	TBD (2 months anticipated)	Minimize risk associated with utility relocation by providing flexibility	Complete	Contractor	Estimate detour paving requirements and cost	12/9/2014	Phasing with one-way traffic developed and accepted by project team and stakeholders	12/19/2014
								Designer	Determine availability of North Frontage Road detour on Lion Ridge Loop			
	Refine Phasing		Ongoing refinement to minimize detour lengths and maintain efficiencies in construction	TBD	0 over previous phasing	Smaller impacts to adjacent Colorado DOT right of way and other properties	Under Review	Designer	Design team updating and to be included in Final Office Review plan set	Final Office Review Plans	—	—
	Raise I-70 Profile		Raise I-70 Profile	$300,000	Undetermined but less excavation would reduce duration	Additional value potential in less impacts to utilities and smoother drainage issues	Not Incorporated	Contractor	Provide estimate for replacement of I-70	9/30/2014	Determined not to incorporate due to stakeholder feedback and additional design and environmental clearance impacts	11/3/2014
								Designer	Determine adjustments to South Frontage Road alignment (savings in excavation quantity)	9/30/2014		

Note: VE = value engineering; TBD = to be determined; — = not applicable.

17 In-Progress Design Workshops

These meetings between the designer, the contractor, and the agency take place throughout the design process to discuss and verify design progress.

What Is It?

Throughout the design phase, the state transportation agency or the contractor is able to request a meeting with the designer to discuss design progress. These in-progress design workshops are intended to assist the designer in resolving design issues and questions.

Why Use It?

In-progress design workshops ensure that the project team has a consistent understanding of the project assumptions and expectations. This tool allows issues to be resolved early in the project, before they carry through the design process. The workshops also provide an opportunity to enhance the quality of the project and enable the agency to review design information.

In-progress design workshops provide a forum for the relevant project parties to review and discuss design details. This tool establishes communication between project parties at a time when decisions have a large impact on the quality of a project. All parties involved in the project are able to align their understanding of the project and assign future corrective actions, if needed.

The potential benefits of in-progress design workshops include construction input in design to encourage constructability, innovation, and risk mitigation. The agencies will also gain a shared sense of control over the design.

In-progress design workshops address the Alignment Strategy, Scope Strategy, and Design Quality Strategy. The team will work jointly on achieving design goals in real time. Agencies can provide feedback if the scope starts to stray or key scope items are not being met. Overall design quality will benefit from the collaborative approach.

When to Use It?

This tool is implemented at any stage during the design phase of a project (Table A.19). It is best suited to projects delivered using alternative project delivery methods in which the designer and the contractor are contractually obligated to coordinate with one another.

Table A.19. Recommended uses for in-progress design workshops.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	Noncomplex	**Moderately Complex**	**Complex**	**≤ $10 million**	**$10 million–$50 million**	**> $50 million**
17 In-Progress Design Workshops		✓			◗	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

The agency or the contractor requests an in-progress design workshop well in advance of the desired workshop date. This enables the contractor and/or the designer to submit drawings or other documents for review during the workshop. The agency may choose to limit the number of in-progress design workshops held per week because of resource constraints. The agency should keep a written record of details, such as workshop participants, items covered, discrepancies and comments, planned corrective actions, and identified follow-up actions.

Synthesis of Examples

Ideally, this tool would be specified in the contract with details on who can call the meeting, the minimum lead time required, and who documents the meeting outcomes. Despite whether this tool is specified in the contract, it can be discussed at a partnering meeting. In-progress design workshop meetings are most successful when there is a continuity of team members, team members prepare for the workshop by reviewing documents, team members are actively engaged in the workshop, and team members who are knowledgeable in the disciplines being discussed are present and are able to make decisions for the project.

Example

I-15/I-215 (Devore) Interchange Improvements Project, California Department of Transportation

In-progress design workshops were utilized throughout this project. Their description and requirements were outlined in the *Project Requirements Book 2*, as follows.

> **In-Progress Design Workshops**
>
> Throughout the design process, the Design–Builder or the Department may request (with at least [5] Working Days' notice) in-progress design workshops to discuss and verify design progress and to assist the Design–Builder and/or its designer(s) in resolving design questions and issues.
>
> At least [5] Working Days prior to each in-progress workshop, the Design–Builder shall assemble and submit drawings or other documents to be reviewed during the workshop to the Department for its information and review.
>
> The Design–Builder shall maintain a written record of all in-progress design workshops, including
>
> - A list of the participants in attendance, date, time, and location;
> - Description of the items covered and discussed;
> - Identification of discrepancies and comments and a report on corrective actions (both those taken and those planned); [and]
> - Identification of follow-up action items, due dates, the party responsible for action items requiring resolution, and deadlines for resolution.

18 Over-the-Shoulder Reviews

Over-the-shoulder review meetings bring the designer and the agency together to look at and discuss design documents while these designs are progressing.

What Is It?

Over-the-shoulder reviews are informal design reviews where designers and agency representatives talk about design assumptions, project constraints, and alternative design solutions prior to formal design submittals. These meetings are an opportunity for the agency to provide input to the designer before design decisions are documented in a formal submittal (Gransberg et al. 2008). These types of design reviews mainly assess whether the designer is properly meeting the design requirements and design criteria of the contract. In addition, these reviews can address whether the design quality management plan activities are occurring in accordance with the agency-approved, contractor-developed, quality management plan, as well as overall project quality requirements (Gransberg et al. 2008).

Why Use It?

An agency can use over-the-shoulder reviews to provide feedback to the designer sooner than a formal submittal, thus avoiding incomplete design work or redesign. Designers can receive agency feedback where it is desired and helpful (Gransberg et al. 2008). Design does not need to stop for an over-the-shoulder review in the same way it would for a formal submittal and review. An over-the-shoulder review provides review input and opportunities to resolve confusion and conflicts without pausing the design progress. Additionally, over-the-shoulder reviews can help to increase the contractor's adherence to required criteria, increase the quality of the design, and, in turn, increase the quality of the constructed project.

Potential benefits include schedule acceleration and owner control of design. Over-the-shoulder reviews allow the agency to stay involved in the design process, and it can prevent designers from pursuing alternatives that will not meet the agency's needs.

Over-the-shoulder reviews address the Alignment Strategy, Scope Strategy, and the Design Quality Strategy. Alignment is refined as the project team discusses the project during over-the-shoulder reviews. The reviews encourage active participation of the contractor during design. Bringing the agency, designer, and contractor together to look at and discuss the plans enhances the design quality.

When to Use It?

This tool can be used throughout the design phase. Over-the-shoulder design reviews can be prioritized on design aspects that are on the critical path (Gransberg et al. 2008). Over-the-shoulder meetings are helpful in checking specific design criteria. Projects with strict or difficult performance and design criteria can benefit from the communication that occurs in an over-the-shoulder meeting. Some agencies conduct regularly scheduled over-the-shoulder reviews.

Over-the-shoulder reviews are recommended for projects of any size and when projects are moderately complex to complex (Table A.20).

Table A.20. Recommended uses for over-the-shoulder reviews.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	Construction	Closeout	Noncomplex	**Moderately Complex**	**Complex**	**<$10 million**	**$10 million–$50 million**	**>$50 million**
18 Over-the-Shoulder Reviews		✓			◗	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

The use of over-the-shoulder reviews should be stated in the RFP, along with guidelines on how to initiate, structure, and document an over-the-shoulder meeting. Over-the-shoulder meetings should be collaborative for optimal benefit. The agency can initiate these meetings at any time or they can be part of the project schedule. Over-the-shoulder meetings can be group meetings or one-on-one conversations. The designer should implement the feedback, but, generally, providing written documentation of the feedback is not required.

Synthesis of Examples

The expectation to implement over-the-shoulder reviews should be made in the RFP and in the contract. Project teams can hold regularly scheduled over-the-shoulder reviews or call special meetings when a design issue arises. In general, over-the-shoulder reviews should not wait until a design milestone submittal. These reviews can help facilitate communication between discipline reviewers in the agency and on the design team. Over-the-shoulder reviews will help the agency expedite the review of milestone submittals. The use of such reviews can enhance partnering. Over-the-shoulder reviews are not hold points that restrict progress of design. They are reviews of the design as it progresses and opportunities for the agency to provide comments and feedback on the design.

Example 1

I-15/I-215 (Devore) Interchange Improvements Project, California Department of Transportation

The Devore Interchange was a complex D-B project. To facilitate communication, project schedule, and project quality, Caltrans offered to meet with the designer to review the design in progress before formal submittal. The process of over-the-shoulder reviews was described in the *Project Requirements Book 2*, as follows:

> **Over-the-Shoulder Reviews**
>
> Over-the-shoulder reviews are informal examinations by the Department of design documents during the Project design process. Over-the-shoulder

(continued on next page)

reviews will mainly assess whether the requirements and design criteria of the Contract documents are being followed and whether the Design–Builder's Design Quality Management plan activities are being undertaken in accordance with the approved Quality Manual.

Each design package may have multiple over-the-shoulder reviews at the request of either the Department or the Design–Builder. The reviews may, at the Department's discretion, include review of design drawings, electronic files, calculations, reports, specifications, geotechnical data, progress prints, computer images, draft documents, draft specifications and reports, other design documents, and any other relevant design information as requested by the Department.

It is the intent of these reviews to check for concept, level of detail, design criteria, and fatal flaws. Comments made by the oversight team will be considered non-binding. It is the Design–Builder's responsibility to conform to the Contract requirements. These reviews will not routinely include detailed calculation or drawing reviews, although the Department retains the right to perform detailed reviews of any item at any time. If mutually agreed upon between parties, for specific review items, the over-the-shoulder review may consist of an exchange of electronic files between the Design–Builder's designer and the Department.

The Design–Build shall permit over-the-shoulder reviews by the Department during the course of the development of each design package, prior to issuance of Released for Construction Documents. The over-the-shoulder reviews are not critical activity points that restrict the progress of design. They are simply reviews of the design as it progresses and opportunities for the Department to provide comments and feedback on the design. The Quality Manager shall define the Plan, and format of the over-the-shoulder reviews as mutually agreed.

Example 2

California Department of Transportation *Design–Build Demonstration Program Quality Manual* Outline

Caltrans also provides the following definition and description of over-the-shoulder reviews within their *Design–Build Demonstration Program Quality Manual* outline, as follows.

Over-the-Shoulder (OTS) Reviews	Informal meetings between the Design–Builder and Department Design staff during the development of a Design package intended to generate discussion and provide conceptual-level feedback. No minutes of these meetings are kept, and any Design–Builder actions based on these meetings are at the Design–Builder's own risk. However, the effort put forth by the Design–Builder towards these OTS reviews should help streamline Department Design reviews.

7A.3.8.1 Over-the-Shoulder Reviews

Over-the-shoulder reviews are generally cursory reviews and are intended to minimize disruption to ongoing design work while providing timely comments and feedback on the design.

Over-the-shoulder reviews by Department representatives (and other approved project stakeholders, as appropriate) will occur through attendance at the Task Force meetings, through attendance at the Comment Resolution meetings that occur at the conclusion of formal reviews, and through routine day-to-day interaction. Feedback from the reviews is documented in the meeting minutes, as appropriate.

References

California Department of Transportation. *Design–Build Demonstration Program Quality Manual* Outline. July 2013. http://www.dot.ca.gov/design/idd/db/sac50-5/rfp/03-2F21U4-Exhibit-2A-Quality-Manual-Template.pdf. Accessed February 12, 2017.

