Lessons Learned by Owners Using Design-Build Project Delivery

A Survey of Water Utility/Agency Executives and Project Managers
SURVEY PARTICIPANTS
The Water Design-Build Council wishes to thank the collective utility/agency officials, executives and project managers for their participation in this survey and for the valuable contributions they have made to the water industry. This survey project was conducted by an independent third-party source while maintaining confidential protocols of the participants.

RESEARCH TEAM
WDBC
- Stephen R. Gates, P.E, BCEE, chair of the WDBC Research Committee and Senior Vice President at Brown and Caldwell
- Linda Hanifin Bonner, PhD, CAE, WDBC Operations Manager

WDBC Committee Members
- Mark Alpert (WDBC)
- John Awezec (HDR)
- Bryan Bedell (Haskell)
- Leofwin Clark (CH2M)
- John Doller (Carollo)
- Patrick Gallagher (CDMsmith)
- David Kinchen (Black & Veatch)

University of Nevada, Las Vegas, Department of Civil & Environmental Engineering & Construction
- Jacimaria Batista, PhD, P.E., Professor
- Pramen P. Shrestha, PhD, P.E., Associate Professor

Cover photos (L to R): Water treatment plant, Augusta, GA (Parsons); wastewater treatment plant, Winter Haven, FL (Haskell); desalination plant, Carlsbad, CA (ARCADIS-US); and wastewater treatment plant, Sacramento, CA (Brown and Caldwell).

Acknowledgments
As a non-profit organization dedicated to education, the Water Design-Build Council (WDBC) fulfills its mission to industry stakeholders through thought leadership, research, education, and communication about the true collaborative approach of design-build and construction management-at-risk (CMAR) delivery for water and wastewater infrastructure projects. Since its origins, the WDBC has pursued various research studies in order to understand the needs of industry owners relative to acceptance and use of design-build delivery. While this report presents the results of the 2015 Survey of Owners on Their Lessons Learned from the use of design-build delivery, it also includes a comparison of the findings from WDBC’s previous two studies.

In 2012, the Water Design-Build Council commissioned a survey of executives and project managers (with municipal water utilities and agencies) to gauge their level of satisfaction with collaborative delivery methods (design-build or CMAR) for procuring and delivering water and wastewater infrastructure projects. Results of the survey revealed high satisfaction levels with the following:

- The high quality of the completed projects
- The greater extent of owner’s involvement
- The increased communication among the parties
- The innovative ideas incorporated into the project
- A reduction in the number of claims/change orders
- The smooth transition of the constructed project to operation

This survey also found that owners chose these collaborative methods primarily for the following reasons:

- Schedule efficiencies
- Better quality results
- Cost advantages

In 2013, WDBC commissioned a second survey identifying the specific impediments to the broader use of collaborative methods. These core findings emerged as:

- Unfamiliarity with the process (need for more education).
- Perception that such methods might entail additional unknown risks for owners.
- A resistance to change from traditional design-bid-build methods.

During both the 2012 and 2013 surveys, a number of survey participants volunteered to provide information to help owners who are considering the use of these collaborative delivery methods, with the lessons learned from their experiences.

In 2014, the WDBC contracted with the Department of Civil & Environmental Engineering and Construction at the University of Nevada, Las Vegas (UNLV) to conduct a new study, among agency/utility executives and managers to elicit what lessons they had learned from using collaborative project delivery methods.

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**STUDY OBJECTIVES**

- Identify the lessons learned in the processes of planning, procuring, allocating risk, design, construction, and commissioning of design-build projects.
- Document the experiences with collaborative delivery projects.
- Provide recommendations for use by other industry practitioners considering the use of design-build delivery.

**STUDY METHODOLOGY**

- **Establish Sources**
  - Develop Candidate Long List (200+)
  - Random Selection of Shortlist (30 – 40)
- **Collect Data**
  - Develop Questionnaire To Achieve Goals
  - Extensive Telephone Interviews
- **Analysis**
  - Transcription & Key Word Analysis
  - Compilation and Interpretation
**Study Results**

**LOCATION OF STUDY PARTICIPANTS**

[Map showing the location of study participants across different states.]

