



# AN OWNER'S GUIDE TO PROJECT DELIVERY METHODS: CONSTRUCTION MANAGEMENT ASSOCIATION OF AMERICA

## PREFACE

This document is an introductory guide for owners who face the choice of delivery methods for their projects, and for the construction and program managers whose role it is to advise owners and to manage the design and construction process utilizing the most appropriate method.

While not intended to be an exhaustive analysis of each delivery method, this guide provides a comparison among the various available methods, an outline of the pros and cons of each, and an overview of the role of a program manager or agency construction manager in each delivery method.

There are many delivery methods in use today, but virtually all of them are variations of the four most common methods that are the subject of this document. Closely related to project delivery methods are procurement strategies, contractual arrangements, and compensation methods. While not the focus of this document, there is a brief discussion that touches on how these contract strategies align with the various delivery methods.

Project delivery methods will continue to evolve. This guide is thus a reflection of today's construction market, and will be periodically updated to reflect future developments. The characteristics of each delivery method are objectively presented in keeping with the Construction Management Association of America (CMAA) policy of remaining delivery method neutral.

## EXECUTIVE SUMMARY

How the project will be designed and constructed, or the project delivery method, is one of the most important decisions made by every owner embarking on a construction project. With a variety of delivery methods in use today across the design and construction industry, it is possible to tailor a delivery method that best meets the unique needs of each owner and each project.

Several fundamental project considerations are directly impacted by the delivery method selected. These considerations include the need to adhere to a realistic budget, a schedule that accurately presents the performance period, a responsive and efficient design process that leads to a quality set of documents, a thorough risk assessment followed by the proper allocation of risk by the owner, and a recognition of the level of expertise within the owner's organization or available to it.



There is a wealth of information in the public domain regarding alternative delivery methods. Most treatments divide the various options into three basic categories: Design-Bid-Build, Construction Management At Risk, and Design-Build. Recent discussions, including in this guide, add a fourth method: Integrated Project Delivery. Other delivery methods are variations of these four, and are treated as such for our purposes.

The project delivery methods examined are:

- **Design-Bid-Build (DBB)** — The traditional U.S. project delivery method, which customarily involves three sequential project phases: design, procurement, and construction.
- **Construction Management At Risk (CMAR or CM@R)** — A project delivery method in which the construction manager acts as a consultant to the owner in the development and design phases, but assumes the risk for construction performance as the equivalent of a general contractor holding all trade subcontracts during the construction phase. This delivery method is also known as CM/GC.
- **Design-Build (DB)** — A project delivery method that combines architectural and engineering design services with construction performance under one contract.
- **Integrated Project Delivery (IPD)** — A project delivery method that contractually requires collaboration among the primary parties — owner, designer, and builder — so that the risk, responsibility and liability for project delivery are collectively managed and appropriately shared.

Each of these project delivery methods carries a different level of risk for the owner. Generally, the level of control retained by the owner correlates with the level of risk, and those levels typically have an inverse relationship to the risk and control levels of the contractor.

None of these delivery methods is right for every project. For each situation, there will be advantages and disadvantages in the use of any specific method. The owner needs to carefully assess its particular project requirements, goals, and potential challenges and find the delivery method that offers the best opportunity for success.

Construction management is a discipline uniquely tailored to the planning, design, and construction process of capital projects. Agency construction management is a management process whereby the owner utilizes a construction manager (CM) as its principal agent to advise on or manage the process over the life of the project, or during specific phases of the project. The use of agency construction management, whether through an in-house resource to the owner or from a third-party firm, has proven effective regardless of the chosen contract form or project delivery method. The role of the CM on each project delivery method is discussed in this document.

Whether provided through owner staffing or a third-party firm, the CM should be engaged as early in the project as possible to guide and assist the owner through all phases of delivering the project. In fact, the CM can be an invaluable source of advice and counsel to the owner when choosing the optimum delivery method for a project. The CM may also act as the owner's representative to the rest of the project team, being the point of contact for the designer, contractor, and other specialty consultants engaged in the project by the owner.

Contracting and compensation methods for professional services and construction services will generally fall into one of three categories: Lump Sum/Fixed Price (LS), Guaranteed Maximum Price (GMP), or Reimbursable. These methods are not specific to any particular delivery method, and may be applied to contracting for professional services, such as design, engineering, and construction management, as well as contracting for construction services.

Procurement of professional and construction services will generally be accomplished in one of three methods: price-based, qualifications-based, or a combination of both. Procurement may also involve a single project award or multiple project awards. Like contracting methods, these procurement methods are not specific to any particular delivery method.

Every construction project or program is unique, and for each, there is an optimum project delivery method. It requires expertise and experience to select the right delivery method for a particular situation.