Gransberg, D. D., J. Datin, and K. R. Molenaar. *NCHRP Synthesis 376: Quality Assurance in Design–Build Projects*. Transportation Research Board of the National Academies, Washington, D.C., 2008. https://dx.doi.org/10.17226/23222.

19 Scope Validation Period

This tool is a predetermined period when the contractor can review all existing contract documents to identify any defects, errors, or inconsistencies.

What Is It?

A scope validation period is an allotted amount of time for the contractor to thoroughly review all contract documents to identify anything that will affect their ability to design and construct the proposed design concept within the contract price and contract time. This review should take place after contract award and can include defects, errors, or inconsistencies within the RFP documents. If any project scope issues are identified, the contractor must present and explain the issues to the agency. Project scope issues do not include items that the contractor should have reasonably discovered prior to contract award.

Why Use It?

The scope validation period allows the contractor to clearly identify any project scope issues that could result in disputes later on. Identifying these potential issues during the early phases of the project minimizes the time and costs required to reach a resolution for both the contractor and the agency (Table A.21). This process also facilitates communication and builds trust.

The scope validation period encourages the contractor to conduct an in-depth review of the contract documents and to even perform activities such as a site survey in the early stages of the project. A similar process should have been conducted prior to award of the contract. However, this designated period after the contract is awarded provides an additional cushion of time to identify defects, errors, or inconsistencies. This can prevent a misunderstanding of project scope. Differentiating this time period from the bidding phase can expedite the procurement process.

The potential benefits include the enhancement of fast-tracking, improvement of team alignment, earlier knowledge of potential cost issues, and enhanced risk allocation.

Scope validation addresses the Alignment Strategy and the Scope Strategy. The Scope Strategy includes a clear understanding of responsibilities, and the alignment builds toward productive relationships as team members fulfill their responsibilities.

Table A.21. Recommended uses for scope validation period.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
19 Scope Validation Period	✓	✓			●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

When to Use It?

The scope validation period takes place after the contract has been awarded, typically lasting 90 to 120 days. Completing the scope validation period prior to the kickoff meeting allows the contractor and agency to discuss any project scope issues at that time.

How to Use It?

During the creation of the RFP, the agency must determine the specifications of the scope validation period. The RFP must clearly explain the intention of the scope validation period, when it begins, when it ends, and what the contractor must produce if project scope issues are identified. After award, the contractor must understand their responsibilities during the scope validation period to ensure that this time is used effectively and efficiently.

Synthesis of Examples

Scope validation periods are a milestone or gated process that provides a verification of the scope. These can range from page-turn meetings on smaller, noncomplex projects to formal processes that are contractually described in the documents. The example that follows is quite rigorous, but agencies can create less-complex processes for simpler projects.

Example

Virginia Department of Transportation Alternative Project Delivery Division *Design–Build Standard Template Documents*

Virginia DOT provides standard guidance on scope validation in their D-B documents, as follows.

2.2 Scope Validation and Identification of Scope Issues

2.2.1 Scope Validation Period. The term **"Scope Validation Period"** is the period of time that begins on Design–Builder's receipt of Department's Notice to Proceed and extends for one hundred twenty (120) days from such date of receipt, unless otherwise stated in Exhibit 1. During the Scope Validation Period, Design–Builder shall thoroughly review and compare all of the then-existing Contract Documents, including without limitation the RFP Documents and the Proposal, to verify and validate Design–Builder's proposed design concept and identify any defects, errors, or inconsistencies in the RFP Documents that affect Design–Builder's ability to complete its proposed design concept within the Contract Price and/or Contract Time(s) (collectively referred to as **"Scope Issues"**). The term "Scope Issue" shall not be deemed to include items that Design–Builder should have reasonably discovered prior to the Agreement Date.

2.2.2 Scope Validation Period for Non-Accessible Areas of the Site. The Parties recognize that Design–Builder may be unable to conduct the additional investigations contemplated by Section 4.2.2 below because it will not have access to certain areas of the Site within the Scope Validation Period set forth in Section 2.2.1 above. Design–Builder shall notify Department at the meeting set forth in Section 2.1.2 of all such non-accessible areas and the dates upon which such areas are expected to become accessible. If Department agrees that such areas are non-accessible, then, for the limited purpose of determining Scope Issues that directly arise from geotechnical evaluations for such areas, the term "**Scope Validation Period**" shall be deemed to be the thirty (30) day period after the date the specified area becomes

(continued on next page)

accessible for purposes of conducting the geotechnical evaluation. If Department does not agree that such areas are non-accessible, then the Scope Validation Period shall not be extended.

2.2.3 Submission Requirements for Scope Issues. If Design–Builder intends to seek relief for a Scope Issue, it shall promptly, but in no event later than the expiration of the Scope Validation Period, simultaneously provide Department and the Alternative Project Delivery Division (APDD) Point of Contact in writing with a notice ("General Notice") of the existence of such Scope Issue, which General Notice shall generally explain the basis for such Scope Issue. Within twenty-one (21) days of the General Notice, Design–Builder shall provide Department and the APDD Point of Contact with documentation that specifically explains its support for the Scope Issue ("Supporting Documentation"). The Supporting Documentation shall include, among other things: (a) the assumptions that Design–Builder made during the preparation of its proposal that form the basis for its allegation, along with documentation verifying that it made such assumptions in developing its proposal; (b) an explanation of the defect, error or inconsistency in the RFP Documents that Design–Builder could not have reasonably identified prior to the Agreement Date: and (c) the specific impact that the alleged Scope Issue has had on Design–Builder's price and time to perform the Work. For the avoidance of doubt: (1) Design–Builder shall not be entitled to raise in its Supporting Documentation any Scope Issues that were not previously addressed in a General Notice; and (2) Design-Builder shall have no right to seek any relief for any Scope Issues that have not been specifically identified in a General Notice provided to Department during the Scope Validation Period.

2.2.4 Resolution of Scope Issues. Within a reasonable time after Department's receipt of the Supporting Documentation described in the Section 2.2.3 above, the Parties shall meet and confer to discuss the resolution of such Scope Issues. If Department agrees that Design–Builder has identified a valid Scope Issue that materially impacts Design–Builder's price or time to perform the Work, a Work Order shall be issued in accordance with Article 9 hereof. If Department disagrees that Design–Builder has identified a valid Scope Issue that materially impacts Design–Builder's price or time to perform the Work, then Design–Builder's recourse shall be as set forth in Article 10. Notwithstanding anything to the contrary in the Contract Documents or as a matter of law, Design–Builder shall have the burden of proving that the alleged Scope Issue could not have been reasonably identified prior to the Agreement Date and that such Scope Issue materially impacts its price or time to perform the Work.

2.2.5 Design-Builder's Assumption of Risk of Scope Issues. The Parties acknowledge that the purpose of the Scope Validation Period is to enable Design–Builder to identify those Scope Issues that could not reasonably be identified prior to the Agreement Date. By executing this Agreement, Design–Builder acknowledges that the Scope Validation Period is a reasonable time to enable Design–Builder to identify Scope Issues that will materially impact Design–Builder's price or time to perform the Work. After the expiration of the Scope Validation Period, with the sole exception of those Scope Issues made the subject of a General Notice during the Scope Validation Period and subject to valid requests for Work Orders in accordance with Section 2.2.3 above, the Parties agree as follows:

1. Design–Builder shall assume and accept all risks, costs, and responsibilities of any Scope Issue arising from or relating to the Contract Documents, including but not limited to conflicts within or between the RFP Documents and Proposal;
2. Design–Builder shall be deemed to have expressly warranted that the Contract Documents existing as of the end of the Scope Validation Period are sufficient to enable Design–Builder to complete the design and construction of the Project without any increase in the Contract Price or extension to the Contract Time(s); and
3. Department expressly disclaims any responsibility for, and Design–Builder expressly waives its right to seek any increase in the Contract Price or extension to the Contract Time(s) for, any Scope Issue associated with any of the Contract Documents, including but not limited to the RFP Documents.

2.2.6 Waiver of Rights. The failure of Design–Builder to meet the submission requirements required under Section 2.2.3 above for a Scope Issue, including but not limited to the times for providing notice and documentation of the Scope Issue, shall conclusively constitute a waiver of Design–Builder's rights to seek relief for such Scope Issue.

2.2.7 Failure of Technical Proposal to Meet Requirements of the Contract Documents. Notwithstanding anything to the contrary in this Section 2.2 or elsewhere in the Contract Documents, Department shall have no responsibility in the event Design–Builder's Proposal fails to meet the requirements of the Contract Documents, regardless of whether: (a) Department modified the RFP Documents to permit Design–Builder to implement a technical approach; (b) Department accepted Design–Builder's Proposal; or (c) any other action or inaction of Department is alleged by Design–Builder.

References

Virginia Department of Transportation. *Design–Build Standard Template Documents*, November 2016. http://www.virginiadot.org/business/resources/APD_Docs/APD_Office_Page/2016_VDOT_Design-Build_Standard_Template_Documents_Parts_3,_4_5.pdf. Accessed February 7, 2018.

20 Public Announcements

Public Announcements—such as through an agency newsletter—explain to the public what a D-B is and the benefits it offers a specific project.

What Is It?

This tool is distributed to individuals or to groups interested in the project and/or posted on a project website. Project newsletters have traditionally been used to share information on progress updates, traffic switches, road closures, and the opening of new facilities. However, this tool focuses on the use of a project newsletter to inform the public of what a D-B is and the benefits it is bringing to a project. Examples of project benefits include improvements to cost, schedule, quality, safety, and access.

Why Use It?

The agency implements this tool to inform the community about project progress and how the delivery method is yielding positive results. The project newsletter provides general information to the public, answers typical questions, and explains the benefits of using D-B. This communication builds understanding, trust, and community support for the project.

Potential benefits from public support include avoiding delays and employing agency control of how information is presented to the public.

Public announcements address the Alignment Strategy by helping to communicate with the public about project goals and by establishing positive relationships.

When to Use It?

Project newsletters can be used at any time during the project. They can be especially helpful in highlighting significant project delivery benefits. When a project is completed and open to the public, a newsletter can be sent to thank the public for their patience during construction and to reiterate the benefits of D-B. Public announcements are not needed on every D-B project or at every phase. They should only be used when there is a specific reason to make a public announcement. In general, the public is interested in how a project benefits a community and the cost and schedule. However, care should be taken not to confuse the public with details of D-B delivery or to debate with opponents of D-B delivery. Regarding the use of public announcements, one experienced contractor said, "Do it very selectively when there is a specific reason and a very specific proactive outcome desired from the announcement so as not to open up debate that's not value added or risk the project or certain innovations."

This tool is recommended for projects of medium to large size and from moderately complex to complex (Table A.22). Smaller projects may also benefit if there is some special impact the public will experience due to the D-B contracting method.

How to Use It?

Share project newsletters with the public and the media. They can be distributed via email, in paper form at public meetings, and on the project website.

Synthesis of Examples

Public announcements related to D-B can take the form of special articles and sections developed for newsletter, blogs, and various forms of electronic communications (e.g., social media).

Table A.22. Recommended uses for public announcements.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	**Design**	**Construction**	**Closeout**	Noncomplex	**Moderately Complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
20 Public Announcements		✓	✓	✓	○	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

The public announcements related to D-B are usually integrated into other project-related public announcements. It is important for the announcement to explain how D-B differs from other types of project delivery methods, especially the traditional approach of design–bid–build. Content of the D-B–specific public announcements include, but are not limited to

- Explanation of D-B,
- Benefits of using D-B,
- Justification for using D-B on the project, and
- Identification of the D-B contractor.