**TYPES OF DESIGN-BUILD DELIVERY PROJECTS**

- Water Treatment Facilities
- Wastewater Treatment Facilities
- Pumping Stations
- Control Systems
- Energy Systems
  - Gas Compressor
  - Cogeneration Facilities
  - Diesel Generator

**EXECUTIVE/MANAGERS EXPERIENCE WITH DESIGN-BUILD METHODS**

<table>
<thead>
<tr>
<th>Method Experience</th>
<th>Experience by Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design-Build</td>
<td>Fixed-Price &amp; Progressive</td>
</tr>
<tr>
<td></td>
<td>Design-Build Only</td>
</tr>
<tr>
<td>CMAR</td>
<td>Fixed-Price-Design-Build</td>
</tr>
<tr>
<td></td>
<td>Only</td>
</tr>
</tbody>
</table>

**Education Levels of Executives/Managers with Design-Build Delivery Methods**

<table>
<thead>
<tr>
<th>Pre-Project Education/Training</th>
<th>Numbers of Projects Managed</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>1 to 5</td>
</tr>
<tr>
<td>Yes</td>
<td>6 to 10</td>
</tr>
<tr>
<td></td>
<td>10+</td>
</tr>
</tbody>
</table>

**Primary Reasons Agencies/Utilities Switched from Design-Bid-Build to Design-Build Delivery for Water Infrastructure Projects**

1. Provides schedule and/or cost benefits.
2. Ability to select a design-builder based on qualifications and experience.
3. The use of design-build delivery in other areas of organization motivated the water and wastewater project staff and executives to change.
4. New changes in state legislation to allow the use of design-build for water and wastewater projects.
5. Allows performance guarantees to help owners manage risk for complex projects using advanced or innovative technology.
6. Previous bad experience with design-bid-build (DBB) project delivery.

**Other reasons included:**

- Involving the design-builder earlier in the process can shorten the time to complete the project.
- Provides better budget control and a more streamlined process, by focusing owner’s inputs on things that are important to the success of the project.
- Facilitates a fair and efficient allocation of risks associated with technical aspects, cost and schedule between the owner and design-builder.
USE OF DESIGN-BUILD DELIVERY RESULTED IN:

2. Opportunities to negotiate a fixed or Guaranteed Maximum Price (GMP).
   - An effective decision-making process based on critical milestones.
   - The ability to specify equipment types by owners to attain better quality.
3. A collaborative environment and teamwork among staff and project managers.
   - Created a more efficient project management process and oversight.
   - Improved coordination between owner and design-builder.
4. Enabling owners the ability to select the design-builder based on qualifications and experience.
   - Identifies performance of the design-builder early on in the process.
   - Procurement approach promotes the most qualified firms to be involved in proposal process.

OBSTACLES FREQUENTLY ENCOUNTERED WITH DESIGN-BUILD DELIVERY

- Perception by some that design-build is more costly because it is not “low-bid” contracting.
- Reluctance to consider the use of design-build delivery because it might require changing the organization’s management culture.
- Unfamiliarity of city councils and elected officials with design-build delivery.
- Limited education and experience levels of staff with design-build delivery methods.
- Staff preferences for prescriptive specifications that can limit design-build effectiveness.

UTILITY/AGENCY EXECUTIVES’ RECOMMENDATIONS FOR A SUCCESSFUL PROJECT

- Determine the delivery method that best suits the project based on its characteristics.
- Network and consult with other owners who have used design-build delivery in water/wastewater and other infrastructure projects for lessons learned.
- Get help from an independent consultant with design-build experience.
- Educate staff members about how to effectively manage design-build projects.
- Choose project members who are fully engaged and committed to project success.
- Select a design-builder based on defined qualifications for the project.
- Clearly define the project goals and objectives before the procurement phase.
- Conduct planning meetings to evaluate project cost, schedule, and risks and devise ways to manage identified project challenges.
- Consider pre-purchasing long-lead items to expedite project completion.
Lessons Learned FROM PROJECT MANAGERS’ EXPERIENCES

One of the important goals of this research is to provide others in the industry with the tools and information needed to complete successful design-build projects. The following recommendations were made by project managers interviewed in the study.

PROCUREMENT PHASE

- Provide enough time to prepare clear and concise contract documents to avoid “scope creep.”
- Select the design-builder based on qualifications.
- Educate staff about the design-build procurement process and recognize it takes time to implement best practices.
- Conduct pre-proposal meetings so the owner can learn about the design-builder’s design approach, which helps align parties’ interests as proposals are prepared.
- Obtain more than one proposal to select a qualified design-builder with the most advantageous proposal. The ideal number of proposals is generally three.
- Solutions and services should not be highly prescribed in the procurement documents in order to promote the most innovative and advantageous proposals.
- Design-build projects are more successful when an experienced procurement team implements an effective selection process.
- During the procurement phase, the proper weighting of cost versus innovation helps to select the best design-builder.
- Understand how to properly use a proposal stipend during the procurement phase to stimulate competition and to allow the ideas of all bidders to be used in the project.
- Use a two-step procurement process: Request for Qualification (RFQ) and Request for Proposal (RFP) to obtain the most advantageous proposal.
- Recognize that in progressive design-build projects, a guaranteed price is developed after the owner and design-builder collaborate on all design details.

