THE DESIGN-BUILDER'S GUIDE TO DESIGN MANAGEMENT:

A Playbook for the Water/Wastewater Sector

CHARLES PANKOW FOUNDATION

THE DESIGN-BUILDER'S GUIDE TO DESIGN MANAGEMENT: A PLAYBOOK FOR THE WATER/WASTEWATER SECTOR

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EXECUTIVE SUMMARY

Design-build projects in the water/wastewater sector require the expertise and experience of owners, designers, and builders who understand the complex nature of these projects.

A common structure for a design-build team involves a design-builder that subcontracts the design responsibilities to one or more design firms. Within this structure, the design integration manager is typically an employee or representative of the design-builder who reports to the project manager and is responsible for coordinating and integrating the design process. On large or complex projects, these responsibilities may be distributed across several people in different departments.

This *Water/Wastewater Sector Playbook* offers guidance tailored to the characteristics of design-build project delivery in the water/wastewater sector primarily for professionals who have been tasked with the role of design integration manager. This playbook is meant to be used in conjunction with *The Design-Builder's Guide to Design Management*. The guide aims to help owners, designers, and builders of design-build projects achieve greater success by understanding and fully leveraging the unique role of the design integration manager. To complement the guide, this playbook provides detailed information specific to the design integration manager's role in the water/wastewater sector and describes how this individual interacts with project stakeholders across different project phases.

To succeed as a design integration manager in the water/wastewater sector, it is crucial to recognize the key characteristics that differentiate this sector from other sectors and to understand the diverse skills, abilities, and characteristics that a design integration manager needs to effectively guide a project from start to finish. This playbook addresses the skills and qualifications a design integration manager needs to effectively deliver a design-build project in the water/wastewater sector and outlines the design integration manager's roles, responsibilities, and involvement throughout all phases of water/wastewater design-build projects.

In water/wastewater design-build projects, the role of the design integration manager spans five distinct phases:

1. The **Proposal/Pre-Award Phase** begins when the design-builder starts to develop the teaming agreements among the design-build partners, often before the request for proposals is published, and concludes when the owner announces the selected design-builder.
2. The **Post-Award Phase** begins with the execution of the contract between the owner and the design-builder and concludes when subcontracts are issued to all partners.

"This playbook provides detailed information specific to the design integration manager's role in the water/wastewater sector and describes how this individual interacts with project stakeholders across different project phases."

3. The **Early Design Phase** begins after all contracts are issued and ends with the owner's approval of the preliminary design.
4. The **Detailed Design Phase** begins after the owner approves the preliminary design and ends with the completion of the construction drawings and specifications.
5. The **Construction Phase** overlaps the detailed design phase and begins with the start of construction or when a guaranteed maximum price (GMP) is agreed upon and ends when the project is handed over to the owner.

It should be noted that for industrial water/wastewater projects, the typical project phases may also be called estimating (combining the proposal/pre-award and post-award phases), pre-front-end engineering design (corresponding to the early design phase), front-end engineering design (corresponding to the late design phase), and construction.

Each phase involves a set of key tasks and presents unique challenges and opportunities, and the design integration manager plays a critical role in ensuring seamless coordination and integration across all project phases. By understanding the responsibilities and tasks expected during each phase, the design integration manager can effectively navigate the complexities of water/wastewater projects and contribute to their successful delivery.

To provide a clear overview of the water/wastewater design-build process and establish a structured approach to design integration, the following table organizes the design integration manager's tasks by project phase and notes the frequency at which they must be performed. In some cases, the tasks may be led by the project manager with help from the design integration manager. The highlighted tasks, indicated by a faucet icon, represent additional or alternative tasks specific to the water/wastewater sector that are not included in *The Design-Builder's Guide to Design Management*.

Phase	Task	Frequency
Proposal/Pre-Award	Review the owner's project announcement and identify the design, supplier, and trade contracting partners**	Once
	Negotiate a teaming agreement with all partners**	Once
	Assign initial scopes of work to all partners based on the owner's project announcement**	Once
	Coordinate with partners to identify project-specific risks and create a risk register	Every few days to weekly until proposal submission
	Develop a preliminary schedule for proposal and design deliverables	Once*
	Develop a conceptual cost estimate for professional services	Once
	Establish a communication plan with partners	Once
	*↗ Facilitate review of the owner's technical requirements from the request for proposals*	*Every few weeks to monthly until proposal submission*
	Identify and communicate key project expectations to all partners**	Daily throughout the project*
	*↗ Identify innovative ideas*	*Every few weeks to monthly throughout design*
	Verify that the design subcontracts to be issued to partners upon award meet the project requirements	Once

Table continued on following page

** Phrasing has been modified slightly from The Design-Builder's Guide to Design Management to reflect the unique characteristics of the water/wastewater sector*

*** Task typically managed by the project or pre-construction manager with assistance from the design integration manager*

Table continued from previous page

Phase	Task	Frequency
Post-Award	Manage and oversee the execution of the design subcontracts with partners**	Once
	Document the initial basis of design and review project program to reconcile the owner's "ask" with the design-build team's "offer"**	Once
	*↗ Establish a communication plan with stakeholders*	*Once*
	Update and manage the project-specific risk register	Every few weeks to monthly throughout the project*
	Refine the schedule for design deliverables**	Every few weeks to monthly before design begins
	Build a supportive team culture**	Daily throughout the project
Early Design	Confirm that the design aligns with the project budget	Every few weeks to monthly until project close-out*
	Facilitate meetings with the authority having jurisdiction to discuss project-specific code compliance	Every few weeks to monthly throughout design
	Mediate design questions and concerns between the project designer and the owner	Every few weeks to monthly throughout design*
	*↗ Mediate constructability concerns and comments between the design team and the construction team*	*Every few weeks to monthly throughout design*
	Create and maintain a log of design changes and their associated costs	Every few days to weekly throughout design
	Set goals for meetings, then plan and organize effective meetings	Every few days to weekly throughout design
	Oversee the progress of the design schedule	Weekly to every few weeks throughout design
Detailed Design	Facilitate quality in the design process through design and constructability reviews with internal and external stakeholders	Daily to weekly throughout design*
	Document the final basis of design and obtain owner approval	Once
	*↗ Establish and manage internal milestones for design elements*	*Every few weeks to monthly throughout design*
	Maintain morale and refocus the team	Every few days to weekly throughout the project
	Track and monitor the actual design costs	Every few days to weekly throughout design
	Monitor the procurement schedule with the construction team and coordinate deliverable deadlines with the design team	Every few weeks to monthly throughout design
Construction	Document key design changes and communication with the authority having jurisdiction during construction	Every few weeks to monthly until project close-out
	*↗ Assist with commissioning and startup*	*Monthly*
	Facilitate the project close-out documentation process	Every few weeks to monthly until project close-out
	Bridge design team and construction team efforts to maintain project alignment	Every few days to weekly until project close-out

** Phrasing has been modified slightly from* The Design-Builder's Guide to Design Management *to reflect the unique characteristics of the water/wastewater sector*

*** Task typically managed by the project or pre-construction manager with assistance from the design integration manager*

CHAPTER 1: CHARACTERISTICS OF THE WATER/WASTEWATER SECTOR

The unique characteristics of water/wastewater sector design-build projects can affect the role and responsibilities of a design integration manager. Awareness of these characteristics can help professionals better understand the challenges that arise and considerations that must be addressed when managing the design integration process in this sector. Water/wastewater projects entail consideration of plant operations, complex systems, and especially regulatory requirements. The involvement of regulatory bodies in the design review process introduces a unique level of complexity and necessitates a comprehensive understanding of permitting processes and close coordination with authorities. Some of the key characteristics of water/wastewater design-build projects are described in the following sections.

Involvement of Smaller Municipalities or Governmental Entities

Water/wastewater projects can have various types of owners, including municipal entities, private companies, public utilities, or industrial facilities. Each type of owner may have specific objectives, constraints, and decision-making processes that impact the design integration approach used for a given project. Many public water/wastewater projects have municipal or small governmental entities as owners. Compared to other types of projects, municipal projects often involve more rules and restrictions, emphasizing small footprints and community impacts, which may introduce additional layers of decision-making, regulations, and funding considerations that design-build teams must navigate. Many municipal owners hire an owner advisor (OA) to help with the design-build process.

Environmental and Regulatory Conditions

Water/wastewater projects are in many ways driven by environmental conditions, such as water source and quality, and environmental and other government regulations. Projects must be designed to handle variable inputs (i.e., source water, flow rates, supply quality, and return water) while producing a consistently high-quality output that meets all regulatory requirements. Compliance with applicable regulations is paramount to ensuring public health and environmental protection. Delays or failure to meet project requirements can lead to legal issues and termination. The strict constraints of water/wastewater projects can result in longer conceptual and schematic design phases and extensive permitting requirements.