Example 1

Arizona Department of Transportation Blog

Arizona DOT has used blogs to communicate information to constituents about D-B. The department used the following sample blog to introduce the basic concepts of D-B.

[Arizona DOT] Blog, Thursday, July 11, 2011

Design–Build Projects Satisfy the Need for Speed (and Save Money, too)

In less than a year, spectacular ramps and bridges have risen from bare ground in the Southeast Valley. By this fall, they'll link 12 miles of new high-occupancy vehicle lanes on the Loop 202 (Santan Freeway) with Interstate 10 and the Loop 101 (Price Freeway) in Chandler—see the project's progress in the slide show above.

On the other side of the Valley, crews are adding new HOV lanes—and improving three bridges—on the Loop 101 (Agua Fria Freeway) from I-10 near Avondale to I-17 in north Phoenix. In just six months, they have built and paved 18 miles of the 30-mile project and are eyeing completion by this fall.

Both of these projects are utilizing the "design–build" (D-B) method of delivery—and proving that D-B can yield big results in a relatively small amount of time. That's why D-B is one of the "alternative delivery methods" that [Arizona DOT] uses for freeway projects when doing so makes sense.

> The D-B concept involves pairing a design team with a construction team to create one, synergistic entity that delivers a freeway project from beginning to end. This differs from the more traditional

"design–bid–build concept," where one firm designs a project that is then put out to bid and awarded to a construction company to build.

Contractors that bid on [Arizona DOT's] D-B projects must not only meet quality standards, but also demonstrate their capability to complete the project on time and on budget at a much faster and dynamic pace. (Editor's note: This is a key point to emphasize. The D-B team must have the capability to meet quality, schedule, and cost goals).

Because D-B projects are schedule-driven, they can make driving through the work zone a bit more challenging. The faster pace means doing more—and more complicated—work in a shorter amount of time. For motorists, it can mean numerous restrictions or detours while the project is under way.

The flip side? The same restrictions or detours occur but are spread out over a longer period of time for a project that takes longer to complete and probably costs more.

The D-B method can save time and money by overlapping the design and construction phases. Other benefits include improved design efficiency through ongoing constructability reviews and better management of the project schedule. Because the design firm and construction company typically form a joint venture to deliver the freeway project, [Arizona DOT] also benefits from having a single point for contractual responsibility if challenges arise.

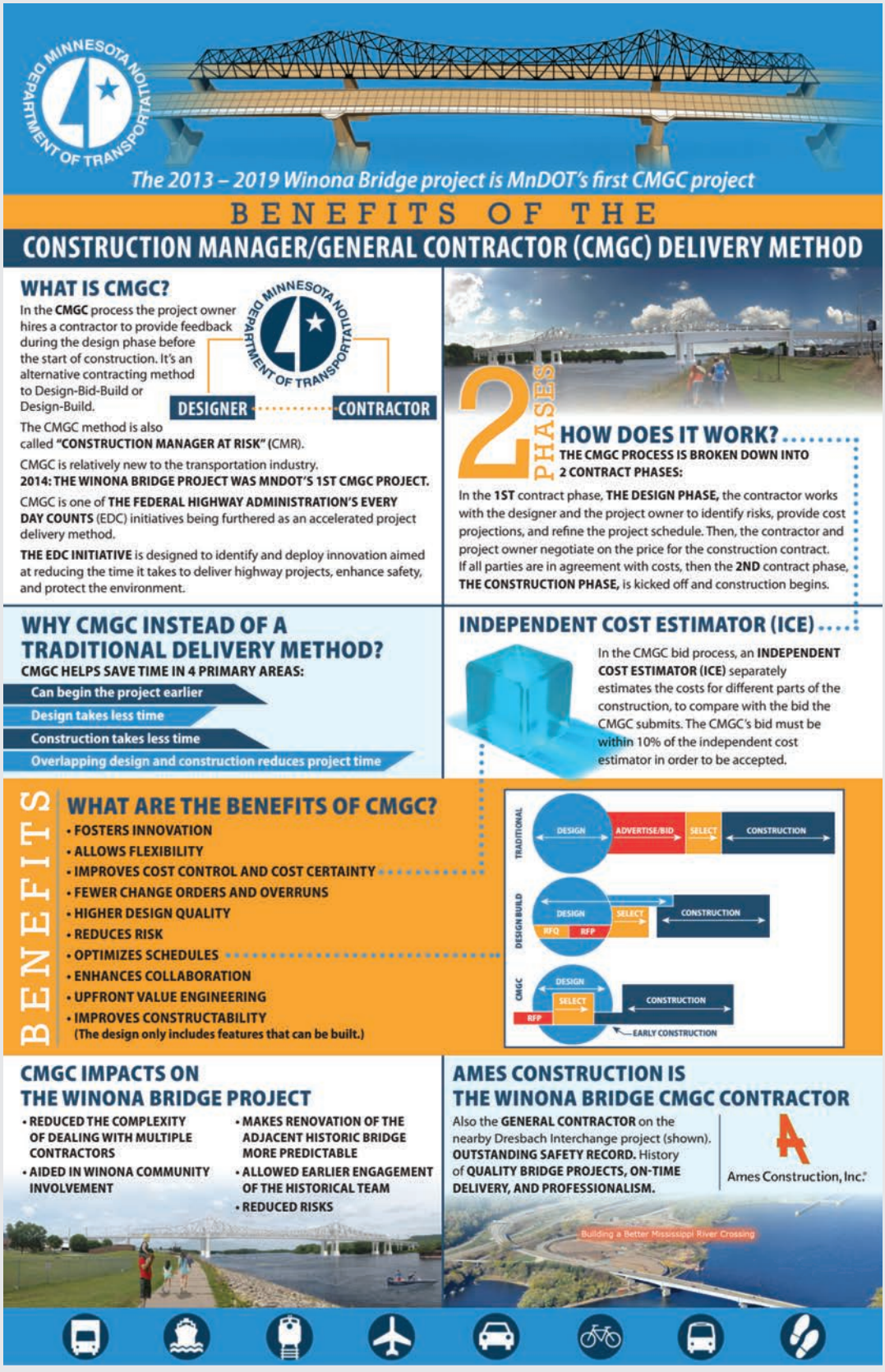
With so many benefits, why doesn't [Arizona DOT] use D-B for all of its projects? Simply put, not all freeway projects are good candidates. The best project candidates do not require significant right-of-way acquisition or extensive, complicated relocation of existing utilities. In addition, [Arizona DOT] believes that D-B is most advantageous when transportation improvements are immediately needed to improve safety and reduce high traffic volume or chronic congestion.

So the next time you're maneuvering through a sea of orange cones on the Loop 101 in Peoria or find yourself on a detour route because the Loop 202 is closed in Chandler, remember that [Arizona DOT] is working to make your everyday commute safer and more efficient—and saving time and taxpayer dollars at the same time!

Example 2

Winona Bridge Project, Minnesota Department of Transportation

Although this project is a CM-GC, it provides a useful example of how an agency can communicate with the public in words and images about a project delivered through an alternative contracting method. Minnesota DOT distributed project newsletters on the Winona Bridge Project that highlight the benefits of CM-GC. The newsletters provided a brief definition of CM-GC and the general benefits of using the method, followed by a description of how specific benefits manifested themselves.



References

Arizona Department of Transportation. Design–Build Projects Satisfy the Need for Speed (and Save Money, Too). July 11, 2011. https://uat.azdot.gov/media/blog/posts/2011/07/07/design-build-projects-satisfy-the-need-for-speed-(and-save-money-too). Accessed September 23, 2017.

Minnesota Department of Transportation. *Benefits of the Construction Manager/General Contractor (CM-GC) Delivery Method.* n.d. www.dot.state.mn.us/winonabridge/docs/benefits-of-cmgc.pdf. Accessed July 30, 2017.

Minnesota Department of Transportation. *Case Study Work Package #1: Early Piling Procurement*. n.d. www.dot.state.mn.us/winonabridge/docs/package1.pdf. Accessed July 30, 2017.

21 Delegation of Authority

This agency action empowers the agency engineer in charge of a project to make project decisions that often have an impact on the project budget.

What Is It?

The agency delegates authority—with specific limits—in writing to the agency engineer managing the project. This enables some project decisions to be made quickly by personnel with specific project knowledge, even when these decisions may increase the project budget.

Why Use It?

The authority to execute agreements and increase the budget up to a designated amount is placed in the hands of the agency engineer in charge of the project. By delegating authority, the project team has confidence that project decisions will be made in a timely fashion so that schedule commitments can be met. Decisions made by those familiar with a project can avoid unintended consequences, which sometimes arise when decisions are made by those not involved in a project day to day.

Potential benefits include schedule acceleration, the ability to fast-track, and owner control of design.

Delegation of authority addresses the Scope Strategy and the Design Quality Strategy (Table A.29). Clarity in responsibilities is part of the Scope Strategy, and delegation of authority clarifies that the responsibility of making timely decisions belongs to the agency engineer. Knowing that agency engineers have this responsibility encourages the D-B team to raise questions because team members know that they are speaking with the decision makers.

When to Use It?

A memo delegating authority and specifying authority limits should be written at the end of the procurement process. The authority granted is in effect from design through closeout. This tool is recommended for projects of all sizes and complexities (Table A.23).

How to Use It?

Often an agency selects an alternative delivery method because it wants the project to have an accelerated schedule. To keep the project team advancing the project, decisions must be

Table A.23. Recommended uses for delegation of authority.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
21 Delegation of Authority		✓	✓	✓	●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

made quickly. Agencies often have an extended process for approving agreements and allocating additional funds. Delegation of authority to the agency engineer managing the project creates a streamlined process.

Synthesis of Examples

The delegation of authority should occur before it is needed, typically at the time of NTP. Extent and limitations of the authority should be clearly stated. The person given authority should be supported by upper management to use that authority. Some agencies associate the delegation of authority with their change order process, but it should be thought of as a broader authority that can address design exceptions and other agreements.

Example

Saint Louis District Safety Project, Missouri Department of Transportation (Missouri DOT)

This design–build project included 31 improvements across two counties. To help the Missouri DOT remain nimble in responding to project team requests, the Missouri Highway and Transportation Commission delegated authority to the Missouri DOT project director to execute agreements that were beneficial to the project. This action gave the D-B team confidence that project issues would be handled expeditiously by a knowledgeable Missouri DOT staff member. The contents of the memo delegating authority follows.

> **SUBJECT:** Delegation of Authority to [name], Project Director for the [Saint] Louis District Safety Improvements Design–Build Project in Franklin and [Saint] Charles Counties.
>
> The Missouri Highways and Transportation Commission at its August 2013 meeting delegated to the Chief Engineer position or his designee to approve and execute documents and expend funds on their behalf for the following items, except that nay change resulting in the expenditure of 2 percent over the project costs will be presented to the Commission.
>
> - **Escrow of Bid Documents**—Approve authority to execute agreements, affidavits, and related documents and expend funds for costs associated with the escrow of bid documents on the project.
> - **Agreements**—Approve authority to execute agreements with local governments, including other entities for cost–share, enhancements, use of property, environmental mitigations, utilities, [and so on] on the project, subject to approval as to form by Chief Counsel's Office and Commission Secretary attestation.
> - **Railroad Agreements**—Approve authority to execute agreements pertaining to railroads, subject to approval as to form by Chief Counsel's Office and Commission Secretary attestation.
> - **Construction Change Orders**—Approve authority to approve construction change orders on the project.
> - **Consulting Engineering Services**—Approve authority to execute contracts for engineering services needed subject to approval as to form by Chief Counsel's Office and Commission Secretary attestation.
> - **Other**—Approve authority to expend funds for the project, as well as approve, execute, sign, and seal project-specific documents.
> - **Design Exceptions—**Approve authority to sign design exceptions specific to the design of the project currently delegated to the State Design Engineer and the State Bridge Engineer, subject to consultation with the department's technical experts.