Areas of importance in the procurement process to project managers.

DESIGN PHASE

- The constructability of projects improves because of the strong collaboration of design and construction professionals during the design phase.
- Addressing site development issues early on limits “unforeseen” conditions occurring during construction.
- To facilitate an efficient design review and approval process, owners should be actively involved during the design phase with dedicated and knowledgeable staff participating.
- Conduct regular collaboration meetings throughout the design process and recognize the need for timely decisions to maintain the project schedule.
- Maintaining flexibility during the design process promotes innovation.
- It is important to select designers and builders who have worked together before.
- Using a 3D model for design is very helpful to an owner.

Water treatment plant, Weslo, TX (CDMSmith)
CONSTRUCTION PHASE

- There is increased commitment to achieving project success when the designer, builder, and owner work well together.
- The design-build construction process is more efficient than the design-bid-build method because cost and schedule risk is concentrated within a single design-build contract.
- With a collaborative process, design-build projects can be fast tracked to save time.
- Select a qualified and experienced design-build team to make construction phase successful.
- It is important to have a design-builder who has experience with collaborative projects.
- It can be helpful to have an “owner’s advisor” to provide special expertise in the project procurement and contracting process and to supplement the owner’s resources to support project implementation.
- Implementing projects is more effective through design-build delivery because the many “unknowns” that arise during the construction phase can be efficiently addressed.
- Have the design and construction professionals (on the same team) work together to solve problems.
- An “owner’s advisor” can be used to supplement available staff resources to review design submittals and perform construction inspections.

COMMISSIONING (TRANSITION) PHASE

- The owner’s operations and maintenance staff and the design-builder should be part of the collaborative team throughout the project.
- To ensure a smooth transition process, involve plant personnel early in the project’s design phase to identify and include specific needs for the commissioning and operations in the original contract.
- Select an experienced design-builder who can effectively manage the commissioning process.
- Define performance criteria for commissioning and operations up front, during the proposal phase and documented in the design-build contract.
- Provide enough time to schedule “acceptance testing” by inspectors commissioning the project.

PROJECT MANAGERS’ RECOMMENDATIONS FOR A SUCCESSFUL PROJECT

- Emphasize teamwork and conduct partnering sessions early on to promote collaboration.
- Educate all staff members about design-build delivery methods.
- Project managers should have an open, collaborative mindset.
- Leadership by owners is key to a successful design-build project.
- The project manager should be involved early in the project.
- Good communication between the owner, designer, and builder is essential.
- Recognize that every project is unique; therefore, the same delivery method will not work for all projects.
- Allow enough time in the project schedule for design reviews.
- Identify project objectives early on, including key design requirements.
Important components of this study are the education and learning experiences of utility/agency executives and project managers in preparing for and managing their design-build delivery projects and their recommendations for other industry practitioners.

**PREPARING FOR COLLABORATIVE DELIVERY**

In preparing to use collaborative delivery for a water project, the majority of the executives reported that they and/or their staffs participated in some form of education or training about design-build delivery methods prior to proceeding with their projects. A minority (one-third) said that they did not pursue any design-build education.

Most executives surveyed had prior education and training about design-build delivery methods.

**OBTAINING EDUCATION**

Project managers receiving education and training about design-build delivery prior to their projects identified the following sources: attending DBIA courses and conferences, using WDBC’s Handbook and website, and presentations from independent consultants.

Project managers that did not seek any formal education about design-build delivery methods believed there was limited value in participating in courses and seminars. Some believe the better way to learn about design-build delivery is to actually manage a design-build project.

Sources of project managers design-build delivery education and training
A LEARNING PROCESS

Both utility/agency executives and project managers believe that the “peer-to-peer education” process is an important aspect of learning about design-build delivery methods and are willing to disseminate information about their experiences to others.

A large percentage of project managers and executives also find that conference presentations are an important learning mechanism through peer-to-peer information. Another segment claims that making informal education presentations to their counterparts, owner staffs, and other peers about their design-build projects is essential. A smaller segment identified presentations at local chapter meetings as being an effective mechanism.