## INTRODUCTION

Every owner responsible for the implementation of a construction project must make an early and important decision regarding the method by which the project will be designed and constructed — the project delivery method. This decision has become more difficult in recent years as several alternative delivery methods have been developed to address potential weaknesses in the traditional design-bid-build scenario. Methods that have gained in popularity include construction management at risk, multiple prime contracting, dB, and the latest, IPD. Proponents of particular alternative methods advocate or promise improvements over the traditional system in terms of project schedule and cost control, and the number of disputes.

For the owner, with a wealth of choices available, the ultimate decision can be both good and bad. The downside is that with the variety of delivery systems, along with the accompanying assurances of the superiority of one method over another, confusion is inevitable. The good news is the increased number of alternatives offers the owner or developer more flexibility to choose an appropriate and effective system for its particular project.

Construction Management is a discipline uniquely tailored to the planning, design, and construction process of capital projects. It has proven effective regardless of the chosen contract form or project delivery method. Indeed, owners have utilized construction management successfully in all contracting methods and delivery systems, using either internal staffing or third-party firms. It is particularly helpful for owners who do not continuously maintain a construction management staff in numbers or qualifications necessary to deal with the complex responsibilities involved in the management of major projects.

A companion CMAA document, *An Owner's Guide to Construction and Program Management* defines construction management and program management as follows:

- **Construction Management** is a professional management practice applied to construction projects from project inception to completion for the purpose of controlling time, cost, scope and quality.
- **Program Management (PM)** is the practice of professional construction management applied to a capital improvement program of one or more projects from inception to completion. Comprehensive construction management services are used to integrate the different facets of the construction process — planning, design, procurement, construction, and commissioning — for the purpose of providing standardized technical and management expertise on each project.

Construction management comes in two general, but very different, forms: agency construction management (CMA) and CMAR or CM@R. Outside of this document, the abbreviation CM can be used to mean many things. For clarity, the following abbreviations will be used for the remainder of the discussion to distinguish between various uses of the CM abbreviation:

- **CMA:** Agency Construction Management — a management process.
- **CMAR:** Construction Management at Risk — a delivery method.
- **CM:** Construction Manager — a person or firm acting in an agency role.
- **CMR:** Construction Manager at Risk — a person or firm acting in an at-risk role

Agency Construction Management, a management process, can be implemented regardless of the project delivery method. In CMA, the owner utilizes a CM as its principal agent to advise on or manage the process over the life of the project, or specific phases of the project.

PM, also a management process, is the practice of professional construction management applied to a capital improvement program of one or more projects. For the purposes of this document, only CMA will be discussed since the CMA discussion also can be applied to program management.

CMAR, a delivery system, is similar in many ways to the Design-Bid-Build system, in that the CMR acts as a general contractor during construction. The CMR holds the risk of subletting the construction work to trade contractors and typically guaranteeing completion of the project for a fixed, negotiated price following completion of the design. However, in this arrangement, the CMR also provides advisory management assistance to the owner prior to construction, offering schedule, budget, and constructability advice during the project planning and design phases. Thus, instead of a traditional general contractor, the owner deals with a hybrid CM/general contractor.

## CONSIDERATIONS IN SELECTING A DELIVERY METHOD

### Owners Requirements and Risk Considerations

An owner has several areas of concern when embarking on a construction program or project. It is necessary to choose an overall project delivery and contracting strategy that effectively and efficiently delivers the project. The following are some of the key considerations that will influence the selection of the project delivery method for a project:

#### Budget

Determining a realistic budget before design to evaluate project feasibility, to secure financing, to evaluate risk, and as a tool to choose from among alternative designs or site locations, is a primary need. Once the budget is determined, the owner requires that the project be completed at or near the established budget figure. Owners must decide how quickly they need to establish final project costs and with what risk level of exceeding this cost.

#### Design

Of foremost importance to the owner is that the desired facility function as envisioned while successfully fulfilling the needs of the owner and users. Therefore, the design team should be well qualified in the type of facility being designed. In addition, the owner must ensure that the program needs are clearly conveyed to the design team. Since the design of the facility must be buildable and design intent must be properly communicated, the owner requires that the design documents are constructible, complete, clear and coordinated. The documents should properly incorporate unique features of the site to include subsurface

conditions, interfaces with adjoining properties, access, and other characteristics. Owners must decide how much control they need to have over the design elements of a project.

## Schedule

The owner has similar needs in the area of scheduling. The dates of design commencement, construction completion, and ultimately the operation of a new facility can be critical, either in terms of generating revenue from the facility, or in terms of providing needed functional space by a particular deadline. Therefore, a realistic assessment of project duration and sequencing needs to be performed early in the planning process. The schedule must then be monitored and updated throughout the design, construction and pre-occupancy phases to achieve the desired goal. An owner must decide how critical it is to minimize schedule duration for a project.