References

Utah Department of Transportation. Change Orders, UDOT 08B-10, Revised August 17, 2017. https://www.udot.utah.gov/main/uconowner.gf?n=10539014823834013. Accessed July 23, 2018.

22 Contractor-Controlled Quality Control Testing

This tool allows contractors to perform their own QC testing.

What Is It?

This tool removes restrictions placed on contractors that force them to retain an independent third party to perform their QC testing and inspection.

Why Use It?

Allowing contractors to perform QC functions using their own personnel simplifies scheduling, reduces costs, and may maintain equivalent levels of quality when compared to requiring a third party to perform the same functions. This is done by removing contract clauses that demand the use of independent laboratories or independent inspectors and by inserting clauses that present contractors with the option to use their own personnel, provided certain conditions are met.

Allowing contractors to use their own directly employed personnel for QC testing and inspection reflects the direction that the industry is evolving: The more mature contractors are embracing QM as a key differentiator and are integrating QM into their core performance goals. This allows D-B contractors to be more cost effective, giving them a competitive advantage. Ultimately, the agency benefits from a lower price. Larger projects may be able to support a contractor-provided project-specific laboratory. However, smaller or more remote projects may benefit from using a local laboratory rather than to incur the cost of mobilizing a dedicated laboratory. Before a contractor can determine which approach is most viable, the agency must make the critical decision of whether the QC personnel are fully dedicated to QM, or if they have multiple job roles on the project. A variant of this model is for an agency to accept contractor sampling that is still sent to an independent laboratory for testing.

Potential benefits include cost savings and schedule savings. Cost savings can be realized by eliminating the overhead and profit costs of independent laboratories, and cost savings and schedule savings can be gained when the contractor does not have to wait for another party to perform testing.

Contractor-controlled QC testing addresses the Construction Quality Strategy and the Construction Efficiency Strategy. Many construction projects have aggressive schedules; thus, having a QC person on site when that individual is needed is important to ensure quality during construction, as well as to assure the efficiency of the construction process.

When to Use It?

In fairness to all bidders, the agency should specify whatever options it will allow in the RFP. Many agencies expressed hesitation in using this tool because they felt that it opened the opportunity for quality to be compromised. With this tool, agencies can thoughtfully develop QM programs with processes and checks on quality to assure that agency quality standards are being met.

This tool can be used with projects of all sizes and complexities (Table A.24).

How to Use It?

Contract clauses or standard specifications that require a contractor to retain a third-party independent laboratory to perform QC inspection and testing should be removed. A new clause

Table A.24. Recommended uses for contractor-controlled quality control testing.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	**Construction**	Closeout	**Noncomplex**	**Moderately Complex**	**Complex**	**≤ $10 million**	**$10 million–$50million**	**> $50 million**
22 Contractor-Controlled QC Testing			✓		●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

must be added that establishes acceptable certification bodies or levels that inspectors and technicians directly employed by the contractor need to have.

Synthesis of Examples

For this tool to be successful, the agency should retain remedies to enforce contract provisions that the contractor uses only appropriately certified staff, keeps detailed records, and maintains open and frequent communication with the agency with regard to quality matters.

Example

Portland Transit Mall Revitalization, Tri-County Metropolitan Transportation District of Oregon (TriMet)

TriMet typically requires that contractors hire an outside, independently certified laboratory to perform QC testing. However, TriMet allowed the contractor to use directly employed inspectors and technicians to do the QC testing on the South Corridor Light Rail Extension Project. TriMet's willingness to do this was based on both parties in the contracting joint venture having reputations for quality and integrity and on TriMet's requirement that all inspectors and technicians be nationally certified to perform the needed inspections and testing. Without sacrificing quality, this decision saved the project money and streamlined the scheduling process by removing the inherent scheduling complications that occur when dealing with an independent firm.

References

FHWA. *Contractor Quality Control Plans, Contractor Guidelines, and Example Quality Control Plan*, Washington, D.C., 1998. https://flh.fhwa.dot.gov/resources/construction/documents/contractor-qc-plans.pdf. Accessed February 18, 2018.

Molenaar, K. R., D. D. Gransberg, and D. N. Sillars. *NCHRP Report 808: Guidebook on Alternative Quality Management Systems for Highway Construction*, Transportation Research Board of the National Academies, Washington, D.C., 2015.

California Department of Transportation. *Quality Control Manual for Hot Mix Asphalt for the Quality Control Quality Assurance Process*, 2009. http://www.dot.ca.gov/hq/construc/publications/qcqaman1.pdf. Accessed February 18, 2018.

23 Contractor Involvement in Establishing Quality Control Standards

This tool allows for changes to QC standards for construction that may result in more efficient QM programs.

What Is It?

This tool recognizes the unique nature of every construction project and the value that contractors can add to QM processes by streamlining sampling frequencies and requirements where appropriate.

Why Use It?

This tool is designed to customize and/or streamline QC on projects, where appropriate, without sacrificing overall quality and while still meeting the goals of the project. This tool allows the agency to judiciously consider alterations to its traditional specifications and testing requirements for construction. An agency may typically apply traditional standards to every project, but adopting the approach of this tool would mean an agency is willing to consider accepting some project-specific quality specifications instead of traditional standards when opportunities arise and the contractor clearly presents reasons to do so.

Potential benefits include cost savings and schedule acceleration when a more efficient and less-costly process for achieving quality construction on a project is agreed upon.

Contractor involvement in establishing quality control standards addresses the Construction Quality Strategy and the Construction Efficiency Strategy. Quality is maintained because appropriate quality standards are kept in place. Construction efficiency is maintained because unnecessary quality requirements are eliminated.

When to Use It?

Contractor-proposed alternatives to quality standards/specifications can be used on projects with prescriptive-based—not performance-based—quality specifications and is particularly useful in dealing with innovative or uncommon situations. The flexibility afforded by this tool is useful in instances where materials are used in a nontraditional manner.

This tool is recommended for medium to large projects that are moderately complex to complex (Table A.25). It can be considered for small, noncomplex projects if the work differs from standard construction.

How to Use It?

This tool is useful in either a formal or an informal manner. Used formally, this tool will involve the addition of contract language that allow the use of contractor-proposed alternatives to quality specifications, only if sufficient justification is provided and documented. In order to use this tool informally, the agency and the contractor must establish a close working relationship in which both parties operate in good faith. It must also be recognized that the decision to approve or deny a project-specific specification ultimately resides with the agency. The agency should have agency discipline experts participate in the review of any deviations from QC standards. The agency project manager must be able to articulate to other agency personnel the benefit of the proposed changes and create an inclusive environment where discipline experts are actively engaged in the review process.

Table A.25. Recommended uses for contractor involvement in establishing quality control standards.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	**Construction**	Closeout	Noncomplex	**Moderately Complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
23 Contractor Involvement in Establishing QC Standards			✓		◗	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

Synthesis of Examples

QC standards should be in alignment with the intended function of the constructed facility. In the park path project that follows, the agency allowed modified quality standards for an asphalt bike path. In another circumstance, the agency may have required the standard specification if heavy maintenance vehicles or utility company vehicles access the path to maintain facilities along the path.

Example

Willamette River Bridge Project, Oregon Department of Transportation (Oregon DOT)

Oregon DOT successfully used this tool on their Willamette River Bridge Project where I-5 crosses the Willamette River. A contractor and agency team customized quality standards and reduced the agency's QC costs based on several contractor-proposed alternatives to Oregon DOT's standard quality specifications.

In one case, hot-mixed asphaltic cement was to be used to pave the trails in the parks surrounding the project to meet the needs of the local park agencies. The typical Oregon DOT hot-mixed asphaltic cement specification required development and submittal of project-specific mix designs and optimum rolling procedures designed to provide the highest quality results on major paving jobs. In this case, those specifications would have added costs for very little return, as the demand on bike path pavement is so much less than the demand on interstate highway pavement, which the specifications were written for. The costs of the submittals and testing, when spread into the very small quantities needed for the bike paths, resulted in extremely high prices for the pavement. After the contractor made their case for the alteration, Oregon DOT was able to write a minor hot-mix asphalt specification that was more in line with what the local park agencies used on their bike path projects, meeting the needs of the project and its stakeholders at a reduced cost.

References

Molenaar, K. R., D. D. Gransberg, and D. N. Sillars. *NCHRP Report 808: Guidebook on Alternative Quality Management Systems for Highway Construction*, Transportation Research Board of the National Academies, Washington, D.C., 2015.

24 Incentive–Disincentive Program for Superior Quality

This tool is an incentive–disincentive program to encourage superior quality performance by the contractor. It can also be used for safety performance, cost, environmental compliance, disruption to the traveling public, or other areas that align with the agency's priorities.

What Is It?

With this tool, the agency can incentivize superior performance by the contractor in areas that are deemed critical by the agency. In practice, agencies using this tool provide incentives but not typically disincentives.

Why Use It?

Obtaining superior performance on high-priority construction tasks adds value to the project but does not require the agency to revise its performance criteria. Contractors can determine cost-effective means to achieve quality. Disincentives can motivate contractors to address agency concerns and noncompliance issues in a timely manner without implementing a dispute process.

An incentive–disincentive program should set clear goals for the contractor to achieve. When these goals are achieved, an incentive payment is issued to the contractor. This is a bonus for superior performance. Some incentive programs direct the incentive payment to the workers involved in the activities. Disincentives are not commonly applied as they are not seen as strong motivators.

The potential benefits include encouraging innovations that result in schedule acceleration and improved cost and schedule performance when rework is avoided.

Incentive–disincentive program for superior quality addresses the Construction Quality Strategy and the Construction Efficiency Strategy. Performance goals are clearly stated by the agency, so the contractor can determine efficient means and methods to achieve the performance goals.

When to Use It?

An incentive program for superior quality should be used in the construction phase (Table A.26). Incentives and disincentives should be used by the agency when the agency has clear goals about what aspects of a project would benefit from high performance. Disincentives may be deployed to penalize poor performance, delays in schedule, or delays in correcting substandard work. When a contractor performs work that meets or exceeds quality standards the first time, the agency saves money by not having staff dedicated to inspecting rework.

This tool is recommended for all size projects and for moderately complex to complex projects. It may be used with noncomplex projects if there is a particular aspect of the project that the agency wants to assure high performance or avoid rework.

How to Use It?