> *"Awareness of the unique characteristics of the water/wastewater sector can help professionals better understand the challenges that arise and considerations that must be addressed when managing the design integration process."*

Performance Guarantees and Risk Management

Two important features of water/wastewater contracts stand out: performance guarantees and risk management strategies. Performance guarantees are crucial in this sector because they ensure that the project outcomes are reliable, consistent, and high quality. Meanwhile, risk management strategies play a vital role in addressing uncertainties related to water quality, treatment process efficiency, and compliance with regulations.

Stakeholder Collaboration and User Feedback

Effective collaboration with stakeholders is critical in the water/wastewater sector. Projects in this sector have numerous stakeholders, including government agencies, utility providers, contractors, operators, and community representatives. Incorporating user feedback, particularly from operators, can influence design decisions and have cost implications.

Operation and Maintenance Planning

Operation and maintenance (O&M) planning is critical in water/wastewater projects. Water/wastewater projects have extended operational lifespans, demanding consideration of the long-term performance and operation of the constructed facilities. Design-build teams should account for maintenance requirements, asset management systems, and future expansion possibilities to ensure sustainable project outcomes. It is also vital to carefully plan for O&M needs in order to meet permit requirements and ensure the continuous and smooth functioning of the plant.

Maintenance of plant operations (MOPO) is an important consideration for water treatment plants and wastewater treatment facilities. Unlike projects in other sectors, where the site may be vacant or inactive throughout much of the project, water/wastewater projects involve plants that must continue operating to ensure uninterrupted water and wastewater treatment. The design integration manger in water/wastewater projects must facilitate MOPO and minimize disruptions to ensure safety and the continuous provision of clean water. Health and safety considerations are of the utmost importance in such projects, and collaboration among all stakeholders is necessary to ensure the project's overall success.

Site-Specific Design Considerations

Several factors specific to the site of a given water/wastewater project must be considered during design:

- **Equipment selection.** Water/wastewater projects often require heavy, specialized equipment, which impacts the overall project footprint, the level of involvement of vendors and licensors in design and construction, and the ultimate performance of the treatment process. Therefore, water/wastewater projects require careful selection of the major equipment that plays such a significant role in the reliability and efficiency of water/wastewater treatment processes. Selecting the appropriate technology and managing long lead times for equipment acquisition are critical considerations during the design-build process. For instance, the proper selection, installation, testing, and startup of project equipment and the acquisition of appropriate warranties and guarantees are essential for the successful operation of the facility and need to be carefully managed.

- **Proprietary processes.** The use of proprietary processes in water/wastewater projects is a critical consideration. Proprietary processes refer to unique, patented, or specialized methods and technologies developed by specific companies or entities that may offer advantages in terms of efficiency, effectiveness, or environmental impacts. In water/wastewater treatment, these processes include innovative filtration techniques, advanced chemical treatments, or unique biological processing methods. The selection of such processes should be based on a thorough evaluation of their suitability for the project's specific requirements, considering factors such as cost-effectiveness, compatibility with existing systems, and long-term sustainability. Adopting proprietary processes often involves licensing agreements, specialized staff training, and ongoing support from the equipment manufacturers, making it essential to understand the full scope and implications of the use of these processes in project design and implementation.
- **Soil and grading.** The selection of the site and its soil properties can significantly impact the design and construction of water/wastewater facilities. For example, subsurface conditions, soil drainage, stability, and load-bearing capacity are important considerations that affect the project's feasibility and long-term performance.
- **Coatings.** Proper coatings protect equipment and structures from chemical reactions, corrosion, and damage caused by exposure to wastewater, chemicals, and other elements commonly found in the water/wastewater industry.

Level of Development Specifications and the Use of Digital Twins

Level of development (LOD) refers to the level of detail and accuracy of information contained within a building information model (BIM) or a 3D model of a water/wastewater facility. LOD specifications ensure that the design and construction processes meet regulatory requirements and industry standards and help define the extent to which the 3D model represents the actual physical components and systems of the facility. These specifications are typically established in collaboration with the project stakeholders, including the owner, design-build team, and other relevant parties.

The 3D model serves as a digital twin of the actual water/wastewater facility, meaning that the 3D model is a virtual representation that mirrors the physical asset in almost every respect. This digital twin is handed over to the owner as the final as-built model, capturing the constructed facility's exact layout, components, and systems.

LOD specifications and the use of digital twins bring substantial benefits to water/wastewater projects. They improve accuracy, coordination, regulatory compliance, visualization, and operational efficiency and ultimately contribute to the facility's successful delivery and long-term performance.

CHAPTER 2: THE DESIGN-BUILD AND PROGRESSIVE DESIGN-BUILD PROCESSES

The water/wastewater sector uses two delivery methods for design-build projects: fixed price design-build (sometimes called traditional design-build) and progressive design-build (PDB). These two delivery methods share commonalities but can differ depending on the project requirements. The selection of the project delivery method depends on the owner's desired method of execution for the project.

Fixed Price Design-Build

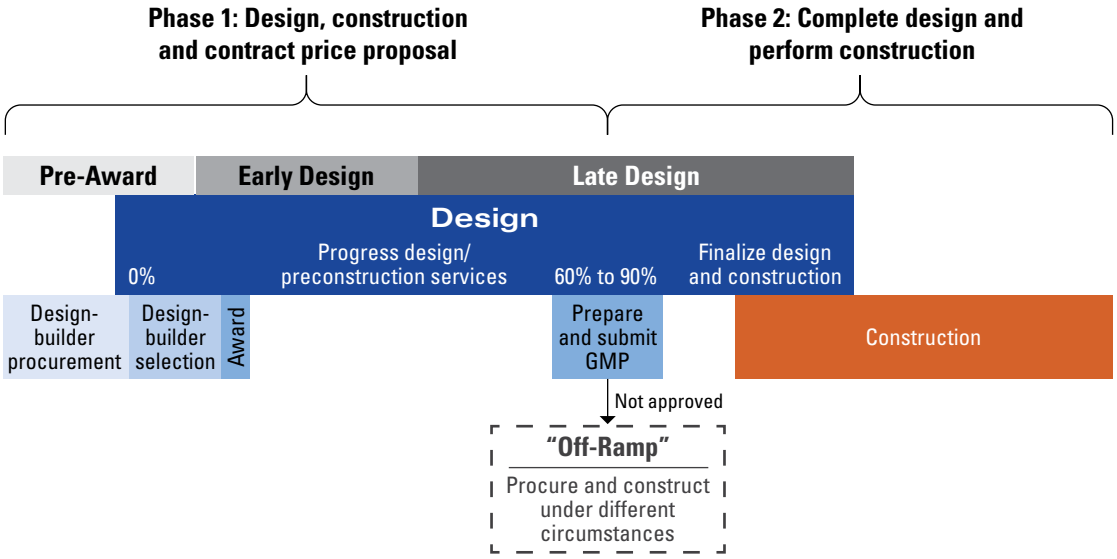
The fixed price delivery method requires the design-builder to propose a fixed price to complete all work from design through construction. The owner's selection of the winning design-builder includes evaluation of the proposed price. Because the design-builder is proposing a fixed price, the request for proposals (RFP) is expected to include some design requirements. To facilitate development of these requirements, the owner may procure an owner advisor (OA) to help draft the RFP. Incorporating design requirements into the RFP is crucial because it helps establish conceptual design ideas or performance requirements before the design-builders develop their proposals. With a fixed price design-build approach, enough of the design must be developed to allow the proposing design-builders to determine a price, scope, and approach that meets the owner's requirements. The design integration manager may be required to facilitate daily meetings between the lead designer and lead cost estimator to ensure that the design meets the owner's requirements.

Progressive Design-Build

PDB delivery is often utilized in the water/wastewater sector due to the extensive investment required of design-builders for proposal preparation in fixed price design-build delivery. PDB delivery is broken into two phases: Phase 1 encompasses pre-construction and early design activities, and Phase 2 includes design completion and construction.

"The water/wastewater sector uses two delivery methods for design-build projects: fixed price design-build and progressive design-build."