## Risk Assessment

In construction, issues of risk are closely tied to the status of the local construction market, on-site safety, the schedule, and the budget. The owner requires an understanding of the risks involved in construction, and should make a conscientious decision regarding allocation of these risks among project participants, so that all areas of exposure are properly understood. In considering risk allocation, the owner should strive to assign risks to those parties that can best exercise control over those aspects. For example, it would typically be problematic to require that the contractor correct problems due to design errors or changes at no extra cost since a contractor generally has little control over the cause or magnitude of such errors or changes. An owner must decide how much project risk they are comfortable in assuming.

## Owner's Level of Expertise

The owner's familiarity with the construction process and level of in-house management capability has a large influence over the amount of outside assistance required during the process, and may guide the owner in determining the appropriate project delivery method. An owner must make an assessment of its ability to properly perform under the various delivery methods.

## Project Delivery Methods Available to Owners

A project delivery method is a system designed to achieve the satisfactory completion of a construction project from conception to occupancy. A project delivery method may employ any one or more contracting formats to achieve the delivery.

Because of financial, organizational, and time constraints, various project delivery methods have evolved to fit particular project and owner needs. Most delivery methods used today

are variations of three methods: DBB, CMAR, and DB. A fourth method, IPD, although to-date only used on a negligible number of projects, is included here due to the attention it is getting and the interest in understanding the concept. The four methods and the primary variations are:

**Design-Bid-Build (DBB)** — The traditional U.S. project delivery method, which typically involves three sequential project phases: The design phase, which requires the services of a designer who will design the project; the bid phase, when a contractor is procured; and a build or construction phase, when the project is built by the contractor. This sequence usually leads to the sealed bid, fixed-price contract. A common variation is:

- Multiple Primes — An owner contracts directly with separate trade contractors for specific and designated elements of the work, rather than with a single general or prime contractor.

**Construction Management At Risk (CMAR) (also called CM@R and CM/GC)** — A delivery method that entails a commitment by the CMR for construction performance to deliver the project within a defined schedule and price, either fixed or a Guaranteed Maximum Price (GMP). The CMR acts as consultant to the owner in the development and design phases, but as the legal equivalent of a general contractor during the construction phase.

**Design-Build (DB)** — A project delivery method that combines architectural and engineering design services with construction performance under one contract. Variations include:

- Bridging — A designer is retained by the owner to develop the design documents to a specific point (usually schematic level) prior to engaging the DB contractor, who then finishes the design and constructs the project
- Public Private Partnership (P3) — A private entity or consortium of investors provides some or all of the required capital with a commitment to deliver a completed project for a public sector owner in exchange for revenue that the completed facility is anticipated to generate.

**Integrated Project Delivery (IPD)** — A project delivery method that attempts to spread the risk, responsibility, and liability for project delivery equally among the primary parties — the owner, the designer, and the builder, whether through partnership agreements or multi-party contracts.

Each of these project delivery methods carries a different level of risk for the owner. Generally, the level of control provided to the owner correlates with the level of risk, as illustrated in the following chart.

PROJECT DELIVERY METHODS				
P3	Design-Build	Design-Bid-Build	CM at Risk Contracts	Multiple Prime Contracts
LEAST	OWNER'S RISK			GREATEST
GREATEST	CONTRACTOR'S RISK			LEAST
LEAST	OWNER'S CONTROL			GREATEST
GREATEST	CONTRACTOR'S CONTROL			LEAST

IPD does not fit cleanly on the above chart because the basis of IPD is shared risk among all parties, or an aligned relationship rather than an inverse relationship of risk between the owner and contractor.

In today's U.S. construction market, the prevalence of each of the methods described in this guide varies between the vertical construction market and the horizontal construction market. In the vertical construction market, the breakdown is approximately as follows:

- DBB 60%
- CMAR 25%
- DB 15%
- IPD < 1%

The recent trend has been an increasing use of CMAR and DB, with a corresponding decline in the use of the DBB method. There has been a great deal of recent attention to IPD. However, the formalization of IPD as a distinct delivery method is still relatively new and lacks an overall industry consensus. There are only a limited number of projects that have actually employed the multiparty contractual arrangements that IPD proponents use to define IPD as a delivery method, as opposed to a collaborative management approach or philosophy.

In the horizontal infrastructure market, DBB is still most prevalent. DB is also used, particularly in large public-private partnership infrastructure projects. One noticeable difference in horizontal construction is that CMAR is seldom utilized in this market.

CMAA promotes a policy of project advocacy that requires being delivery method neutral. Owners who are unfamiliar with alternate delivery methods should consult with a professional CM/PM to determine what specific delivery method is best for them and their project.