The criteria for incentives should be objective, definable, and quantifiable so that they serve as accurate indicators of achievement by the contractor. Incentive criteria can be established in

Table A.26. Recommended uses for incentive–disincentive program for superior quality.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	**Construction**	Closeout	Noncomplex	**Moderately Complex**	**Complex**	**≤ $10 million**	**$10 million–$50 million**	**> $50 million**
24 Incentive–Disincentive Program for Superior Quality			✓		◗	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

the contract or by agreement after the contract is signed. For example, Washington State DOT designated environmental compliance and pavement smoothness as key criteria on a project, with the contract clearly specifying the incentive–disincentive requirements and process. Alternatively, Arizona DOT inspection staff collaborated with the contractor's construction and QM staff on a specific project to develop detailed checklists on tasks that are candidates for nonconforming work. Checklist tasks are then weighted. Each checklist item is observed in the field and rated conforming, nonconforming, or not applicable (or cannot be inspected). The percentage of conforming items to the sum of conforming and nonconforming is calculated. Minimum standards are developed for safety, operability, durability, and appearance. Work that is removed scores no points. However, the rework may score points. Agency inspectors and the contractor work together to score the checklists. Incentive payments are reviewed and paid regularly, such as monthly or quarterly.

Synthesis of Examples

The incentives provided by Arizona DOT under this program are to incentivize the achievement of quality standards while avoiding rework. By reducing rework, Arizona DOT anticipates a reduction in its own inspection and overhead charges for the project. However, it is difficult to set a dollar amount on any given incentive. For an incentive to be meaningful, it may need to be larger than the potential agency savings from inspecting rework.

It is important that any incentives that are set be objective, definable, quantifiable, and measure the actual achievements of the contractor. It can also help to assess and pay incentives in increments to encourage high performance throughout an activity. Additionally, in both the Arizona DOT and Washington State DOT examples, the responsibilities of project team members involved in the incentive program are clearly defined, and the steps for evaluating and awarding incentives are clearly described. This clarity is essential for the project team to achieve quality goals and avoid disputes.

Some agencies determine that meeting performance standards—such as quality—is part of the contract and no additional incentives should be offered. An agency should have a strong rationale for offering any incentives and undertaking the administration of a quality incentive program.

Example 1

US 60 (Grand Avenue) and Bell Road Interchange Project, Arizona Department of Transportation

The agency included the incentive program for superior quality in the RFP of this D-B project. Checklists were developed collaboratively, regular inspections of checklist items were conducted, and progress payments were made monthly. When incentive payments were made, the additional money went to the contractor's staff who worked directly on these items.

Operating a Superior Quality Workmanship Plan

Quality Management Program		
	Construction Quality Management Plan	
Design Quality Management Plan	Materials Quality Management Plan Sampling & Testing	**Superior Quality Workmanship Plan & Incentives**

The Department is offering an incentive to encourage the Design–Builder to operate a Quality Management Program that promotes superior workmanship. The desired goal is to accomplish work that is in conformance with project requirements on the initial effort. To accomplish this goal, checklists will be used for all Work elements. The incentive progress payment will be based on the Design–Builder's ability to meet project construction requirements as measured by the checklists and iterations as required, while minimizing [re]work and [re]inspection activities.

This provision is to provide incentive for the Design–Builder to develop, staff, and operate an internal workmanship quality inspection process. The total monthly payment for incentive is a direct measure of the quality of Work and effectiveness of the Design–Builder's inspection program.

The format of the program is as follows:

1. Items of Work selected for checklists will be based on the Department's inspection personnel identification of potentially Nonconforming Work for more detailed inspection (judgment sampling).
2. The Design–Builder's construction and [QM] personnel shall form a team with the Department's inspection personnel to create or revise checklists that detail requirements for the various items of Work that will be inspected. Work for which a checklist is required shall not begin until the checklist has been agreed upon. Items of Work may have more than a single checklist, dependent upon the characteristics of the work. The checklists shall be weighted for the various categories of work as determined by the Department in consultation with the Design–Builder team.
3. Checklists are included on the [compact disc] containing project information provided with this RFP Package. Checklists are intended to be living documents subject to changes, additions, and enhancements based on mutual agreement between the Design–Builder and the Department. Each line or observation of a characteristic on the checklist is either yes (conforming), no (not conforming), or NA (not applicable or can't be inspected). The percent conforming for each checklist is calculated by adding the number of yes answers, dividing by the number of yes answers plus the number of no answers, and multiplying by 100.

   Percent Conforming = {(# of yes) / (# of yes + # of no)} × 100

4. Each checklist will be categorized as shown in the following table relating to a) safety, b) operability, or c) durability and appearance.

5. To receive maximum credit, the work inspected must meet the following minimum standards on the first inspection: a) Safety—97.5 percent, b) Operability—95 percent, and c) Durability and Appearance—90 percent. The Design–Builder will be given one point for each work item on the checklist for which it has met these goals*. A Work Item that is removed and replaced will receive a rating of zero points on the initial checklist that will be included in the pay incentive calculation. The replaced Work Item will be treated as new work with a new checklist and will have the potential to earn a full point on its initial inspection.
6. A member of the Department's inspection personnel and a member of the Design–Builder's conformance inspection staff will be responsible for filling out checklists. The completed checklist will be reviewed and signed by the appropriate construction representative (e.g., foreman, lead tradesperson, or superintendent). The Department will keep all completed checklists and calculate the monthly incentive payment. All checklist conformance calculations will be performed immediately upon checklist completion. If rework for any checklist is not performed, the reason should be stated in the space provided on the checklist for comments.

Checklist Performance Goals Versus Checklist Categories

Checklist Performance Goals	Workmanship Inspection Checklist Categories	
	Measurement by Examination	Dimensional Measurement
a) Safety: Goal = 97.5 percent conformance	Traffic control Job-site safety Concrete barrier Guardrail Crash attenuators Signs Traffic signals (Others as required)	(Developed as required)
b) Operability: Goal = 95.0 percent conformance	Curbs, gutters, sidewalks, and driveways Drilled shafts and other deep foundations Portland cement concrete pavement Electrical underground materials Electrical hardware and wiring Reinforced concrete pipe (Others as required)	Reinforcing steel tolerances Reinforcing steel cover Concrete member dimensions (Others as required)
c) Durability and Appearance: Goal = 90.0 percent conformance	Aggregate base Concrete materials Concrete curing Bituminous tack coat Asphaltic concrete Concrete structures Landscaping National Pollutant Discharge Elimination System (NPDES) protection Grading Rubberized asphalt (Others as required)	(Developed as required)

* Reaching these checklist goals does not constitute acceptance of the work and does not terminate rework on nonconforming items. If field changes are subsequently approved by the engineer, the design–builder will not be eligible for the incentive. To reiterate, the goal of the Superior Quality Management Plan is to accomplish work in conformance with project requirements on the initial effort.

7. Each time that a checklist work item is reworked and reinspected, a checklist will again be used for measurement. Categories that have been improved to meet the previous goals on a second inspection will receive half a point. Items that are in conformance on subsequent inspections will receive a score of zero points.

Example 2

I-405, NE 6th Street to I-5 Widening and Express Toll Lanes Project, Washington State Department of Transportation

Washington State DOT uses incentives to promote superior performance in some aspects of construction. Incentives are earned when technical specifications or administrative program requirements are exceeded. The I-405 D-B project involves widening and adding express toll lanes. Incentives and disincentives were described in the RFP. The work involved is evaluated monthly, and incentives are paid quarterly.

INCENTIVES AND DISINCENTIVES

1. INCENTIVES

1.1 Purpose and Amount of Incentive Award

General. An incentive award program has been established to provide the Design–Builder the opportunity to earn awards commensurate with superior performance in certain components of the Project relating to construction. The program is designed to encourage and reward the Design–Builder for exceeding technical specification and administrative program requirements. An incentive award will be earned only by clear and constant superior performance that exceeds minimum technical and administrative requirements. It is [Washington State DOT's] desire that the Design–Builder perform in such a superior manner as to ultimately earn the maximum possible incentive award.

Total Incentive Award. The maximum incentive award pool under the Incentive–Disincentive Program is $1,020,000, as tabulated in Table 7. This amount will not be increased if Work is added to the Project but may be reduced if Work is deleted.

Periodic Award Earnings. With regard to incentive category designated as Periodic Incentive in Table 7 below, an incentive award may be earned by the Design–Builder in whole or in part, based upon [Washington State DOT's] monthly evaluations of the Design–Builder's performance. This program allows incremental portions of the incentive award to be earned and paid quarterly. The amount potentially available for each quarter for any given Periodic Incentive category will be determined by the [Washington State DOT] Engineer after receiving an approved cost-loaded schedule for the Project. For planning purposes, the first planned incentive period will be the first full quarter following the start of construction, with all further incentive periods running quarterly thereafter.

Project Incentive Award Earnings. With regards to the category designated as Project Incentive in Table 7 below, the designated incentive criteria will be evaluated by [Washington State DOT] pursuant to the Contract, and payment, if any, will be made upon the Project reaching Substantial Completion.

Incentive Criteria. The incentive criteria established herein are objective, definable, and quantifiable, and will measure the actual achievements of the Design–Builder. The various incentive criteria are predefined and weighted appropriately to encourage Design–Builder achievements in the Project elements that are the most critical to [Washington State DOT].

1.2 Determination and Payment of Periodic Incentive Award

General. The Periodic Incentive evaluation process shall have a two-tiered organization: the Award Determination Official (ADO) and the Performance Evaluation Team [PET]. Periodic Incentive evaluations will not begin until the actual start of physical construction.

Award Determination Official. [Washington State DOT] will designate the ADO. The ADO reviews the findings and recommendations of the Performance Evaluation Team and determines the amount of

earned award for each period of Project activities. No changes to the evaluation criteria or incentive award assignments can be made without the approval of the ADO.

Performance Evaluation Team. The [PET] will consist of [Washington State DOT] employees and representatives and stakeholders designated by the [Washington State DOT] Engineer. The Design–Builder staff or employees shall not be official members of any PET. The PET will prepare Monthly Evaluation reports for all periodic award program criteria. The Design–Builder's performance and activities will be observed and continuously evaluated. The PET will prepare Quarterly Incentive Award Performance Reports and provide the Design–Builder with a copy for comment and corrective actions, if any. The Design–Builder shall prepare a self-assessment regarding performance relative to the incentive award criteria and submit a written summary with each monthly invoice. The Design–Builder's self-assessment may be considered by [Washington State DOT] in deciding incentive payment amounts, but determination of actual periodic incentive payments rests in the sole discretion of the ADO.

1.3 Quarterly Incentive Award Performance Reports and Review Schedule

The Quarterly Incentive Award Performance Report, prepared by the PET, shall include a recommendation for the incentive award amount, the rationale supporting the evaluation and assessment of each incentive award criteria, and identification of areas of performance that need improvement. Within [7] Calendar Days of receiving the Quarterly Incentive Award Performance Report, the ADO will review the recommendations and other pertinent information and determine the amount of the earned periodic incentive award, if any. Within 10 Calendar Days after the ADO receives the recommendations from the PET, the Design–Builder will be notified in writing of the determination of incentive award earned for the quarter.

2. PROJECT MEASURES

Key Measures. All incentive award payments will be based on the key measures and maximum possible award shown in Table 7, Allocation of Incentive Award Among Key Measures.

TABLE 7
ALLOCATION OF INCENTIVE AWARD AMONG KEY MEASURES

Key Measure	Maximum Possible Award
Periodic Incentive	
Environmental Compliance	$600,000
Subtotal	$600,000
Project Incentive	
Pavement Smoothness	$420,000
Subtotal	$420,000
TOTAL	$1,020,000

2.1 Environmental Compliance

General. Adhering to the environmental commitments, relative to all phases of project development, will prevent environmental degradation, reduce work delays and cost increases, minimize negative publicity, and reduce the number of upset citizens/landowners. The portion of the incentive award allocated to Environmental Compliance is up to $600,000. This is the maximum amount that can be earned from all environmental compliance criteria combined. The amount is divided among the three environmental compliance criteria, as shown in Table 9.