Fixed price design-build delivery



Progressive design-build delivery

Phase 1 concludes once the contract price is submitted, which is as early as 30% or up to 60% to 90% design completion, depending on the project. PDB delivery involves incrementally developing the scope, price, and design as the design-build team reaches a contract price or a guaranteed maximum price (GMP). Under PDB delivery, the owner selects the winning proposal based on the design-build team's qualifications and limited pricing information. The limited pricing information may include, but is not limited to, Phase 1 design and pre-construction services, fees, and general conditions. Once the contract is awarded, the design-build team works with the owner to further develop the design.

The use of PDB delivery in the water/wastewater sector allows for increased engagement and input from the owner's team, which can inform decisions such as equipment selection that affect future operations and maintenance. The Water Collaborative Delivery Association (WCDA) *Water and Wastewater Design-Build Handbook* is a recommended resource for further information on PDB delivery.

The owner may also decide to use a hybrid procurement approach that involves evaluating the proposing design-build teams' qualifications, the submitted technical proposals, and the proposed prices and choosing the design-build team using a best-value selection method.

The role of the design integration manager differs between the two design-build approaches. However, some of the activities are similar but can occur at different times throughout the project. With fixed price design-build delivery, the design integration manager has a greater presence during the proposal/pre-award phase because a significant amount of preliminary design work must be completed to arrive at a fixed price for the entire project. In contrast, with PDB delivery the design integration manager has a smaller role during the proposal/pre-award phase but a greater role during the early design phase because the design is developed with input from both the owner and design-builder. With PDB delivery, the design integration manager is involved in developing teaming agreements with specialty subcontractors early in the project and, compared to fixed price design-build delivery, is more involved up front in setting performance and quality expectations.

In both delivery approaches, the design integration manager works with the cost estimator and designers to develop a gap list, which involves listing items that need pricing that are not yet developed in a set of documents at 30% design completion. Developing a gap list is a critical step to ensure that all necessary items are accounted for in the project budget. The gap list is also relevant in PDB delivery when preparing the GMP at 60% to 70% design completion. Overall, the design integration manager is heavily involved in facilitating knowledge exchange between cost estimators and designers to assess different approaches, means and methods, and construction materials to ensure that the owner's requirements are met.

CHAPTER 3: ROLE OF THE DESIGN INTEGRATION MANAGER

In the water/wastewater sector, the design integration manager is essential in ensuring the successful execution of design-build projects. Water/wastewater projects pose unique challenges, including the need to manage multiple entities, contracts, and regulatory bodies. Effective management and coordination are therefore essential to ensure smooth progress, on-time delivery, and strict adherence to regulations. The role of the design integration manager can vary based on the project's size and complexity, the industry involved, and whether the project uses fixed price design-build or progressive design-build (PDB) delivery. On some teams, the responsibilities of the design integration manager may be shared between the design lead and the construction manager, depending on the unique project requirements. The design integration manager holds broader responsibilities than the pre-construction manager, working closely with the owner, engineers, contractors, and other project stakeholders to communicate and maintain design intent and requirements throughout the construction phase. The design integration manager thus bridges the engineering and construction teams, coordinating and integrating various aspects of the project to meet performance, safety, and regulatory requirements throughout the project's life cycle.

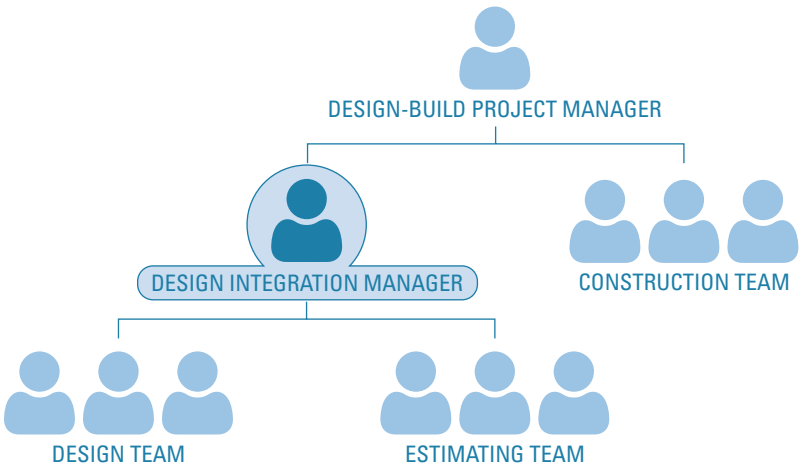
"In the water/wastewater sector, the design integration manager is essential in ensuring the successful execution of design-build projects."

Organizational Structures of Water/Wastewater Sector Projects

Establishing an effective organizational structure for a water/wastewater design-build project is paramount to achieving seamless integration between the design and construction teams. Well-defined roles for the design-build project manager, design integration manager, design team, and construction team are pivotal in ensuring the balance of the design and construction phases and facilitating efficient communication, collaboration, and coordination among team members.

Within the water/wastewater sector, various organizational structures exist and serve as possible models for implementation. Adopting one of these structures based on the needs of the project and fostering a culture of teamwork can contribute to the success of water/wastewater design-build projects. The most suitable organizational chart for a given project depends on several factors, including the project's requirements, size, and complexity and the chosen delivery method.

In one possible hierarchical structure, the design-build project manager has the ultimate authority and accountability for the project's successful completion and adherence to project objectives. This individual oversees the integration of the design and construction phases, ensuring smooth coordination between the design and construction teams. Reporting to the design-build project manager, the design integration manager (referred to by some organizations as the design project manager or engineering manager) is responsible for leading and managing the design and estimating teams and equipment procurement. This individual's primary role is to ensure effective communication and collaboration within the team of designers and engineers and to facilitate the seamless integration of process equipment into the overall design. This role is instrumental in ensuring that the project budget and schedule align with performance, quality, and compliance standards. The construction team—led by the construction manager—can be phased into the project during the pre-construction stage. This team works closely with the design team to understand the design intent and ensure constructability. This phased approach allows for early involvement of the construction team, fostering collaboration with the design team and reducing potential conflicts during the construction phase.



Organizational structure featuring a design-build project manager, design integration manager, and construction team

Some organizations adopt a modified structure with distinct roles for the pre-construction manager and design integration manager. The pre-construction manager focuses on early project planning, budgeting, and vendor/subcontractor coordination. The design integration manager works closely with the construction team, facilitating constructability assessments and ensuring that the design aligns with construction requirements.

In addition to various organizational structures, design-build teams in the water/wastewater sector can also use multiple legal structures. The design-builder could be a general contractor-led organization, a joint venture (consisting of an engineering firm and a construction firm), or an integrated design-construction firm. The interactions between the designer, builder, and owner can differ in each scenario as follows:

- **General contractor-led organization.** In this scenario, the general contractor oversees the project while an engineering subcontractor is responsible for the design. The design integration manager is most likely an employee of the general contractor.
- **Joint venture.** This scenario involves an engineering firm and construction firm agreeing to pool their resources to jointly deliver a project. Each firm retains its own identity, and the agreement lasts for the duration of the specific project. In this arrangement, the design integration manager could be an employee of the construction firm or an employee of the joint venture.
- **Integrated design-construction firm.** In this scenario, a single entity offers both design and construction services, streamlining the entire process. The design integration manager is an employee of the integrated firm.

Roles and Responsibilities of the Design Integration Manager in the Water/Wastewater Sector

In the water/wastewater sector, the role of design integration manager is both critical and multifaceted. While the general responsibilities discussed above and in *The Design-Builder's Guide to Design Management* form the foundation of the role, the specific responsibilities of the design integration manager within the water/wastewater sector can vary significantly depending on the project's scale and complexity. It is also essential to recognize that the role of design integration manager is often subject to varying interpretations and can encompass a wide range of responsibilities. Depending on the context, the design integration manager may act as a pre-construction leader, a design manager, or even a design-builder navigating the complexities of project-specific challenges.

This variability in the definition of the role underscores the need for a structured approach to delineate the responsibilities of the design integration manager clearly. Utilizing a tool such as the responsible, accountable, consulted, informed (RACI) matrix is recommended to ensure a clear understanding of various roles within the project team. The RACI matrix serves as an invaluable resource in defining the specific responsibilities of the design integration manger across different project contexts, particularly in scenarios where the role may be divided among multiple individuals or encompass diverse functions.

Following this holistic understanding of the design integration manager's role within the water/wastewater sector, ***specific key roles and responsibilities*** are described in the following sections.

Integration of Process Equipment

The design integration manager, who often has a background in construction and engineering, oversees the integration of process equipment into the overall design. Collaborating with engineers, the design integration manager gathers essential information from vendors and utilizes intelligent database systems and advanced smart plant software for coordination and 3D modeling. This early involvement of major equipment vendors is critical to addressing design issues promptly, thereby ensuring the seamless integration of equipment and systems into the design.