## The Role of the CM

There are benefits and trade-offs that come with various delivery methods, and it can be invaluable for the owner to have professional CM advice to determine what makes the most sense for any given project or program. For example, one owner may value the speed to completion and the potential for design innovation that DB promises while another owner may not wish to accept the reduction in owner control of final design that accompanies DB delivery. In addition, many alternate delivery methods require the owner to have sufficiently experienced staff resources to fully define the project or be willing to allow another entity to define it. The owner must also be able to make decisions, handle inquiries, and manage other processes quickly enough to take full advantage of the accelerations offered by some alternate delivery methods.

Regardless of the delivery method utilized, the professional CM can play a pivotal role throughout all phases of project implementation. In each section of this document describing a delivery method, the role of the CM is discussed.

## Contracting Alternatives

Contracting and compensation methods for professional services and construction services will generally fall into one of three categories:

1. Fixed Price or Lump Sum (LS)
2. Guaranteed Maximum Price (GMP)
3. Reimbursable

These methods are not specific to any particular delivery method, and may be applied to contracting for professional services, such as design, engineering, and construction management, as well as contracting for construction services.

Lump sum contracting, also called fixed price, is when an owner contracts with an entity to perform a fixed scope of work in exchange for an agreed lump-sum payment for the specified services. This method is one of the most commonly used.

Guaranteed maximum price contracting is an arrangement in which an owner contracts with an entity to perform a fixed scope of work in exchange for a price that is guaranteed to not exceed a stated maximum price. The GMP will typically include a base cost along with several allowances and contingencies that, depending on their ultimate use, may result in a final cost below the stated GMP. These savings may fall to the owner or may be shared with the entity providing the GMP.

Reimbursable contracts come in a variety of forms, and are sometimes coupled with a maximum price. With a reimbursable contract, an owner contracts with an entity to perform a fixed or variable scope of work in exchange for a payment based on some agreed calculation method. The forms of reimbursable contracts include:

- Unit Price — payment is based on actual quantities at set unit prices
- Cost Plus Fixed Fee — payment is based on actual cost plus a fixed fee
- Cost Plus Incentive Fee — payment is based on actual cost plus an incentive based fee
- Cost Plus Award Fee — payment is based on actual cost plus a performance based fee
- Time Spent — payment is based on actual hours spent at set billing rates
- Time and Materials — payment is based on actual costs with a fixed markup on costs

PROJECT DELIVERY METHOD	DESIGN-BID-BUILD (DBB)	CONSTRUCTION MANAGEMENT AT RISK (CMAR)	DESIGN BUILD (DB)	INTEGRATED PROJECT DELIVERY (IPD)
<b>Contracting Methods</b>				
Lump Sum	Common	Common	Common	Rare
Guaranteed Maximum Price	Rare	Common	Common	Rare
Reimbursable	Rare	Rare-Common	Rare	Common

## Procurement Alternatives

Procurement of professional services and construction services will generally be accomplished in one of three ways:

1. Price-based
2. Qualifications-based
3. Best value (combination of 1 and 2)

Procurements may also involve a one-step process, in which there is just a single round of submittals that determine the selection, or a two-step process, which may include a qualifications submittal as the first step and then a price proposal as the second step.

For the procurement of construction services, the chart below illustrates the use of the various options.

SELECTION CRITERIA	LOW BIDDER	BEST VALUE	BEST QUALIFICATIONS
<b>PROJECT DELIVERY METHOD</b>	Selection is based solely on price	Selection is based on a weighted combination of price and qualifications	Selection is based solely on qualifications
Design-Bid-Build	Most common	Common: Price evaluation based on construction cost	Rare
Construction Management at Risk	Rare	Most common: Price evaluation based on CMAR fees and general conditions	Common
Design/Build	Common	Most Common: Price evaluation based on fees and general conditions; may or may not include Construction Cost	Common
Integrated Project Delivery	Rare	Common	Most common

Services will be procured for a single project or for multiple projects within a single procurement. By far, the most common procurement method is the single project award. In this method, an owner has a specific project and they procure services specifically for, and only for, that project.

The other procurement option is the multiple project award method, of which there are several variations. This method can be utilized to procure both professional services and construction services. With this method, an owner procures the services of one or more firms to perform a series of projects, also sometimes referred to as tasks. Each project is priced separately, but a single contract vehicle is used for all projects.

The various types of multiple project (task) awards include:

- Indefinite Delivery / Indefinite Quantity (IDIQ)
- Multiple Award Task Order Contract (MATOC)
- Single Award Task Order Contract (SATOC)
- Job Order Contracts (JOC)

The IDIQ award is commonly used with professional services. With an IDIQ, an owner will select one or more firms and award an IDIQ contract to these firms. Billing rates are generally pre-established in the IDIQ contract, and as subsequent projects or tasks are identified, the IDIQ firm(s) will submit a proposal to the owner based on the requirements and prices set forth in the master IDIQ agreement. When multiple firms hold the same IDIQ contract, they will generally be competing for subsequent projects and tasks. IDIQ contracts are typically awarded for a three-to-five-year period, often with renewal options.