TABLE 9

INCENTIVE AWARDS AND CRITERIA FOR ENVIRONMENTAL COMPLIANCE

	Criteria	Test Criteria	Maximum Possible Award
A.	Environmental Awareness		$100,000
B.	Environmental Inspections and Compliance Monitoring		$300,000
C.	Reacting to Non-Compliance Events		$200,000
	Total Maximum Award:		$600,000

(Table 9 is followed by a detailed description of Criteria A, B, and C, as well as procedures for changing evaluation criteria, payment, and appeals).

3. INCENTIVE/DISINCENTIVE FOR PAVEMENT SMOOTHNESS

The portion of the incentive award allocated to Pavement Smoothness is $420,000 and is the maximum that can be earned from all Pavement Smoothness program criteria. The project will utilize International Roughness Index (IRI) values to quantify pavement surface smoothness for determination of the incentive/disincentive award.

Section 5-04.3(13) of the Standard Specifications is deleted in its entirety and replaced with the following:

> The completed surface of all hot mix asphalt (HMA) wearing courses shall be of uniform texture, smooth, uniform as to crown and grade, and free from defects of all kinds.

The project shall utilize the value of [IRI] calculated by averaging the left and right wheel path IRI as the basis pay adjustment for the smoothness of the roadway surface. The entire length of each through lane, auxiliary lane, passing lane, overlaid or constructed shall be profiled from the beginning to the end of the project. Ramps, shoulders, tapers, and city streets will not be profiled and will not be subject to the IRI pay adjustments. The IRI rating for the new HMA wearing surfaces shall be evaluated, and payment shall be adjusted.

References

FHWA Minnesota Division and Minnesota Department of Transportation. Stewardship & Oversight Agreement. 2015. https://www.fhwa.dot.gov/mndiv/stewardship.cfm. Accessed August 20, 2017.

Washington State Department of Transportation. I-405/NE 6th Street to I-5 Widening and Express Toll Lane Project, Request for Proposal, July 25, 2011. http://www.wsdot.wa.gov/biz/contaa/ProjectContracts/DESIGNBUILDCONTRACTS/NE%206TH%20ST%20TO%20I-5/Default.htm. Accessed December 16, 2017.

25 Real-Time Electronic Quality Management Information

Real-time electronic management of QM information—and other project documents—provides an organized system to record and access information.

What Is It?

Electronic management of the QM process can look very different, depending on the needs of the project and agency. At a minimum, such a system should allow for uploading and organizing daily reports for review and submission to the necessary team members. Some systems incorporate recording devices for inspectors to use in the field, which can then automatically upload checklists and inspection results. Other systems provide statistical analysis and decision tools, integrated databases, and administrative tools for use at an enterprise- or agency-wide level. In addition, using a central location for all QC tests and a system to flag failed tests can be useful on large projects where noncomplying sections of work may not be fixed immediately.

Why Use It?

The benefits of an electronic data management system (EDMS) vary based on the scope of the system and the level that project participants utilize it. The primary benefit is organizing large volumes of information and providing a clear record of submission, receipt, and approval of everything from daily reports to QC tests performed by a third party. Additionally, it allows quick retrieval of not only the submitted information but also the project plans and specifications related to QC.

The use of software—and some hardware devices—to manage QM provides several advantages. First, it organizes project documents in a centralized location for later reference. This is vital on large transportation or infrastructure projects where large volumes of information and reports are generated daily or weekly. Second, it provides users with access to information that they are authorized to view and alter via the Internet or intranet. Third, it tracks noncompliance issues and ensures that all areas of concern are followed up and closed out. Finally, the use of an electronic QM information system is customizable to the specific needs of a project.

Potential benefits include cost savings and schedule acceleration, as information is available when needed and does not slow down the project.

Real-time electronic QM information addresses the Construction Quality Strategy and the Construction Efficiency Strategy. Quality standards are logged in and accessible. Quality tests are recorded and passes and fails quickly determined and communicated. Using one source for quality data enhances efficiency.

When to Use It?

The use of an electronic data management system becomes more valuable as project size increases. Projects spanning long time periods and large geographic distances can benefit from the organization and standardization provided by an EDMS. Smaller projects can also benefit and can be set up to contribute information to a large database of information. The database becomes a resource for the agency to use in future decisions.

This tool is recommended for all size and complexities of projects, assuming that the system is already in place and available to the agency to use (Table A.27).

Table A.27. Recommended uses for real-time electronic quality management information.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	**Construction**	Closeout	**Noncomplex**	**Moderately Complex**	**Complex**	**≤ $10 million**	**$10 million–$50 million**	**> $50 million**
25 Real-Time Electronic Quality Management Information			✓		●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

The implementation of some form of electronic QM information system will require varying levels of commitment from an agency's staff, depending on the types of information to be captured and the level of functionality required. A simple system would provide a central location for depositing and organizing electronic files with varying levels of access for different project team members and may only exist for the life of the project. More complex, enterprise-level systems require the buy-in of agency upper management in procuring the necessary equipment and software development services, field inspectors to use the systems to their full potential, contractors and designers to use the system, and the agency as a whole to input project information into a database and then to use that database of knowledge for future projects. The implementation success of the selected system will require continual user and system support to add, delete, train, and support users and to troubleshoot and customize features to meet the needs of the users. Deploying a system to the field in the form of handheld devices streamlines the inspection process and ensures that every item of work is checked so that any incomplete work can be flagged for review. The agency should also ensure that the documents produced will be compatible with its permanent final records-retention protocols.

Synthesis of Examples

Some agencies dive into a management system when implementing a large, complex project and then have it available for future projects of any size. Agency staff need to be trained on the benefits and use of the system. The system must be used consistently and per the proper procedures. Inspectors must be equipped with appropriate handheld devices to use the systems effectively.

Example 1

Northwest Corridor Project, Georgia Department of Transportation

Georgia DOT is constructing more than 29 miles of reversible toll lanes for this D-B project, at a cost of nearly $600 million. The immense size of this project makes it a good candidate for an electronic data management system. Georgia DOT used an off-the-shelf system called Assure-It to track all materials used on the job. Inspectors use tablets and laptop computers in the field to enter data. They also have access to testing standards and the current version of construction documents to facilitate materials verification.

Example 2

SH-130 Turnpike Project

Texas DOT used a particularly comprehensive EDMS on their SH-130 Turnpike Project, completed in 2008. The Electronic Laboratory Verification Information System (ELVIS) was a web-based EDMS developed to support the construction QA program. ELVIS supported the input of 43 different field and laboratory test results, as well as their correlation with the results of agency verification testing. ELVIS provided a wide range of data management, project management, and deficiency monitoring functions, as well as statistical analysis and enterprise-level management tools. The system was credited with large reductions in the number of nonconformance reports generated, with a significant reduction—18.7 percent to 4.6 percent—in the amount of uncorrected material deficiencies (Jie et al. 2006, Molenaar et al. 2015).

References

Jie, Y., C. Nan Fu, and G. W. Raba. Implementation of a Web-Based Electronic Data Management System for the Construction Material Quality Assurance Program of a Highway Mega-Project. Presented at 85th Annual Meeting of the Transportation Research Board, Washington, D.C., 2006.

Migliaccio, G. C., G. E. Gibson, and J. T. O'Connor. Procurement of Design–Build Services: Two-Phase Selection for Highway Projects. *Journal of Management in Engineering*, Vol. 25, No. 1, 2009, pp. 29–39.

Molenaar, K. R., D. Gransberg, and D. N. Sillars. *NCHRP Report 808: Guidebook on Alternative Quality Management Systems for Highway Construction*. Transportation Research Board of the National Academies, Washington, D.C., 2015. https://dx.doi.org/10.17226/22128.

26 Dual Construction Engineering Inspector Roles

This is the use of two separate construction engineering inspectors (CEI). One CEI role is hired by the constructing firm, and the agency provides the oversight construction engineering inspector (OCEI) role.

What Is It?

A CEI is a hired independent engineering consultant used to inspect, test, and verify the quality of a project. With the dual CEI–OCEI roles, there are two entities in charge of assessing and accepting quality. The CEI entity hired by the contractor is responsible for the QM (QC) of day-to-day operations. The agency-hired OCEI then conducts audits with statistical sampling verification testing (quality acceptance).

Why Use It?

The dual use of a CEI and an OCEI provides a checks and balance of QC and acceptance from the contractor and the agency side of a contract. It discourages a contractor from producing low-quality work, since the CEI and the separate OCEI provided by the agency monitor quality. Additionally, the CEI–OCEI roles essentially handle all of the QM system for the project, allowing the agency to focus resources on other important areas of the project.

Potential benefits include schedule acceleration, as constructed work will likely meet quality standards more often when the dual CEI–OCEI roles are on the job.

Dual construction engineering inspector roles address the Construction Quality Strategy and the Construction Efficiency Strategy. These dual roles help keep the contractor's focus on achieving quality so that quality is maintained and efficiency enhanced.

When to Use It?

Certain projects have attributes that make them candidates for the use of dual CEI–OCEI roles. When a project lacks specific contract quality incentives or financial goals, the contractor may not put as high of an emphasis on quality as the agency would like. In this situation, the implementation of the dual CEI–OCEI roles requires the contractor to utilize a CEI. Then, the CEI must communicate and interact with the agency's OCEI. This process helps ensure project quality is discussed, planned for, and meets agency requirements.

Both inspection entities need to be in place before construction starts so that construction quality is managed properly from the very beginning (Table A.28). Once the CEI–OCEI is in place, it is best that the CEI–OCEI work together on QM for the duration of the project construction.

How to Use It?

Early in developing a QM system, a decision should be made whether to use dual CEI–OCEI roles. Once the decision is made, the contractor selects a CEI, and the agency selects an OCEI to act as independent engineering consultants for construction quality. Although the CEI is paid by the contractor, ideally the CEI should act professionally and independently from the contractor.

Once each consultant is in place, partnering exercises should take place between the CEI and the OCEI to promote good communication and interactions during construction. After

Table A.28. Recommended uses for dual construction engineering inspector roles.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	**Construction**	Closeout	Noncomplex	Moderately Complex	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
26 Dual Construction Engineering Inspection Roles			✓		◗	◗	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

construction begins and for the duration of the project, the CEI performs the construction QC testing for the contractor and the OCEI performs quality acceptance for the agency.

Synthesis of Examples

Communication and collaboration between the dual roles will help the project proceed efficiently. As noted in the [Saint] Louis RFP that follows, the agency has the right to ask the contractor to uncover work for the OCEI to test it, with payment for the uncovering and re-covering assigned to the agency if all quality standards are met and to the contractor if not met. This should be considered a backup plan. With proper communication, the goal should be to test in a timely manner before work is covered.

Example 1

I-595 Express Corridor Improvements Project, Florida Department of Transportation

Florida DOT implemented dual CEI–OCEI roles for the I-595 Express Corridor Improvements Project. On this public–private partnership project, the role of the concessionaire CEI was to provide daily QC activities by adhering to the specifications and design provided in the contract. Then, to make sure that the concessionaire was performing work at the level of quality detailed in the contract, Florida DOT also hired a construction consultant to act as the OCEI. The OCEI audited the quality testing and inspections performed by the CEI to make sure that the concessionaire was adhering to the specifications and design provided in the contract (Molenaar et al. 2015).