Emphasis on Process Engineering

In water/wastewater projects, the focus is primarily on process engineering rather than architectural aesthetics. The design integration manager is crucial in aligning design excellence with project objectives, emphasizing performance, quality, and compliance with drinking water and environmental safety standards. The design integration manager also serves as a facilitator between the team and the owner during the design stage and plays a crucial role in coordinating and documenting ideas and alternatives during the procurement stage, which enhances the outcome of the project.

Transfer and Management of Performance Risk

The management and transfer of performance risk is a key aspect of the design integration manager's responsibilities. Performance guarantees are important in the water/wastewater sector because they ensure reliability, consistency, and quality in project outcomes. The design integration manager effectively facilitates the definition and allocation of performance risks to the appropriate parties involved in the project.

Communication and Maintenance of Design Intent

The design integration manager actively communicates and maintains the original design intent throughout the construction phase and is responsible for ensuring that request for information (RFI) responses and alternative submittals align with the design requirements and performance guarantees.

Design Representation and Constructability Input

The design integration manager serves as a design representative during the construction phase and balances construction challenges with the need to uphold the intended design quality. In this regard, expertise in resolving conflicts between design and construction personnel is invaluable. In larger projects, the design integration manager is a key figure in conducting constructability reviews and coordinating between design and construction, playing a significant role in bridging gaps between engineering insights and practical construction applications.

Continued Involvement in the Warranty Period

The design integration manager's involvement may extend beyond the construction phase into the warranty period to identify design issues that may emerge as construction issues. This continued oversight remains essential in resolving post-construction issues effectively.

Coordination of Multiple Disciplines

Coordinating multiple disciplines within the same engineering firm and across multiple firms is essential for water/wastewater projects. The design integration manager's role in this regard may be fulfilled by one person or split among several individuals depending on the project size.

Early Work Packages in Construction

The design integration manager plays a key role in defining and negotiating early work packages. These are essential items that go to procurement early in the project or, for PDB projects, before the guaranteed maximum price (GMP) is established to help the owner and the team understand what is needed during the initial stages of the project.

Incorporation of a RACI Matrix for Role Clarification

Implementing a RACI matrix in water/wastewater projects is a crucial strategy for clarifying the specific roles and responsibilities of various team members. This delineation is especially important given the diverse and sometimes overlapping responsibilities within water/wastewater projects. The RACI matrix ensures efficient and clear communication and highlights the distinct roles of team members, including the design integration manager and the project manager.

What the Design Integration Manager Needs to Be Successful

The Design-Builder's Guide to Design Management provides a list of competencies that the design integration manager needs to be successful. In addition to the knowledge, skills, abilities, and other characteristics outlined in the guide, the design integration manager working in the water/wastewater sector requires a supplementary set of competencies to ensure that the design integration manager is qualified to engage in all stages of the project, from the proposal/pre-award phase to the construction phase. Knowledge, skills, abilities, and other characteristics unique to the water/wastewater sector are indicated by a faucet icon.

Key Recommended Knowledge in the Water/Wastewater Sector

	The design process and stages of design
	Construction work sequencing
	Sources of risk and risk management practices
	Familiarity with applicable local, state, and federal building codes
	Contractual terms and conditions
	Technical and operational requirements of various project types
	Specialized engineering knowledge
	Regulatory expertise and understanding of funding mechanisms
	Familiarity with maintenance of plant operations

On water/wastewater projects, possessing the right knowledge can make all the difference. Of the recommended knowledge documented in *The Design-Builder's Guide to Design Management*, the following is key in the water/wastewater sector:

- **The design process and stages of design; construction work sequencing.** In the water/wastewater sector, the design integration manager must understand the design process and stages of design and the construction means and methods for water/wastewater projects. This includes knowledge of the unique construction techniques required for water treatment plants, such as installing complex piping systems, large-scale filtration units, and biological reactors. The design integration manager must navigate the complexities of these construction techniques while sequencing construction in a way that maintains facility operations during critical upgrades or expansions. As part of this role, the design integration manager must ensure design compliance and optimize construction approaches for efficiency and effectiveness in water/wastewater treatment facilities.
- **Sources of risk and risk management practices.** In the water/wastewater sector, the design integration manager plays a pivotal role in identifying and managing risks associated with environmental compliance, community impact, and the technical complexities of water/wastewater treatment processes. A strategic approach to managing these risks is key to successful project execution.
- **Familiarity with applicable local, state, and federal building codes; contractual terms and conditions.** The design integration manager must be well-versed in the rigorous environmental regulations and safety standards governing water/wastewater treatment, including applicable local, state, and federal codes and specific water quality and discharge regulations. The design integration manager also needs expertise in managing contracts specific to water/wastewater projects, for example, contracts involving public utilities or government entities. Managing contracts such as these includes navigating public financing structures and grant requirements, which are common in the water/wastewater sector.
- **Technical and operational requirements of various project types.** The design integration manager must have a deep understanding of the latest water/wastewater treatment technologies, such as advanced filtration systems, biological treatment processes, and emerging sustainability and resource recovery techniques, to ensure the use of cutting-edge solutions in project designs.

In addition to the key recommended knowledge highlighted above, the following supplementary knowledge is required to ensure that the design integration manager is qualified and successful in the water/wastewater sector:

- **Specialized engineering knowledge.** The design integration manager in the water/wastewater sector must possess specialized engineering knowledge beyond general civil engineering knowledge. Understanding the complexities of water treatment processes, wastewater treatment technologies, and the equipment used in treatment facilities is essential. This specialized knowledge allows the design integration manager to integrate process equipment into the overall design effectively.
- **Regulatory expertise and understanding of funding mechanisms.** A proficient design integration manager must comprehensively understand regulatory requirements in the water/wastewater sector. This includes being well-versed in the environmental standards and permitting processes set forth by agencies such as the Environmental Protection Agency (EPA). Additionally, the design integration manager should understand the funding mechanisms specific to this sector because water/wastewater projects often involve public financing and grants. Navigating these funding sources, in turn, requires proficiency in documentation writing and paperwork management.
- **Familiarity with maintenance of plant operations.** Knowledge of maintenance of plant operations (MOPO) is particularly crucial for upgrade and expansion projects, which are common in the water/wastewater sector. The design integration manager must ensure that treatment plants remain operational and compliant during construction, which requires a nuanced understanding of plant operations and performance factors and underlines the importance of this knowledge in the success of water/wastewater design-build projects.

Key Recommended Skills in the Water/Wastewater Sector

	Organizing information and record keeping
	Determining client and stakeholder expectations
	Using scheduling software
	Managing change
	Communicating with and motivating teams from various sectors
	Demonstrating technical proficiency in relevant sectors
	Navigating the project environment effectively
	Problem-solving and facilitating the decision-making process

On water/wastewater projects, possessing the right skills can make all the difference. Of the recommended skills documented in *The Design-Builder's Guide to Design Management*, the following are key in the water/wastewater sector:

- **Organizing information and record keeping.** In water/wastewater projects, the design integration manager must excel at organizing information and record keeping to ensure clear and effective communication among all teams. This skill is vital for maintaining alignment in terms of project goals and facilitating smooth collaboration, both of which are particularly crucial given the multi-disciplinary nature of water/wastewater projects.

- **Determining client and stakeholder expectations.** The design integration manager is responsible for determining, managing, and balancing client and stakeholder expectations, perspectives, and needs, which are inherently diverse in water/wastewater projects. This involves transparent communication, especially when conveying challenges or updates.
- **Using scheduling software.** While technical proficiency in scheduling software is important, the design integration manager's ability to leverage schedules effectively is an even more critical skill. The design integration manager must ensure realistic and achievable timelines through an understanding of the specific constraints and complexities unique to water/wastewater projects.