A MATOC is very similar to the IDIQ contract and actually is a form of IDIQ contract. It will always involve multiple firms and typically be used for design-build or construction-related work. The MATOC contract is very common in government contracting. Similar to a MATOC, the SATOC operates in the same manner but will only be awarded to a single firm.

Job Order Contracting is another form of an IDIQ contract and is typically used to complete large numbers of smaller projects or tasks. A single JOC contractor is selected and a contract is executed based on a pricing guide (e.g., RSMMeans online) that is used as the basis for payment. As tasks are assigned to the contractor, pricing proposals are generated based on the rates in the pricing guide multiplied by a fixed pricing factor, which is established with the contractor in the contract.

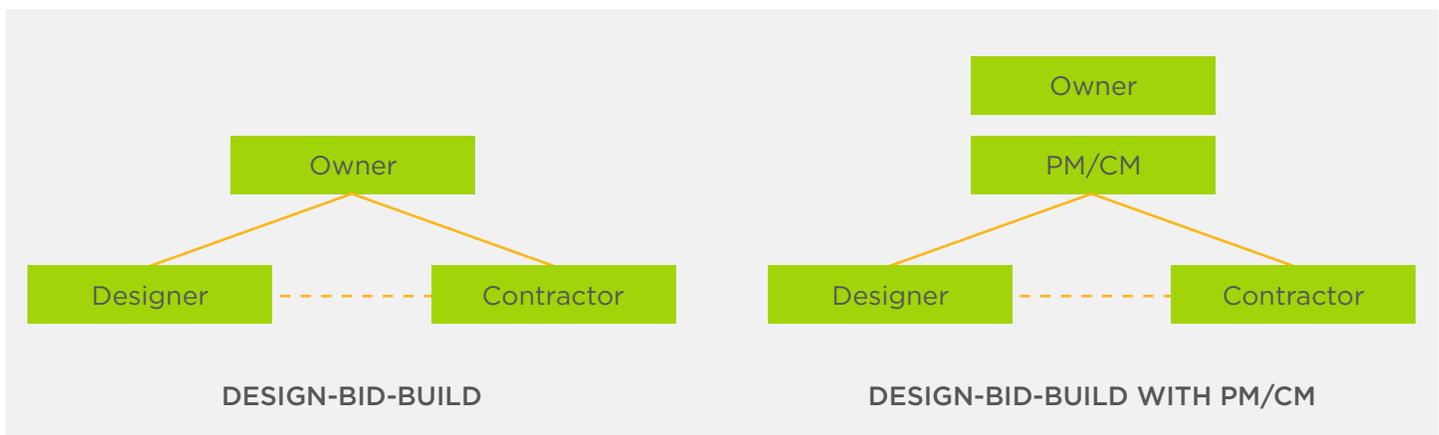
## PROJECT DELIVERY METHODS

### Design-Bid-Build (DBB)

#### Description

The Design-Bid-Build system remains the most frequently used delivery method for construction projects. Using this method, the owner engages a designer to prepare the design of the project, including construction drawings, and specifications. The designer may also provide additional services, including environmental investigation, permitting, right-of-way purchase documents, hearings for public approval, and submissions for project funding.

Once completed, the bid package, including the design and bidder's information packet, is presented to interested contractors, who prepare and submit their bids for the work. The owner will select a contractor, usually based on the lowest responsive and responsible bid (for most all public work), or some hybrid of price and technical merit. The selected general contractor will then execute contracts with subcontractors to construct various specialty items. The contractor is responsible for constructing the facility in accordance with the contract documents. The designer typically maintains limited oversight of the work and responds to questions about the design on behalf of the owner. If a CM is not involved in the process, the designer may also assist the owner in administering the construction contract, including determination of project progress, for validation of interim payments made to the general contractor.



## Risk Analysis

The DBB delivery method has been the standard delivery method for many years. This method gives the owner reliable price information for the project before construction starts.

With proper design oversight and budgeting of the total project, costs are somewhat predictable for the owner once the bids are received. In DBB, the owner has more control over the design content, relative to other delivery methods.

However, this method typically involves a longer time period to execute, in that construction may not begin until the design and procurement phases are complete. DBB is prone to creating more adversarial relationships between all parties when issues develop, as there is no contractual relationship between the contractor and the designer and no opportunity for collaboration during the design phase.

### Advantages:

- This method is widely applicable, well-understood, and has well-established and clearly defined roles for the parties involved.
- This method is the most common approach for public owners having to comply with local, state, or federal procurement statutes.
- The owner has a significant amount of control over the end product, particularly since the facility's features are fully determined and specified prior to selection of the contractor.