Example 2

Saint Louis District Safety Project, Missouri Department of Transportation

For this D-B project, 31 safety projects were combined into one contract. This project used a modified form of the dual construction inspector roles. The D-B contract assigned responsibility for QC and QA to the D-B. In addition, Missouri DOT performs a second QA, or quality verification, by checking 10 percent of all items, as Missouri DOT would typically do for a D-B-B. The RFP contained the following information:

Book 1

5.5 Quality Management

The Contractor shall perform the [QM] necessary to comply with its obligations under the Contract Documents.

5.5.1 Oversight, Audit, Inspection, and Testing by the Commission and Others

All Materials and each part or detail of the Work shall also be subject to oversight, audit, and testing by the Commission and other Persons designated by the Commission. When any third party, including a Utility Owner, railroad company, unit of government, or political subdivision, is to accept or pay for a portion of the cost of the Work, its respective representatives have the right to oversee, audit, inspect, and Test the Work. Such oversight, audit, Inspection, and/or testing does not make such Person a party to the Contract nor will it change the rights of the parties hereto. The Contractor hereby consents to such oversight, Inspection, and testing by the Commission and other Persons. Upon request from the Commission, the Contractor shall furnish information to such Persons as are designated in such request and shall permit such Persons access to the Site and all parts of the Work.

5.5.2 Obligation to Uncover Finished Work

If requested by the Commission, the Contractor, at any time before Final Acceptance of the Work, shall remove or uncover such portions of the finished Work as may be directed. After examination, the Contractor shall restore said portions of the Work to the standards required by the Contract Documents. If the Work thus exposed or examined proves acceptable, the uncovering, the removing, recovering or making good the parts removed, and recovery of any delay to the Critical Path will be paid for in accordance with Section 13. If Work exposed or examined proves unacceptable, the uncovering, removing and recovering or making good the parts removed, and recovery of delay shall be at the Contractor's expense.

5.6 Effect of Oversight, Spot Checks, Audits, Tests, Acceptances, and Approvals

5.6.1 Oversight and Acceptance

The Contractor shall not be relieved of its obligation to perform the Work in accordance with the Contract Documents, or any of its other obligations under the Contract Documents, by oversight, spot checks, audits, reviews, Tests, inspections, acceptances, Approvals, or approvals by any Persons, or by any failure of any Person to take such action. The oversight, spot checks, audits, reviews, Tests, inspections, acceptances, Approvals, and approvals by any Person do not constitute Final Acceptance of the particular material or Work, or waiver of any legal or equitable right with respect thereto. The Commission may reject or require the Contractor to remedy any Nonconforming Work and/or identify additional Work [that] must be done to bring the Project into compliance with Contract requirements at any time prior to Final Acceptance, whether or not previous oversight, spot checks, audits, reviews, Tests, inspections, acceptances, or Approvals were conducted by any Person.

5.6.2 No Estoppel

The Commission shall not be precluded or estopped, by any measurement, estimate, or certificate made either before or after Final Acceptance and payment therefore, from showing that any such measurement, estimate or certificate is incorrectly made or untrue, or from showing the true amount and character of the Work performed and Materials furnished by the Contractor, or from showing that the Work or Materials do not conform in fact to the requirements of the Contract Documents. Notwithstanding any such measurement, estimate or certificate, or payment made in accordance therewith, the Commission shall not be precluded or estopped from recovering from the Contractor and its Surety(ies) such damages as the Commission may sustain by reason of the Contractor's failure to comply or to have complied with the terms of the Contract Documents.

Book 2

3.1.1.2 Quality Control

The Contractor shall provide Quality Control (QC) of the Work and material on the Project. All results shall be recorded and documented as part of the daily inspection report. The Contractor shall ensure that all personnel who perform sampling and/or testing are certified by the [Missouri DOT] Technician Certification Program or a certification program that has been approved by [Missouri DOT] for the sampling and testing they perform.

3.1.1.4 Quality Assurance

The Contractor shall provide Quality Assurance (QA) of the Work and material on the Project. QA inspection and testing results may not be used as a substitute for QC inspection and testing. When QA testing is required on an item, the QC/QA testing cannot be done by the same person or firm. QA staff shall be available for Hold Point inspections at the times planned in the Weekly Schedule. The Contractor may re-schedule inspections as needed, but a minimum 24-hour advance notification shall be given to QA and [Missouri DOT] staff so that any conflicts with respect to QA testing may be resolved.

3.4 [Missouri DOT] Quality Verification

[Missouri DOT's] quality verification will use an audit approach for assessing the Contractor's performance. This will entail checking on a random sampling basis to determine if the Work is in compliance with the Contract Document requirements. The results of auditing will be documented on standardized audit report forms and provided to the Contractor. Nonconforming Work will be tracked and communicated to the Contractor. The timing, frequency, and depth of auditing will be at [Missouri DOT's] discretion. [Missouri DOT] release points may be required for specific items or types of Work. [Missouri DOT] will complete owner verification acceptance testing at frequencies agreed upon by [Missouri DOT] and the Federal Highway Administration (FHWA). The Contractor shall provide safe access to the Work, its organization, and all Subcontractor and Supplier organizations to allow [Missouri DOT] and FHWA to carry out quality oversight Activities. This will include the allowing of samples for the purposes of testing, the provision of information and records, and interviews with personnel from the Contractor's organization and all Subcontractor and Supplier organizations. The Contractor shall not use the results of [Missouri DOT's] quality verification Activities as a substitute for its own quality Activities. The Contractor shall provide a daily means of communicating the production schedule to [Missouri DOT] in order to allow [Missouri DOT] to perform quality oversight activities. Representatives of agencies of the federal, State, and local government shall have the right to Inspect the Work to the same extent provided above for [Missouri DOT]. Independent Assurance Sampling (IAS) will be in addition to [Missouri DOT's] quality verification.

References

Missouri Department of Transportation. Safety Improvements Design–Build St. Charles and Franklin Counties, MO, Request for Proposals, January 20, 2017. Chesterfield, MO.

Molenaar, K. R., D. Gransberg, and D. N. Sillars. *NCHRP Report 808: Guidebook on Alternative Quality Management Systems for Highway Construction*. Transportation Research Board of the National Academies, Washington, D.C., 2015. https://dx.doi.org/10.17226/22128.

27 Witness and Hold Points

During construction there are certain stages—or points—when inspection, testing, and verification may need to take place. This work is done at critical points where specific aspects—such as checking technical quality requirements and safety requirements—have taken place so that the next activity or activities can proceed. These critical points during construction are called witness and hold points.

What Is It?

A hold point is linked to a specific construction activity. At the designated level of completion of the activity, a mandatory verification by the agency must occur before a process can proceed (Chung 1999). These are commonly assigned to critical construction features, such as work that cannot be easily inspected or corrected at a later stage because it will no longer be accessible (e.g., underground work). Agency verification may include final inspections or tests before further work is permitted.

A witness point is linked to the entire construction project; not a single construction activity. It is an identified point in the work process where the agency may review, witness, inspect, or undertake tests on any component, method, or process in the work being performed (Chung 1999). The presence of authorized agency personnel (i.e., the witness) is suggested during a witness point inspection or test. When a witness point arises, the contractor notifies the agency. The agency can choose to inspect or allow the succeeding activity to continue without inspection.

Why Use It?

Witness and hold points allow the agency to verify that the work is proceeding per plans and specifications before it is covered or enclosed (i.e., subsurface grading and prep for a paving project) and becomes inaccessible for inspection and testing.

Potential benefits include cost savings and improved schedule. This tool can save construction cost and schedule by preventing rework because errors can be detected and corrected early before additional work is placed over the inspected work.

Witness and hold points address the Construction Quality Strategy and Construction Efficiency Strategy. Agreed-upon points serve as quality check points that either verify that work can proceed or that rework is necessary before impacting future work.

When To Use It?

During construction, the contractor is required to implement a QM plan that includes a witness and hold point procedure. Then the agency and contractor agree to specific points where inspections and testing will occur during construction.

This tool is recommended for medium to large projects and moderately complex to complex projects (Table A.29). It can also be used with small, noncomplex projects if there are certain work items that would benefit from a quality check before succeeding work covers it up or locks it in.

How To Use It?

For witness and hold points to be effective, they have to be established before construction work begins. The agency and the contractor collaboratively create an inspection and testing

Table A.29. Recommended uses for witness and hold points.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	**Construction**	Closeout	Noncomplex	**Moderately Complex**	**Complex**	≤ $10 million	**$10 million–$50 million**	**> $50 million**
27 Witness and Hold Points			✓		◗	●	●	◗	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

procedure that both parties agree to use during construction. Once all specific points are identified, each has to be defined as either a witness point or a hold point. Points in construction where quality is critical are identified as hold points requiring agency permission before construction activities proceed. The remaining identified points are witness points where the agency is notified for an inspection but agency permission to proceed is not required.

The contract must contain information about the agency's inspection and testing procedures and how the witness and hold point process works. The agency should provide information about inspections and tests, identification of points, and who is authorized to approve points (Chung 1999). The agency should clearly define requirements in an inspection and testing plan for the project so the contractor can work to meet those requirements.

Synthesis of Examples

On fast-track projects, the contractor may focus more on speed than quality. Witness and hold points are a tool that can help align project team members around quality goals. Witness and hold points serve as periodic reminders of quality goals. These points should be clearly defined prior to the start of construction and kept on the project schedule to make sure these inspections are performed.

Example

I-405, NE 6th Street to I-5 Widening and Express Toll Lanes Project, Washington State Department of Transportation

This D-B project consisted of adding toll lanes to I-405. Working in a highly traveled corridor posed numerous challenges. To maintain quality, quality check points—or hold points—were used. Washington State DOT includes quality check points in its Design–Build Quality Management Plan (QMP) outline, as follows.

5.11 Quality Check Points (Hold Points)

Hold Points referenced in the Release for Construction are referred to as Quality Check Points in this QMP and are interchangeable with the same meaning.

Quality Check Points (QCPs) will be established at various stages of construction for the project and will provide an opportunity to evaluate the work for acceptability before beginning the next portion of the work. Representatives from [Washington State DOT] (when they elect to be present), the Project Manager (PM) design team (when required), and Quality Organization will review progress to date, including the inspection reports, process and [QA] test reports, settlement data, pile driving records, string-line measurements, audits, and other pertinent data. The Construction Quality Assurance Manager meets with [Washington State DOT] on a daily basis to schedule quality check points for the following day. No additional work takes place until all parties present mutually agree that the work done up to the QCP is acceptable. QCP's will be incorporated into the schedule and will occur at the following stages of construction:

Pre-Construction Meetings (Pre-Activity Meetings)

- Prior to starting new work on the project, there will a pre-con meeting held with all parties involved in the work represented and present in the meeting.