RECOMMENDATIONS FOR OWNER (UTILITY) EDUCATION

Overall, the majority of executives and project managers believe that the best way to reach other owners is by networking at national conferences, e.g., WEF and AWWA. These recommendations were followed by the process of presenting case studies of successful design-build delivery projects to educate others about the advantages of using design-build delivery methods and the use of WDBC documents and its website.

EDUCATING OTHER OWNERS

When asked whether they were willing to participate in workshops to share their knowledge with industry peers about the use of design-build delivery methods for their projects, nearly all executives and project managers responded that they are willing to do so. This response demonstrates that experienced design-build owners have a high interest in sharing their lessons learned and an apparent endorsement of the potential benefits of successfully completing projects using collaborative methods such as design-build.
The participants interviewed for this study exhibited considerable experience in using design-build delivery methods—with project managers reporting more experience than agency or utility executives. Based upon the experience level of these survey participants, WDBC also considers the findings from this research to validate many of those found in its previous research.

As with the 2012 and 2013 surveys, the 2015 “Lessons Learned” research confirms that owners value the use of design-build delivery for water and wastewater infrastructure projects. The primary difference is the 2015 findings identify the following three important actions owners should address:

1. It is very evident that education is the foundation to achieving a successful project and must be integrated prior to the planning process.
2. Some level of education or training on the various aspects of design-build delivery from inception to transition must be provided for all participants to be engaged in a project, in order to effectively procure, manage and achieve a successful project.
3. Peer-to-peer education is highlighted as a highly beneficial process for those considering a design-build delivery approach, especially at the executive or higher management level.

The following core topics are further drawn from the 2015 “Lessons Learned” research findings:

• Numerous benefits exist in using design-build methods for delivering water and wastewater projects, as well as achieving positive experiences during the process.
• There are also impediments encountered in the process to use design-build delivery methods.
• Recommendations for using design-build delivery methods and overcoming impediments are provided by experienced executives and managers.

The first two of these findings are also corroborated in previous WDBC research—the 2012 customer satisfaction survey and the 2013 study of external and internal impediments faced by owners.

In the 2015 research, project managers cited these major benefits and positive experiences in preparing for and managing design-build-delivery projects.

• Cost and schedule advantages
• Ability to consider qualifications when selecting a design-builder
• Ensuring that constructability reviews are carried out throughout design development
• Ability to integrate technical innovations into their projects
• Getting construction professionals involved throughout the design phase
• Establishing a teamwork environment, which improved communication and fostered collaboration among the owner, the designer, and the builder

In the 2015 research, executives cited the following benefits as the driving forces that influenced them to switch from design-bid-build to design-build.

• Schedule and cost advantages
• Ability to select the design-builder based on qualifications
• Ability to pursue advanced technology
• Other departments in the same organization using design-build as a delivery method

They also cited the following points as positive lessons learned: (1) not all water/wastewater projects are suitable for design-build; (2) specifying equipment types by owners guarantees better quality; and (3) the usefulness in hiring an “owner’s advisor” to provide additional support or needed technical expertise in the development of the project.

Similarly, the majority of respondents in the 2012 research reported that they saved cost and time and were able to integrate innovations into their projects.

### IMPEDIMENTS TO DESIGN-BUILD DELIVERY

The 2015 research also found agreement among the majority of project managers and agency/utility executives that many of the impediments they incurred were due to their supporting staffs’ lack of knowledge and experience with design-build delivery. Many of the impediments reported by project managers and agency/utility

**Wastewater treatment plant, Hopewell, VA (HDR)**
executives were experienced prior to procurement—both in the process of approving the use of design-build as compared to the traditional design-bid-build. These situations most likely occur in the planning process where characteristics of the project are defined and prioritized.

Project managers cited the following as impediments:

• Their own lack of knowledge about design-build delivery.
• Their organizations’ lack of procedures or guidelines for using design-build-delivery methods.
• The preference of higher level decision-makers to maintain the status quo and a reluctance to use design-build.
• The need for cultural changes within their organizations to encourage replacing traditional design-bid-build with design-build delivery.

Agency and utility executives cited these impediments:

• The need to respond to impediments encountered by project managers, particularly with regard to providing staff resources and eliminating other organizational challenges, such as procurement.
• Complexities of risk allocation, including the need to confront the existing risk culture, identify project risks and develop risk-management strategies early in the planning phase.
• A general lack of knowledge about design-build delivery throughout the organization.
• Their own concern to have control over the design details of the project.
• Insufficient knowledge about how to anticipate and address unknown site conditions.

The 2013 research identified the top-ranked impediments by both project managers and agency/utility executives:

• Unfamiliarity with the design-build process.
• Lack of education and training.
• In many cases, state-level statutory procurement requirements.