### Disadvantages:

- The process may have a longer duration when compared to other delivery methods, since all design work must be completed prior to solicitation of the construction contract.
- The designer may have limited ability to assess scheduling and cost ramifications as the design is developed, which can lead to a more costly final product.
- The owner generally faces exposure to contractor change orders and claims over design and constructability issues, since the owner accepts liability for design in its contract with the contractor.
- This traditional approach, in some cases, may promote more adversarial relationships rather than cooperation or coordination among the contractor, the designer and the owner.
- If the owner uses the fixed-price bidding and compensation method, the contractor may pursue a least-cost approach to completing the project and the owner may receive less scope or lesser quality than expected for the price, requiring increased oversight and quality review by the owner. If the

owner uses the unit price bidding and compensation method, the contractor may pursue an increased-scope approach to maximize revenue from the contract, while providing the owner more scope than expected.

- The absence of construction input into the project design may limit the effectiveness and constructability of the design. Important design decisions affecting both the types of materials specified and the means and methods of construction may be made without full consideration from a construction perspective.
- Technological and programmatic obsolescence can be a problem for a very large, long-lasting project. The owner may be at a disadvantage negotiating programmatic and technological changes in a DBB vehicle.

The disadvantages listed above assume that the owner does not have an experienced certified construction manager (CCM) on staff, and has not retained the services of a CCM during the design phase of the project.

## Contracting and Procurement Methods

Numerous variations in procurement exist when using the DBB method. The most common approach to bidding a project in vertical construction — a building or treatment facility — is for general contractors to submit a sealed lump-sum or fixed-price bid. In most horizontal projects such as transportation, the most common approach to bidding is unit price, line-item bids, where quantities are easily measured during construction and the owner pays only for what is installed.

When allowed by governing procurement policy, many owners make some effort to prequalify contractors, either through invitation or an objective set of criteria considering construction experience and financial capability. Prequalification helps assure the owner that the contractor is capable of performing the scope of work specific to the project at hand. Once the field of bidders is established, an owner will require sealed bids, wherein the lowest responsive and responsible bidder will earn the right to perform the work.

Public owners, where public funds mandate open competition by statute, are unable to develop an invited bidders' list, and are only allowed to eliminate contractors from bidding if the contractor has not qualified for or has been removed from the agency's approved bidder's list.

Some private owners prefer to negotiate bids with pre-selected GCs. This can be an especially powerful technique if the owner considers qualifications, history of claims, and experience in related work, along with price in its evaluation. What the owner

should really be seeking is the best value for its money, not necessarily the lowest initial cost. Through a careful negotiation and contractor evaluation, the owner can maintain the maximum amount of control over the resulting construction portion of the project.

## Role of the CM

In the past, most owners relied on the experience of the designer to provide a complete and responsible set of contract documents. Recently, more and more owners have found the value in utilizing the advice and expertise of those with overall process, program, and construction management knowledge during the design phase.

Whether provided through owner staffing or a third-party firm, the CM should be engaged as early in the project as possible to guide and assist the owner through all phases of delivering the project. The CM may also act as the owner's representative with the other members of the project team, being the point of contact for the designer, contractor, and any other specialty consultants engaged in the project by the owner.

In a DBB delivery, in addition to overall management expertise, the CM must also provide construction expertise and advice to the project team during all pre construction phases, since the contractor will not be involved on the project until the construction phase.

In the pre design phase, the CM's role may include development and evaluation of the project, defining the overall program and scope of work, development of project budgets and schedules, evaluation of project delivery methods, procurement of the design consultant, and development of project procedures and standards. The CM may also develop contract language for use during later procurement phases.

During the design phase, the CM's role will continue to include tasks started in the pre design phase, and may include oversight of the designer, review of design documents, generation of cost estimates, value engineering, budget and schedule management, and development of overall phasing and contracting approaches.

In the procurement phase, the CM's role may include generation of bidder interest, pre qualification of bidders (if used), management of bid document and addenda distribution, conducting the pre bid meeting and bid opening, and production of executed contracts.

As a project shifts into construction phase, the CM's role may include representing the owner's interests through a system of project controls that include conducting periodic progress

meetings, document control, cost-tracking and management, evaluation of payment requests, change-order management, quality management, schedule control, monitoring of contractor's safety efforts, and commissioning and generation of the punchlist.

During the post-construction phase, the CM's role may include commissioning, coordination of occupancy procedures, the assembly and review of record documents and manuals, warranty management, and final project close-out.