In addition to the key recommended skills highlighted above, the following supplementary skills are required to ensure that the design integration manager is qualified and successful in the water/wastewater sector:

- **Managing change.** The design integration manager needs strong change management skills to control scope creep and manage changes efficiently after design validation. Implementing a robust change management process is essential to avoid unnecessary alterations during the construction phase of water/wastewater projects.
- **Communicating with and motivating teams from various sectors.** Excellent communication and motivation skills are crucial for the design integration manager. The design integration manager must manage information effectively and motivate the design and construction teams to work collaboratively. These skills are especially important in water/wastewater projects, where meeting budget and schedule constraints is often challenging.
- **Demonstrating technical proficiency in relevant sectors.** Water/wastewater projects involve various sectors, each with unique characteristics. A skilled design integration manager should possess technical expertise that can bridge the gaps between these sectors. For successful public sector projects, it is vital for the design integration manager to understand municipal regulations, public procurement procedures, community engagement, and how to lead partnering sessions/chartering sessions. Simultaneously, the design integration manager should know private industry practices while adapting to the technical complexities that the private sector offers for water/wastewater projects.
- **Navigating the project environment effectively.** The design integration manager in the water/wastewater sector often operates in complex project environments with multiple stakeholders, including owners, engineers, contractors, and regulatory authorities. An effective design integration manager should have strong communication and interpersonal skills to facilitate collaboration and coordination (e.g., coordination of construction input during the design stage and of constructability, safety, and budgeting throughout the project) among diverse teams. Communicating with and accommodating operation and maintenance (O&M) staff during design, construction, tie-ins, and startup and navigating a variety of interests and priorities are crucial for project success.
- **Problem-solving and facilitating the decision-making process.** Water/wastewater projects can present unforeseen challenges and technical complexities. A capable design integration manager should possess excellent problem-solving skills to address issues promptly and proactively. Facilitating the decision-making process is also vital in resolving conflicts and finding efficient solutions that align with project goals and regulatory requirements. To develop these skills, the design integration manager can undergo design-build training, become certified by the Design-Build Institute of America (DBIA), and earn certification in emotional intelligence.

Key Recommended Abilities and Other Characteristics in the Water/Wastewater Sector

	Adaptable
	Engaging in continuous learning
	Foreseeing potential issues
	Flexible

On water/wastewater projects, possessing the right abilities and other characteristics can make all the difference. Of the recommended abilities and other characteristics documented in *The Design-Builder's Guide to Design Management*, the following are key in the water/wastewater sector:

- **Adaptable; engaging in continuous learning.** The water/wastewater sector continuously evolves with advancements in technology, changes in regulations, and emerging environmental concerns. The design integration manager should be adaptable to embracing new methodologies and best practices and should continuously acquire new knowledge to stay current with industry trends.

In addition to the key recommended abilities and other characteristics highlighted above, the following supplementary abilities and other characteristics are required to ensure that the design integration manager is qualified and successful in the water/wastewater sector:

- **Foreseeing potential issues.** In the water/wastewater sector, a key ability for the design integration manager is to foresee potential issues and anticipate challenges throughout the project, such as those stemming from regulatory changes or technical difficulties. Owners often select a design-build team based on the team's demonstrated ability to predict and manage these issues, especially when key personnel are critical to selection. The design integration manager must also be knowledgeable about the potential issues that may arise due to specific requirements such as Buy American, Build American (BABA), which can impact funding and project execution in the water/wastewater sector.
- **Flexible.** The design integration manager in the water/wastewater sector must demonstrate flexibility and, by extension, patience, particularly given the dynamic nature of operations and client requirements in water/wastewater projects. This characteristic helps the design integration manager adapt to changes in project scope or client needs and maintain a steady approach amidst the evolving water and wastewater management landscape.

CHAPTER 4: PROPOSAL/PRE-AWARD PHASE

Description of Phase

The proposal/pre-award phase commences when the design-builder begins to develop its team, often before the project announcement is published. Teaming agreements are an essential aspect of project planning in the water/wastewater sector. Establishing a partnership in advance of the announcement can ensure that team members are able to collaborate in order to meet client expectations and requirements, and teaming agreements are begun early in the process because negotiating contract terms with partners can take time. The phase concludes when the contract between the owner and the selected design-builder is finalized. In the water/wastewater sector, the proposal/pre-award phase may also be identified as the estimating phase, especially for industrial projects. Depending on the project's size, type, complexity, and allotted time, this phase may last from a few weeks to a few months.

The tasks of the design integration manager during the proposal/pre-award phase largely align with those in *The Design-Builder's Guide to Design Management*, with a few changes. Two tasks related to communication with partners have been moved from the post-award phase to this phase due to the importance of establishing effective and frequent communication among team members early in water/wastewater projects. The frequency of two tasks have changed and two new tasks have been added to reflect the specific needs of water/wastewater projects. The design integration manager's specific tasks during this phase depend on the design-build delivery method selected (fixed price or progressive design-build [PDB]). Depending on the project, the project manager or the pre-construction manager may also manage some of the tasks listed with assistance from the design integration manager.

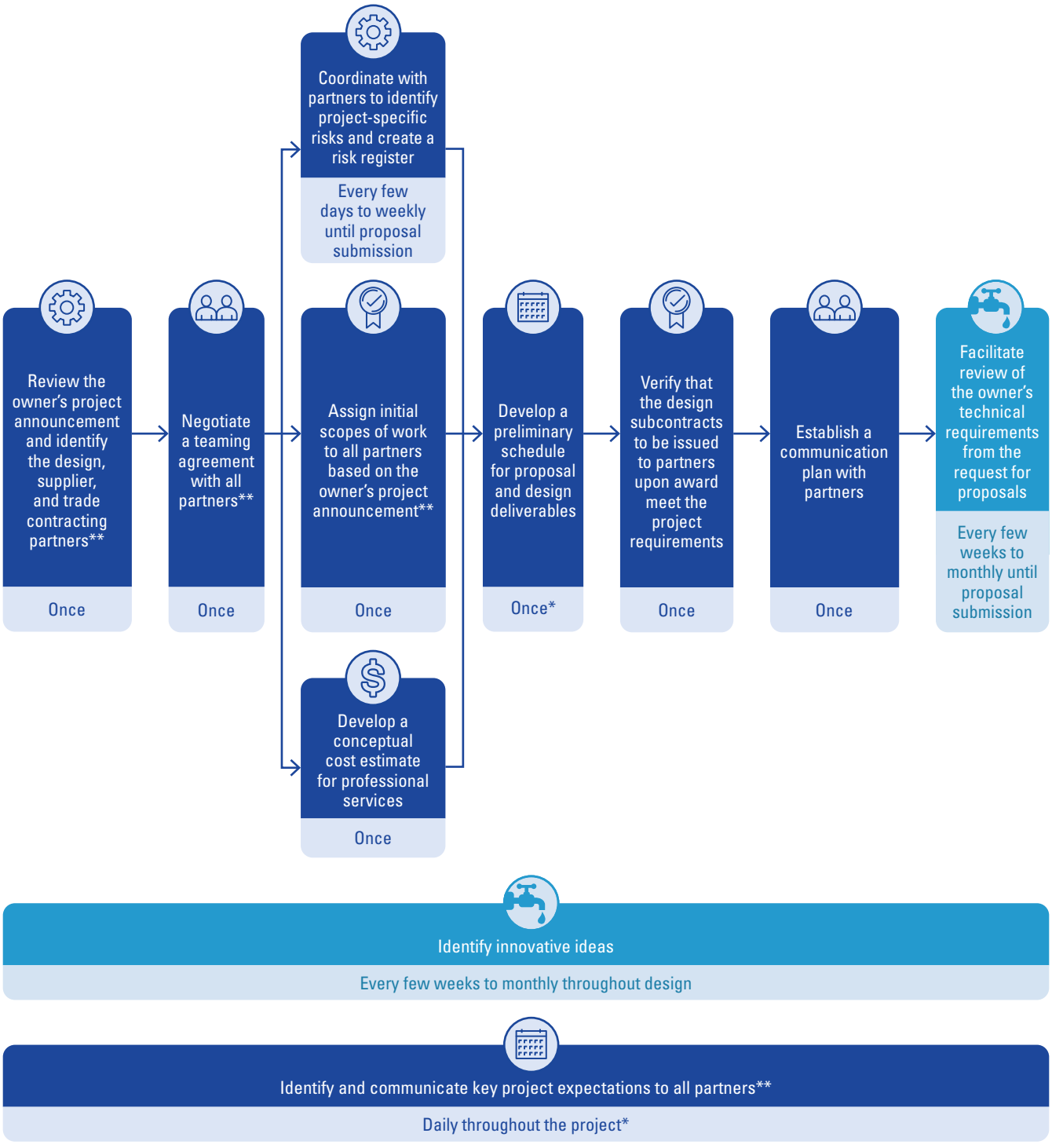
The Role of the Design Integration Manager

The design integration manager's involvement in the proposal/pre-award phase may include contributing to the development of the high-level conceptual design, developing schedules and estimates, and providing feedback on teaming agreements. Starting with this phase, the design integration manager should begin maintaining design evolution documentation reflecting design decisions and projected cost estimates. During the proposal/pre-award phase, the design integration manager's role will vary depending on the project's type, size, and complexity and on whether the project uses fixed price or PDB delivery.

"During the proposal/pre-award phase, the design integration manager's role will vary depending on the project's type, size, and complexity and on whether the project uses fixed price or PDB delivery."