Temporary Erosion and Sediment Control

- After installation of high-visibility fencing around environmentally sensitive areas, clearing limits, travel corridors, and stockpile sites
- After completion of placement of Temporary Erosion and Sediment Control devices, and prior to any construction operations

Embankments

- After completion of drainage embankment and utility installations and before backfill
- At intervals of embankment construction every 5 vertical feet

Structures (Bridge, retaining walls, noise walls, curtain, and end walls)

- At completion of bridge embankment or excavation and before the start of structure foundation
- Before saw-cutting of concrete occurs
- Before pile driving or drilled shaft operations
- After completion of the first piling driven at each structure support and at the completion of each pile group for each structure support
- After completion of each drilled shaft along with Cross Holed Sonic Logging testing and at the completion of each drilled shaft group for each structure support
- Before concrete placement of any subsurface element, including concrete for cast in place piles and drilled shafts
- Grout pad or anchor bolts prior to setting bearing or girder
- After girder and diaphragm placement
- Before concrete placement of bridge deck, approach slabs, diaphragms, traffic barrier, and parapet walls (with formwork, inserts, and reinforcement in place)
- After completion of excavation and prior to box culvert construction
- Before concrete placement for cast-in-place box culverts with formwork, inserts, and reinforcement in place
- Prior to installation of post tensioning strands or bars
- Prior to jacking operations for post tensioning with hydraulic jack on the job site
- After completion of bridge deck grinding and deck repair
- Prior to application of any paint or pigmented sealer

(continued on next page)

Retaining Wall

- After completion of soil foundation and before the placement of the leveling pad of a Structural Earth wall or the foundation of any other type of retaining wall
- Panel tolerances after completion of placement of panels for each Structural Earth wall prior to beginning of coping placement
- Before concrete placement for cast-in-place retaining walls with formwork, inserts, and reinforcement in place

Noise Wall

- After completion of soil foundation and before the placement of footing formwork
- For pre-cast panels, after the placement of [10] panels

Drainage

- After placement of pipe or box culvert and prior to backfilling
- After installation and placement of bands or gaskets and prior to backfilling
- After placement of catch basins and manholes and prior to backfilling

In-Water Work

- Before conducting any in-water construction activities and prior to operating any equipment below the ordinary high-water mark. This includes Work in wetlands, streams, or mitigation sites
- Culvert replacement, removal, and extensions
- Prior to capturing and removing fish from the job site at any area that includes water bypass, in-water cofferdam, and any water area likely to be disturbed
- Prior to installing riprap or other bank stabilization

Subgrade, Surfacing, and Pavement

- Completion of subgrade and prior to surfacing placement
- Completion of surfacing placement and prior to Asphalt Treated Base, hot mix asphalt, and reinforcement for approach slab placement

Electrical

- Prior to removal of existing intelligent transportation system (ITS) equipment and new or temporary ITS equipment in place and operational
- Prior to removal of existing closed-circuit television (CCTV) cameras and new CCTV cameras in place and operational

References

Chung, H. W. *Understanding Quality Assurance in Construction: A Practical Guide to ISO 9000*. E & FN Spon, London, UK, 1999.

Gransberg, D. D., J. Datin, and K. R. Molenaar. *NCHRP Synthesis 376: Quality Assurance in Design–Build Projects*. Transportation Research Board of the National Academies, Washington D.C., 2008. https://dx.doi.org/10.17226/23222.

Hoyle, D. *ISO 9000 Quality Systems Handbook: Using the Standards as a Framework for Business Improvement*, 6th Edition, Elsevier, Oxford, UK, 2009.

Washington State Department of Transportation. *Guidebook for Design–Build Highway Project Development*. June 2004. http://www.wsdot.wa.gov/NR/rdonlyres/46196EB8-F9D0-4290-8F55-68786B1DA556/0/DesignBuild_GuidebookJun2004.pdf. Accessed April 13, 2018.

28 Payment Checklist

The payment checklist is a list of tasks related to payment for construction and specifies which payment tasks are performed by the contractor and which are performed by the agency.

What Is It?

The payment checklist helps guide invoice preparation and review. The checklist identifies contractor tasks, such as invoice cover sheet, progress report, and schedule update. It also identifies agency tasks, such as quality verification, checking schedule, and checking for signatures on force account sheets. Each task may also have a reference to the section in the RFP that relates to that task.

Why Use It?


CONSTRUCTION EFFICIENCY

The payment checklist helps ensure that invoices are prepared completely to meet agency requirements, and it helps ensure a smooth and timely review of invoices so that the contractor can get paid promptly. The payment checklist helps to promote construction efficiency. It also operationalizes lessons learned in a document that D-B project managers can use to efficiently and accurately close out a project.

What Does It Do?

The payment checklist helps ensure that all construction invoices are prepared and reviewed consistently. This can save time, since it is clear what the contractor needs to submit and what the agency needs to review.

When to Use It?

This tool can be used starting with construction and continuing through closeout (Table A.30). The payment checklist should be reviewed periodically and updated for accuracy. It will only be effective if the information remains up to date.

Table A.30. Recommended uses for payment checklist.

	Contract Administration Phase				Project Complexity			Project Size		
	Alignment	Design	Construction	Closeout	Noncomplex	Moderately Complex	Complex	≤ $10 million	$10 million–$50 million	> $50 million
28 Payment Checklist			✓	✓	●	●	●	●	●	●

Note: ● = Recommended; ◗ = Consider case by case; ○ = Not recommended.

How to Use It?

The checklist is created based on the agency requirements and the payment requirements included in the RFP. The contractor can use the checklist to check that all necessary elements are included in an invoice package. The agency uses the checklist as a guide to review invoices in a consistent manner.

Synthesis of Examples

Checklists can take the form of D-B-B standard forms. The payment checklist should list the responsibilities of the design–builder and the agency, as shown in this template table (Table A.31). An agency can modify this table to fully represent their payment checklist process. The complexity of the checklist will depend upon the detail of the contract documents.

Table A.31. Template for payment checklist.

Payment Checklist	RFP Section	✓
D-B		
Invoice cover sheet		
Progress report		
Contract schedule update		
Certification by designer of record		
Certification by construction QA manager		
Invoice data sheets and supporting documents		
Calculations and accounting documents		
Agency		
Verify and mutually agree on percentage of work complete		
Check schedule against invoice amounts		
Review monthly contract schedule updates		
Check that force account sheets are signed		
Check that all contracting officer requests are executed		
Check materials per payment request		
PE sign-off on design–builder request percent		
Complete comments form and transmit back to design–builder		
Notify design–builder of invoice approval and amount to be paid		
Distribute and save documentation		

Example

I-405, NE 6th Street to I-5 Widening and Express Toll Lanes Project, Washington State Department of Transportation

In this design–build project, Washington State DOT created the following payment checklist to guide the contractor in preparing construction invoices and to guide Washington State DOT in reviewing contractor invoices. Tasks related to invoicing work include progress report, schedules, quality data, change order documentation, and signatures. To emphasize the importance of completing these task, references are made to the RFP sections where these tasks are mentioned.

C0000
Example Project
Example Address 12345

Estimate #: 10
Work Done Dates: 04/06/2017 to 05/05/2017
Estimate Payment Date: 05/17/2017

Payment Checklist

Payment Checklist	RFP Section	✓
Design-Builder		
Invoice Cover Sheet w/ signatures of the Design and Construction QA Managers	1-09.9(1).2	
Progress Report including narrative and technical report	1-09.9(1).2	
Contract Schedule update per 1-08.3(7) including .xer Primavera file verified to match the invoice	1-09.9(1).2	
Certification by Design and Construction QA Managers	1-09.9(1).2	
Invoice Data Sheets and Supporting Documents based on the price loaded Contract schedule	1-09.9(1).2	
Design Exception Report	1-09.9(1).2	
Incentive Self-Assessment	1-08.11(1).1	
If HMA adjustment requested, **Calculations and Accounting documents** required to be submitted	1-09.9(2).1	
WSDOT		
QV – verify and mutually agree with D-B on physical percentage of Work completed		
Check Schedule against Invoice amounts incl. Paid TTD; Paid this Period; Previous		
Review Monthly Contract Schedule Updates	1-08.3(7)	
Check to ensure Force Account sheets are signed		
Check to ensure all CO requested are executed		
QV – check materials per D-B payment request		
Input into CAPS and print Pre-Estimate for PE signature		
PE signed off on DB requested %		
Complete WSDOT comments form and transmit back to Design-Builder		
Advise D-B that payment is approved and total amount to be paid		
Once payment is made, email all information to Document Control for distribution		

Signed by:
Print name:
Date:

APPENDIX B

Case Studies

Table B.1. Design–build case studies.

Case Study No.	Agency	Project Name	Primary Facility Type	Project Type	Dollar Value	Start Date
Design–Build < $10 million						
1	Pennsylvania DOT	West 4th Street Bridge	Bridge	Rehab/Recon	$3M	Nov 2015
2	Florida DOT	SR 90 Traffic Signal Update	ITS	Rehab/Recon	$4M	Feb 2016
3	Florida DOT	I-75 (SR 93A)	ITS	Rehab/Recon	$3M	Jan 2017
4	Virginia DOT	Braddock and Pleasant Valley Intersection Improvements	Road	Rehab/Recon	$4M	Apr 2015
5	Georgia DOT	SR-299 Bridge over I-24	Bridge	Rehab/Recon	$7M	Dec 2015
6	Michigan DOT	US-2 Iron Mountain	Road	Rehab/Recon	$2M	Apr 2017
Design–Build $10 million to $50 million						
7	FHWA–CFLHD	Lahaina Bypass 1B-2	Road, Bridge, Drainage	New Construction/ Expansion	$40M	Mar 2017
8	Arizona DOT	US 60 (Grand Avenue) and Bell Road Interchange	Road, Bridge, Other	Rehab/Recon	$42M	Jan 2016
9	Connecticut DOT	Route 8	Road, Bridge, Drainage	Rehab/Recon	$36M	June 2015
10	Missouri DOT	Saint Louis District Safety Project	Road	Rehab/Recon	$24M	Jul 2017

Table B.1. (*Continued*)

Case Study No.	Agency	Project Name	Primary Facility Type	Project Type	Dollar Value	Start Date
11	New York State DOT	Wellwood Bridge	Bridge	Reconstruction	$20M	Spring 2016
12	VTRANS	I-89 in Milton	Bridge	Reconstruction	$23M	Aug 2017
Design–Build >$50 million						
13	Colorado DOT	I-25/Cimarron Design–Build	Road, Bridge, Drainage, ITS	Rehab/Recon	$72M	Jun 2015
14	North Carolina DOT	Business 40 (Salem Parkway)	Roadway/ Bridge	New Construction	$99M	Sep 2016
15	Maryland State Highway Administration	MD 404–US 50 to East of Holly Road	Road, Bridge	New Construction/ Expansion	$105M	May 2016
16	Caltrans	I-15 & I-215 Devore Interchange	Road, Bridge	Reconstruction	$200M	Apr 2017
17	Florida DOT	I-95/I-295 Interchange	Road	Reconstruction	$177M	Nov 2016
18	Georgia DOT	Northwest Corridor	Road, Bridge, Drainage, ITS	New Construction/ Expansion	$600M	Oct 2014
19	Washington State DOT	I-405, NE 6th Street to I-5 (Bellevue to Lynwood) Widening and Express Toll Lanes	Road, Drainage, ITS	Rehab/Recon	$155M	Feb 2012

Note: Dollar value in millions; rehab/recon = rehabilitation/reconstruction.

Abbreviations and acronyms used without definitions in TRB publications:

A4A	Airlines for America
AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FAST	Fixing America's Surface Transportation Act (2015)
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TDC	Transit Development Corporation
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S. DOT	United States Department of Transportation

TRANSPORTATION RESEARCH BOARD
500 Fifth Street, NW
Washington, DC 20001

ADDRESS SERVICE REQUESTED

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

The nation turns to the National Academies of Sciences, Engineering, and Medicine for independent, objective advice on issues that affect people's lives worldwide.
www.national-academies.org

ISBN 978-0-309-48121-2

NON-PROFIT ORG.
U.S. POSTAGE
PAID
COLUMBIA, MD
PERMIT NO. 88