## Multiple Prime Contracting

### Description

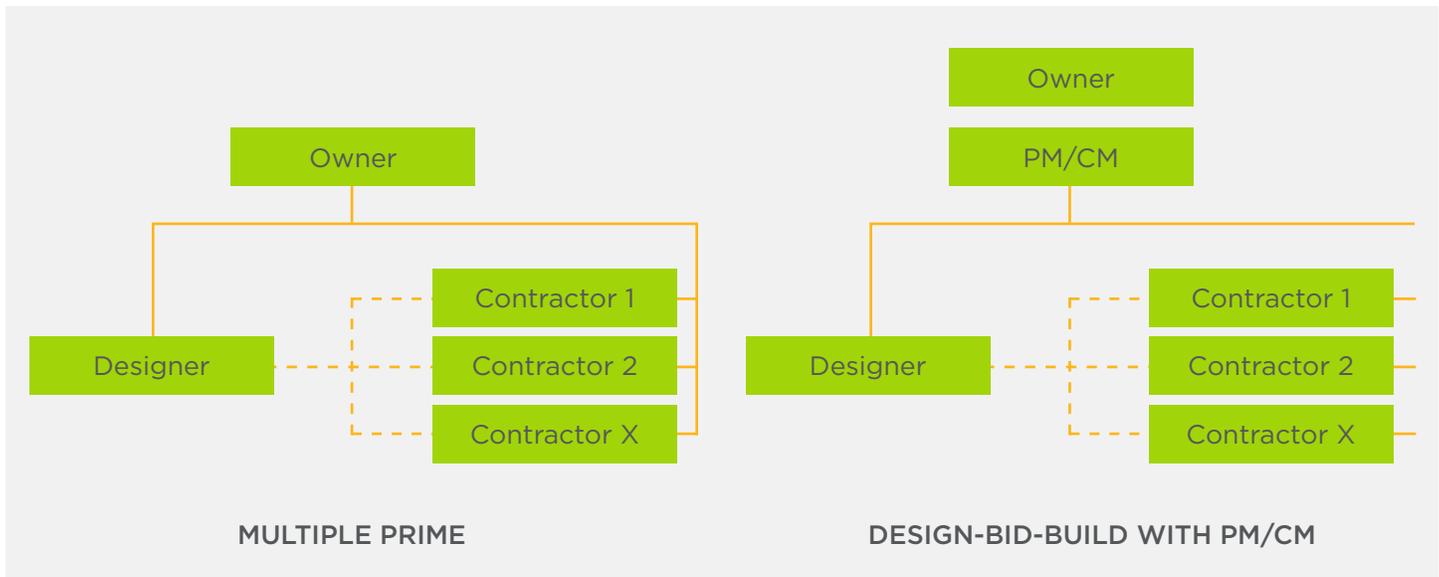
An important variation of DBB is multiple prime contracting, in which the owner holds separate contracts with contractors of various construction work disciplines, such as general construction, earthwork, structural, mechanical, and electrical. In this system, the owner, or its CM, manages the overall schedule and budget.

This system, which some owners are required to use, gained favor in part as another method of fast-tracking construction. Work in each construction discipline is bid separately, allowing the flexibility of awarding construction contracts on the first portions of the project as soon as the respective aspect of design is completed. This fast-track approach can be a highly desirable feature of this method of procurement when time of performance is critical.

Furthermore, the delivery system allows the owner to have more control over the project schedule, since the owner sets the timeline for bidding individual portions of the work. For example, if an initial phase of construction (such as foundation construction) is delayed, the owner may reduce liability for delays by postponing the bidding of follow-on work. Another advantage of this system is that the owner has the potential to realize savings by directly procuring major material items, such as structural steel or major mechanical equipment, and avoiding contractor markups.

### Risk Analysis

The very nature of this delivery system causes its primary disadvantages. To work properly, there is a need for increased coordination in the development of the separate bidding and contract packages for each separate prime, leading to the potential that work scope will be omitted or duplicated. Additionally, the final cost of the project is not known until the final prime contract is procured. In addition, there have been numerous cases when this method did not work well due to the



absence of overall authority and coordination among the prime contractors once construction was underway. The problems primarily arise from lack of coordination and contractor delay issues. While the general construction prime contractor is often given contractual responsibility to coordinate the work among trades, including schedule, this contractor generally lacks the direct contractual authority to dictate the schedule of another prime contractor.

**Advantages:**

- The ability to fast-track early components of construction prior to full completion of design.

**Disadvantages:**

- No central point of contractor coordination and responsibility for all trades. By default, the owner assumes this responsibility.
- Potential for numerous claims between various contractors.

**Role of the CM**

The role of the CM in a multiple prime contracting delivery system is very similar to the role of the CM in a DBB delivery. Whether provided through owner staffing or a third party, the CM is engaged as early in the project as possible and guides and assists the owner through all phases of delivering a project. The CM also acts as the owner’s representative with the rest of the project team, acting as the point of contact for the designer, contractors, and other specialty consultants engaged in the project by the owner.

The primary difference involves the fact that in most instances there is not a single prime general contractor involved to oversee and manage the activities of all of the various trades. Instead, in a multiple prime environment, all trades are contracted directly with the owner. The CM, acting as the owner’s representative, may be required to actively coordinate and manage all trade contractors on the project.