In **fixed price design-build** delivery, the design integration manager has a more significant role during proposal preparation. A key difference between projects in the water/wastewater sector and projects in other sectors is that water/wastewater projects require a high level of engineering detail and complexity at the front end because the process design developed during the proposal/pre-award phase must meet regulatory requirements. Owners may also provide selection criteria that encourage innovative ideas and alternative design concepts during procurement. In such cases, it is crucial for the design integration manger to manage and incorporate creative ideas but not exceed the owner's desired cost. A firm price needs to be provided for this delivery method.

In **PDB** delivery, the design integration manager has a much less significant role during the proposal/pre-award phase. The design integration manager may be involved with conceptual planning, estimating costs, and ensuring that all participants understand the project. Because proposed designs are often developed in a way that satisfies requirements and regulations, the design integration manager works with the design-build team to consider scenarios that may occur during the project (e.g., involving weather conditions or site location). Estimates are then developed for the design that address the potential scenarios. The risk register is developed particularly early in water/wastewater projects to facilitate this process and therefore generally aligns with the cost estimates. These estimates must be reviewed and revised continually throughout this phase because the design can easily change. As with fixed price delivery, the design integration manager confirms that the design aligns with the project budget. The involvement of the design integration manager will increase when the project is awarded to the design-build team.



** Phrasing has been modified slightly from The Design-Builder's Guide to Design Management to reflect the unique characteristics of the water/wastewater sector*

*** Task typically managed by the project or pre-construction manager with assistance from the design integration manager*

Workflow of the design integration manager's tasks during the proposal/pre-award phase

Additional Task: Facilitate Review of the Owner's Technical Requirements from the Request for Proposals

Every few weeks to monthly until proposal submission

A key task for the design integration manager that is specific to water/wastewater sector projects is to review the technical requirements from the request for proposals (RFP) to ensure that the proposed project meets the owner's needs.

Knowledge	Skills	Abilities	Other Characteristics
• Familiarity with applicable local, state, and federal building codes • The design process and stages of design • Technical and operational requirements of various project types • Project roles and the work responsibilities commonly associated with each role • Regulatory expertise and understanding of funding mechanisms	• Conveying a message in written form • Conveying information verbally • Organizing information and record keeping • Determining client and stakeholder expectations • Demonstrating technical proficiency in relevant sectors • Navigating the project environment effectively • Problem-solving and facilitating the decision-making process	• Collecting, analyzing, and interpreting information • Focusing on and remembering details	• Empathetic • Respectful

In the proposal/pre-award phase, the design integration manager facilitates the design-build team's review of the technical requirements listed in the RFP to ensure that owner's needs and performance criteria are met. Based on the outcomes of this task, the design integration manager works with the design-build team to establish the basis of the design.

Additional Task: Identify Innovative Ideas

Every few weeks to monthly throughout design

A key task for the design integration manager that is specific to water/wastewater sector projects is to solicit innovative ideas from the design-build team.

Knowledge	Skills	Abilities	Other Characteristics
• The design process and stages of design • Construction work sequencing • Specialized engineering knowledge	• Compromising and finding equitable solutions • Solving design problems • Reading and understanding design drawings • Problem-solving and facilitating the decision-making process	• Collaborating with partners • Devising innovative solutions • Focusing on and remembering details • Collecting, analyzing, and interpreting information	• Focused • Trustworthy • Adaptable • Decisive

Using a process commonly referred to as value engineering, the design integration manager encourages team members to propose innovative ideas that can save time and money while meeting project requirements. Reducing the project's cost through incorporating innovative ideas can help the design integration manager maximize the scope within the allotted budget. This task is recommended to be conducted several times until the design is completed.

CHAPTER 5: POST-AWARD PHASE

Description of Phase

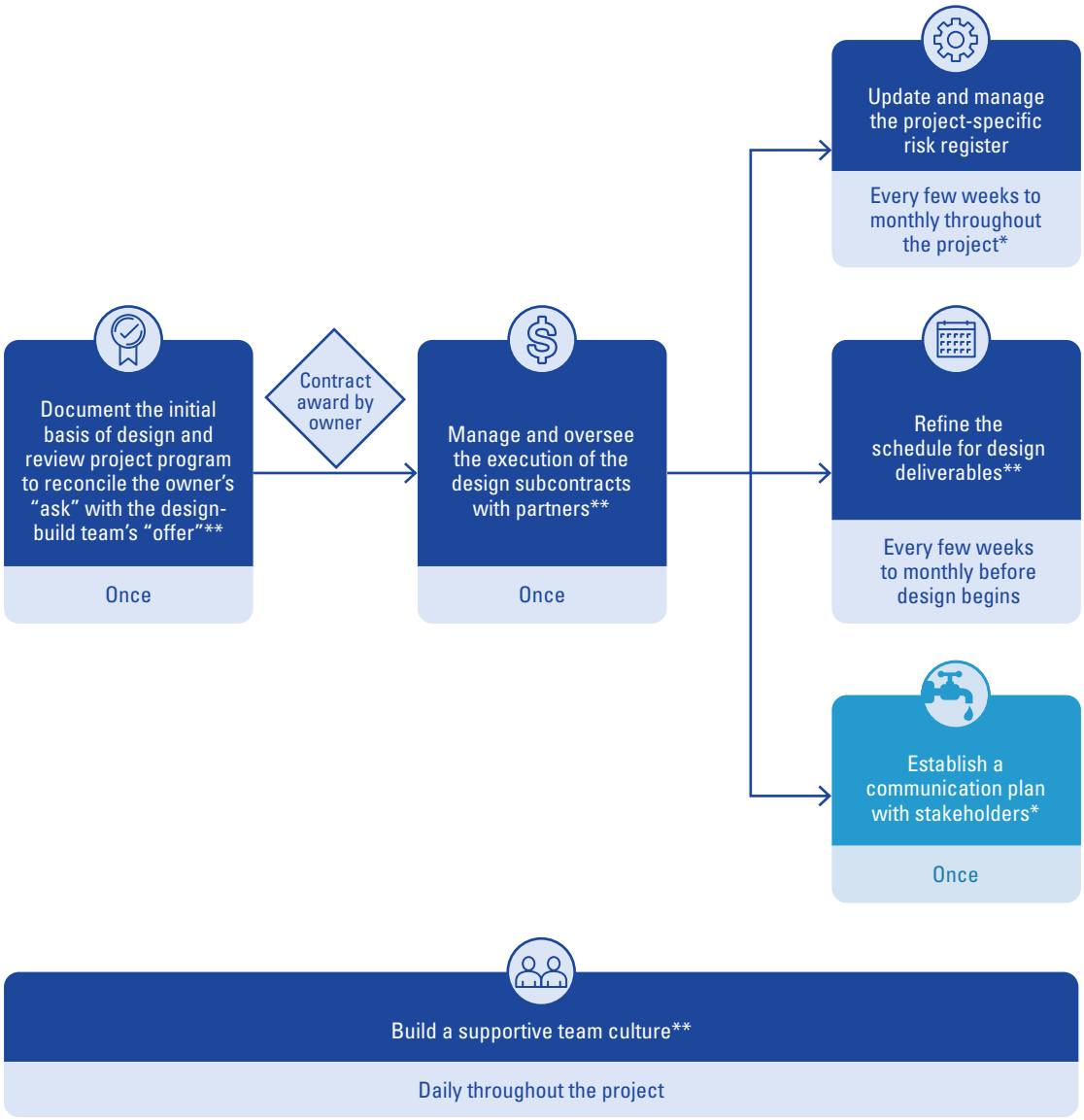
The post-award phase commences when the owner selects the design-build team via a notice of intent, and the phase concludes when subcontracts are issued to all partners.

The tasks of the design integration manager during the post-award phase largely align with those in *The Design-Builder's Guide to Design Management*, with a few changes. Two tasks have been moved from this phase to the proposal/pre-award phase to establish effective and frequent communication with partners earlier in the project, and one new task has been added to establish coordination and communication among the design-build team as the proposal becomes a feasible project. In the post-award phase, there are no significant differences between the progressive design-build and fixed price design-build delivery methods in terms of the tasks required of the design integration manager.

The Role of the Design Integration Manager

The design integration manager's tasks during the post-award phase may include facilitating execution of the design subcontracts with partners, documenting the initial basis of design, refining the project schedule, and building a supportive team culture. However, a full-service engineering firm may assign management of some or all of the engineering tasks to the project manager or pre-construction manager depending on the project's size and complexity. In such cases, the design integration manager in the water/wastewater sector may not manage those tasks.