RECOMMENDATIONS FOR USING DESIGN-BUILD DELIVERY IN ORGANIZATIONS AND OVERCOMING IMPEDIMENTS

In the 2015 research, project managers and agency/utility executives both offered similar recommendations for achieving successful design-build projects, from inception to transition. They emphasized the importance of education—including peer-to-peer education and familiarity with best practices—with actions that can improve the education process for practitioners at every level.

Project managers’ recommendations include the following:

• Educate staff early on about design-build delivery and recognize that education takes time.
• Establish a collaborative process through all phases of the project.
• Define the project manager’s leadership role, responsibility, and authority.
• Maintain communication and promote collaboration among the designer, the builder, and the owner.

Agency/utility executives’ recommendations focus more on the need for project planning prior to beginning the procurement process:

• Select the best delivery method to achieve the projects goals, as well as considering unique project drivers.
• Network with other owners that are experienced in design-build delivery.
• Educate staff and consider hiring an independent consultant to assist with procurement and contracting according to industry best practices.

WDBC Board members express their sincere gratitude to the research study participants for their valuable opinions and recommendations. Through this process, they have given other industry practitioners the benefit of continued education through their experiences with design-build projects. In consideration of these research findings, the Water Design-Build Council remains committed to fulfilling its mission and thought leadership in developing and providing educational materials to continuously improve the efficiency and effectiveness of best practices for design-build delivery methods for water and wastewater capital projects.

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WDBC’s Education and Training Programs

WDBC’s education programs provides officials, managers and project staff of public and private water and wastewater organizations with guidance and direction on the resources to prepare for, manage, and transition a design-build project. All sessions are designed and produced by the Water Design-Build Council, through its independent research program, in order to fulfill the identified industry educational needs.

WDBC Education Programs and Modules Available

Design-Build Delivery Methods for Water Infrastructure Projects

This session is the core component within the program modules and should be the first of any to use. Its contents include information to provide and enhance essential knowledge about:

• Industry terms and concepts associated with the various collaborative delivery methods.
• The potential benefits and advantages, as well as the challenges and disadvantages, of each delivery method.
• Essential owner preparation issues and criteria for selecting and implementing project delivery methods.
• Critical factors for success in design-build and construction management-at-risk projects.

Organizational Readiness for Design-Build Water Projects

This session provides information and enhances essential knowledge about:

• The questions owners and managers have about how to begin to prepare for a design-build project.
• The various roles and responsibilities—who leads, who manages.
• Establishing a project management team—who should be involved and when.
• Defining the role of an owner advisor on the project team—when to involve them and how.
• Defining project priorities/drivers—where they are used and how.
• Lessons learned from other owners that you might want to know.

This session also includes an experiential exercise in defining priorities and drivers that enable an organization to select the appropriate delivery method for their project.

Procurement Methods for Design-Build Water Infrastructure Projects

This session provides information and enhances essential knowledge about:

• The procurement goals that every organization should consider.
• Options to consider in the procurement evaluation process.
• The predominant procurement methods for water design-build projects.
• Essential components and steps in the procurement process prior to contracting.

Risk, Liability and Contracting for Design-Build Water Infrastructure Projects

This session provides information and enhances essential knowledge about:

• Understanding the basic risks between parties (owners–design-builders).
• Avoiding undesirable events and issues.
• Reaching agreement to manage and/or mitigate risk.
• Defining which party is best able to mitigate or absorb each risk.
• The relationship of risk and liability in contracts.
• Proprietary issues and performance guarantees.

This session also includes an experiential exercise in developing criteria that enable an organization to select the appropriate delivery method for their project.

Preparing for and Managing the Transition and Commissioning Process for Design-Build Water Infrastructure Projects

This session provides information and enhances essential knowledge about:

• Early identification of regulatory requirements.
• Addressing planned shutdowns.
• The importance of operator training and when to involve key personnel.
• Management essentials—handing over the keys.
• Focusing on life-cycle components.
• Transition issues to avoid.
• Support after the transition.

Planning, Procurement and Management of Design-Build and CMAR Water Infrastructure Projects

This program is a comprehensive session that not only takes into account all of the education modules, but also addresses the essential management aspects that occur during the implementation of a water design-build project. It typically encompasses an 8- to 12-hour period.

Arrangements for an education session are made through the WDBC Office by contacting Linda Hanifin Bonner, PhD, CAE
WDBC Operations Manager
410-798-0842 (o) | 443-995-2285 (m)
lhanifin@waterdesignbuild.org