> *"The design integration manager's tasks during the post-award phase may include facilitating execution of the design subcontracts with partners, documenting the initial basis of design, refining the project schedule, and building a supportive team culture."*



** Phrasing has been modified slightly from The Design-Builder's Guide to Design Management to reflect the unique characteristics of the water/wastewater sector*

*** Task typically managed by the project or pre-construction manager with assistance from the design integration manager*

Workflow of the design integration manager's tasks during the post-award phase

Additional Task: Establish a Communication Plan with Stakeholders

Once

A key task for the design integration manager that is specific to water/wastewater sector projects is to establish a comprehensive communication plan with project stakeholders.

Knowledge	Skills	Abilities	Other Characteristics
• Project roles and the work responsibilities commonly associated with each role	• Conveying information verbally • Delivering presentations to a variety of audiences • Managing stress effectively • Communicating with and motivating teams from various sectors • Navigating the project environment effectively	• Establishing and maintaining relationships • Collecting, analyzing, and interpreting information • Working well under time pressure • Engaging in continuous learning	• Assertive • Adaptable • Accountable • Empathetic • Patient • Flexible

In this task, the design integration manager establishes a comprehensive communication plan with project stakeholders to support early coordination and collaboration as the project begins to coalesce. In establishing this plan, the design integration manager develops the systems, protocols, and expectations that will lead to beneficial communication among team members and ensure that all parties are on track with their responsibilities on the project. Enabling effective communication through this plan early in the project is a powerful tool for project success.

CHAPTER 6: EARLY DESIGN PHASE

Description of Phase

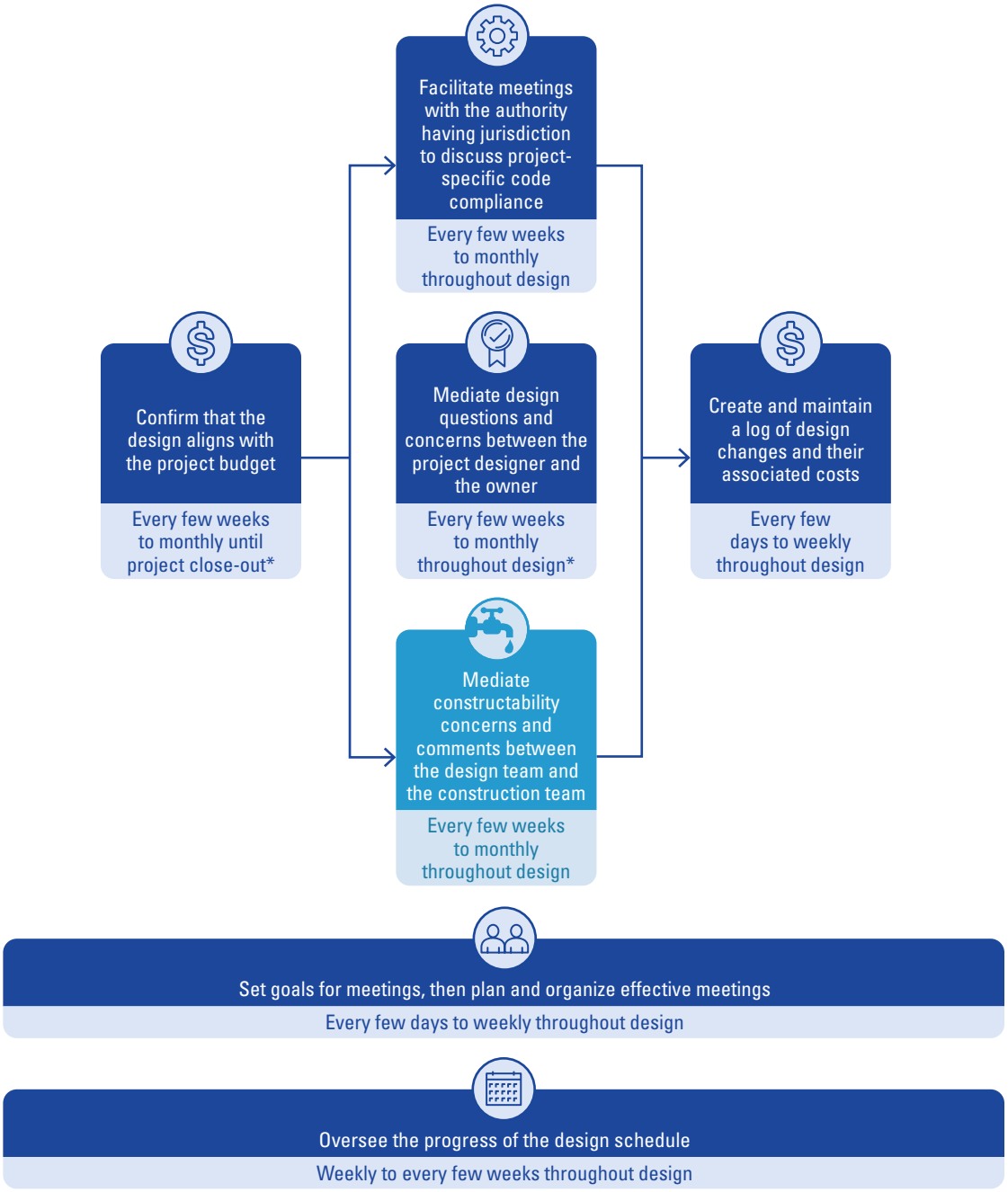
In the early design phase, the design team begins involving the construction team in early communication and design coordination.

The tasks of the design integration manager during the early design phase align with those in *The Design-Builder's Guide to Design Management*, apart from changes to the frequency of two tasks and the addition of one new task. The new task is applicable to both the fixed price design-build and progressive design-build delivery methods and ensures that the construction team and the design team are communicating effectively regarding constructability. In the water/wastewater sector, the use of early work packages is beneficial during this phase to produce discrete packages of work that can occur before the final contract price is established. It is essential for project participants to agree on and have a clear understanding of what is included in these packages.

The Role of the Design Integration Manager

During this phase, the design integration manager oversees the design development in collaboration with the lead design team and coordinates with the client and other stakeholders to ensure that the design meets the project requirements and the level of development (LOD) specifications. To this end, the design integration manager tracks the design progress by comparing the accomplished work against the project's schedule, budget, and goals. Also in this phase, the construction team works with the design team to track and confirm the project's scope against the owner's confirmed scope to determine whether any deviations have occurred and, if so, work collaboratively to resolve them.

"During this phase, the design integration manager oversees the design development in collaboration with the lead design team and coordinates with the client and other stakeholders to ensure that the design meets the project requirements and the level of development specifications."



** Phrasing has been modified slightly from The Design-Builder's Guide to Design Management to reflect the unique characteristics of the water/wastewater sector*

Workflow of the design integration manager's tasks during the early design phase

Additional Task: Mediate Constructability Concerns and Comments between the Design Team and the Construction Team

Every few weeks to monthly throughout design

A key task for the design integration manager that is specific to water/wastewater sector projects is to ensure that the construction team and the design team are communicating effectively regarding constructability.

Knowledge	Skills	Abilities	Other Characteristics
• The design process and stages of design • Construction means and methods • Document management procedures • Contractual terms and conditions • Construction work sequencing • Experience and reputation of local architectural and engineering design service providers	• Listening • Negotiating with partners and stakeholders • Resolving conflict among people on the project team • Compromising and finding equitable solutions • Demonstrating technical proficiency in relevant sectors • Navigating the project environment effectively • Problem-solving and facilitating the decision-making process	• Collaborating with partners • Speaking comfortably in a group situation • Foreseeing potential issues	• Adaptable • Self-motivated • Accountable • Creative • Respectful • Patient • Flexible

Constructability reviews, in which the construction and design teams assess the design with respect to construction realities, are necessary to ensure that project goals are being met and that constructability issues are not affecting operations and ongoing activities. The primary objective of a constructability review is to ensure efficient and effective construction by aligning the design with construction requirements throughout the design process. Typically, the owner does not moderate the constructability review process; rather, the process is internal to the design-build team and is intended to ensure collaborative delivery. The design integration manager mediates the review and answers any concerns or comments from design or construction staff. Constructability mediation should occur throughout the design phases to provide recommendations and feedback to both the design and construction teams.

CHAPTER 7: DETAILED DESIGN PHASE

Description of Phase

In the detailed design phase, a series of design reviews are conducted continuously to address stakeholders' concerns regarding safety and to document the design process. Detailed engineering is underway at this point, and in many cases the construction team is becoming more involved in the project. This phase is executed differently depending on whether the project uses fixed price design-build or progressive design-build (PDB) delivery. In PDB delivery, the design development is typically considered complete when the design is around 60% to 90% complete. However, the exact point at which the design development is considered complete can vary depending on the project's size, complexity, and specific requirements. In some cases, the design development may extend beyond 90% completion, particularly for large or complex projects. As the design development progresses, the design team prepares the plans and specifications for construction.

The tasks of the design integration manager during the detailed design phase align with those in *The Design-Builder's Guide to Design Management*, apart from changes to the frequency of one task and the addition of one new task regarding internal milestones for design elements.

The Role of the Design Integration Manager

During the detailed design phase, the design integration manager's tasks may include facilitating quality checks, documenting the final basis of design and obtaining owner approval, maintaining morale, establishing and managing internal milestones for design elements, and tracking the project's cost and schedule. Throughout this phase, the design integration manager continues to oversee the design development in collaboration with the design team to ensure that the design meets the project requirements and level of development (LOD) specifications. The design is reviewed at 30%, 60%, and 90% completion.

In this phase, the design integration manager must closely track and monitor the project's cost because of the potential for scope creep. The scope of the project can increase or decrease as the design progresses, affecting the cost. It is therefore important to track the design evolution through the use of decision logs, change logs, and the risk register and to track associated costs.

"During the detailed design phase, the design integration manager's tasks may include facilitating quality checks, documenting the final basis of design and obtaining owner approval, maintaining morale, establishing and managing internal milestones for design elements, and tracking the project's cost and schedule."

** Phrasing has been modified slightly from The Design-Builder's Guide to Design Management to reflect the unique characteristics of the water/wastewater sector*

Workflow of the design integration manager's tasks during the detailed design phase

Additional Task: Establish and Manage Internal Milestones for Design Elements

Every few weeks to monthly throughout design

A key task for the design integration manager that is specific to water/wastewater sector projects is to establish and manage internal milestones for design elements.

Knowledge	Skills	Abilities	Other Characteristics
• The design process and stages of design	• Managing time • Managing change • Organizing information and record keeping • Forecasting cost and schedule impacts • Managing and tracking project costs	• Focusing on and remembering details	• Accountable • Focused • Timely

In this task, internal milestones are established and managed to ensure that the project is on track in terms of schedule and cost. This task is conducted every few weeks to monthly throughout the detailed design phase.

CHAPTER 8: CONSTRUCTION PHASE

Description of Phase

The construction phase includes obtaining the necessary approvals and building permits to begin construction, procuring materials and equipment, executing the construction work, and conducting commissioning and startup activities. The design-build team must collaborate closely with the owner and other stakeholders to ensure that the project is constructed according to the specified requirements and to everyone's satisfaction.

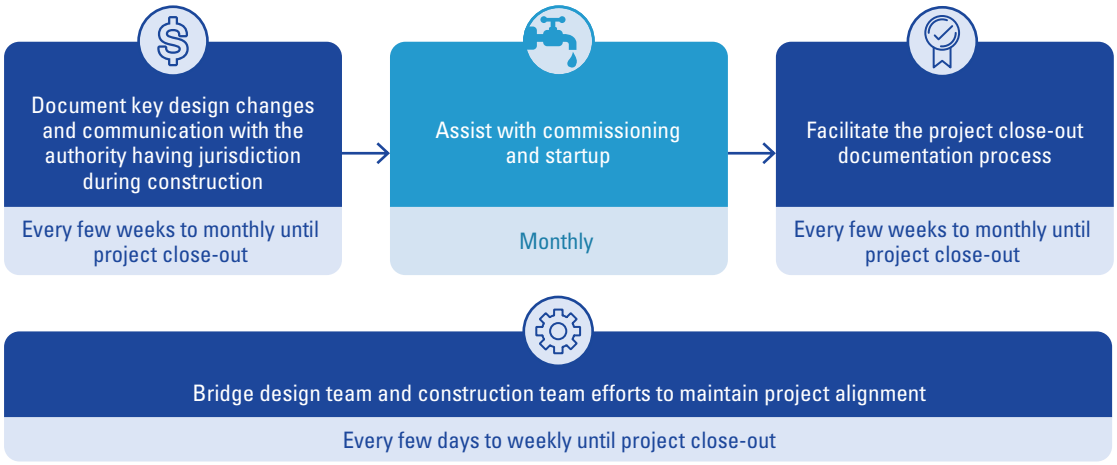
The tasks of the design integration manager during the construction phase align with those in *The Design-Builder's Guide to Design Management*, apart from the addition of one new task related to commissioning and startup activities.

The Role of the Design Integration Manager

As the project progresses into the construction phase, the workload of the design integration manager naturally decreases and shifts to facilitating design changes, managing any remaining coordination tasks, and assisting with project closeout documentation. The design integration manager often remains involved throughout this phase until the operational team takes over or, in some cases, until the design is at 100% completion. If the project includes multiple work packages, the design integration manager may stay on longer to assist.

In the construction phase, the design integration manager typically focuses on maintaining the design intent, addressing issues or changes, and ensuring compliance, reliability, and capacity. The design integration manager acknowledges and documents critical decisions related to design throughout the construction process. These decisions may be prompted by field conflicts, inspection requests, or incorporation of innovative ideas that were previously discussed. The design integration manager also coordinates any requests for information (RFIs) and submittals and may address RFIs that do not need to go to the design team. The design integration manager negotiates responsibility for communication and costs related to these items. The budget for the design must be continuously managed and recorded throughout project.

"In the construction phase, the design integration manager typically focuses on maintaining the design intent, addressing issues or changes, and ensuring compliance, reliability, and capacity."



Workflow of the design integration manager's tasks during the construction phase

Additional Task: Assist with Commissioning and Startup

Monthly

A key task for the design integration manager that is specific to water/wastewater sector projects is to assist with commissioning and startup activities.

Knowledge	Skills	Abilities	Other Characteristics
• Familiarity with applicable local, state, and federal building codes • The design process and stages of design • Construction means and methods • Construction work sequencing • Technical and operational requirements of various project types • Familiarity with maintenance of plant operations	• Using scheduling software • Leading pull planning processes • Persuading others of a position • Organizing information and record keeping • Managing change	• Focusing on and remembering details • Speaking comfortably in a group situation	• Accountable • Timely

Careful consideration of commissioning and startup activities is important to ensure a smooth transition from design to construction. Before construction begins, the design-build team involves the owner's operation and maintenance (O&M) team in developing commissioning and startup plans. These plans remain a work in progress as construction proceeds but must be completed before the check-out process begins. As part of commissioning and startup, the design-build team runs component and systems tests based on acceptance criteria developed during the proposal/pre-award phase. The O&M team may observe the testing and be involved in training to operate the facility during testing. Meanwhile, the design-build team uses the acceptance testing to prove that the facility will operate under various conditions and comply with the performance requirements. The design integration manager assists in the commissioning and startup activities, interacting with the owner and O&M team in developing the documents for commissioning and O&M and facilitating the acceptance testing. This process can take several weeks to complete.

GLOSSARY

B

Buy American, Build American (BABA)
Regulations and policies that encourage the use of American-made products and American labor in construction projects.

E

Early work packages
Specific construction activities that are defined and performed separately before the final contract price has been reached.

Environmental Protection Agency (EPA)
Federal agency responsible for enforcing and managing national environmental standards.

G

Gap list
A list of items that had not been budgeted in the price proposal.

M

Maintenance of plant operations (MOPO)
A management strategy for maintaining plant operations in water/wastewater facilities, especially during retrofitting and upgrading projects.

O

Operation and maintenance (O&M) planning
A planning process for ensuring the long-term performance and operation of water/wastewater facilities.

Owner advisor (OA)
Typically a third-party consultant or firm hired by a project owner to provide specialized expertise, advice, and guidance throughout the various phases of a construction project.

R

Responsible, accountable, consulted, informed (RACI)
A matrix used for defining roles and responsibilities in complex projects to ensure the clarity of decision-making processes.

S

Startup
The point in a project at which construction activities officially commence and contractors, subcontractors, and construction teams mobilize to the site to carry out the planned construction activities.

Sitting at the intersection of multiple parties in a design-build project, the design integration manager must organize and manage the activities of many individuals to conceptualize and develop the project design.

In water/wastewater design-build projects, the role of the design integration manager spans five distinct phases:

PROPOSAL/PRE-AWARD PHASE

POST-AWARD PHASE

EARLY DESIGN PHASE

DETAILED DESIGN PHASE

CONSTRUCTION PHASE

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