This effort involves increased levels of scheduling, since the CM role changes from managing a single schedule from the general contractor to consolidating and managing the schedules of multiple firms. Any schedule slip or design issue will potentially need to be addressed with multiple trades simultaneously, so the level of effort can increase significantly for the CM.

**Construction Management at Risk (CMAR)**

**Description**

This delivery system is similar in many ways to the DBB system, in that the CMR acts as a general contractor during construction. That is, the CMR holds the risk of construction performance and guarantees completion of the project for a negotiated price that is usually established when the design is somewhere between 50 percent and 90 percent developed. However, in this scenario, the CMR also provides advisory professional management assistance to the owner prior to construction, offering schedule, budget, and constructability advice during the project planning and design phases. Thus, instead of a traditional general contractor, the owner deals with a hybrid construction manager/general contractor.

In addition to providing the owner with the benefit of pre-construction services that may result in advantageous changes to the project, the CMAR scenario offers the opportunity to begin construction prior to completion of the design. The CMR can bid and subcontract portions of the work with an approved design at any time, often while design of unrelated portions is still not complete. In this circumstance, the CMR and owner

often negotiate a guaranteed maximum price (GMP) based on a partially completed design, which includes the CMR's estimate of the cost for the remaining design features. Furthermore, CMR may allow performance specifications or reduced specifications to be used, since the CMR's input can lead to early agreement on preferred materials, equipment types, and other project features.



### Risk Analysis

The primary disadvantages cited in the CMAR system involve the contractual relationship among designer, CMR, and owner once the price is fixed. The CMR then converts from a professional advisory role of the construction manager to the contractual role of the general contractor. At that time, tensions over construction quality, the completeness of the design, and impacts to schedule and budget, can arise. Interests and stake holding can become similar to the DBB system, and adversarial relationships may result. While the established GMP is supposed to address the remaining unfinished aspects of the design, this can in fact increase disputes over assumptions of what remaining design features could have been anticipated at the time of the negotiated bid.

One mitigating approach to this problem is for the CMR to open its books and share with the owner its subcontractor bids, ensuring transparency in the process. The CMR may further assume risk by taking some responsibility for design errors discovered during construction, if it was involved in the review of the design prior to establishing the GMP. In addition, arrangements can be made regarding risk-sharing and profit-sharing if there are over-runs or under-runs in the GMP.

### Advantages:

- The owner gains the benefit of having the opportunity to incorporate a contractor's perspective and input to planning and design decisions
- The ability to fast-track early components of construction prior to full completion of design

### Disadvantages:

- A premium is placed on the proper selection of the CMR, based on the CMR's particular skills and experience, to provide the best value to the owner
- While the CMR provides the owner with professional advisory management assistance during design, this same assistance is not present during the construction phase, as the CMR is in an at-risk position during construction

### Contracting and Procurement Methods

A common contracting approach in the CMR delivery method is to enter initially into an agreement with the CMR for a fixed-fee contract for pre-construction and general conditions costs, along with an agreed contractor's markup fee as a percentage of construction costs.

Once the design has progressed to a point where a GMP can be established, the contract is converted to a GMP contract, with all remaining fixed costs rolled into the GMP.

On the procurement side, the selection process is either a one-step or two-step process. In a one-step process, a Request for Proposals (RFP) is issued and proposals are received that will include qualifications of the team, along with price proposals for the pre construction costs, general conditions costs, and construction fee as a percentage. The owner will make evaluations based on the submitted information.

In a two-step process, step one will involve a Request for Qualifications (RFQ) and firms will only submit their qualifications. The owner will then establish a short list of firms and an RFP will be issued to these firms, requesting the same cost information submitted in the one-step process. The owner will then make a selection based on a combination of qualifications and pricing.

As with DBB, private owners may choose to negotiate directly with pre selected CMRs.

### Role of the CM

The role of the CM in a CMAR delivery system is sometimes considered redundant. However, there is still a vital role for the CM to play, whether the CM is from within the owner's staffing or from a third-party CM.

As in other delivery methods, it is important to engage the CM as early in the project as possible to guide and assist the owner through all phases of project delivery. The CM will still act as the owner's representative with the rest of the project team, acting as the point of contact for the designer, CMR, and any other specialty consultants engaged in the project by the owner.

The CM's role in a CMAR delivery method is similar to the CM's role in a DBB delivery, with one major difference: the CM may not be the primary provider of construction expertise and advice to the project team during the pre construction phases once the CMR firm is engaged by the owner, and as such may not be called upon to perform as many tasks. An example of this would be that the CM might not provide estimating or constructability reviews during design phases if the owner relies on the CMR to perform these tasks.

Tasks that will remain with the CM include verification of schedule, overall project cost-tracking, quality control, administration of all contracts, and coordination with all owner stakeholders.

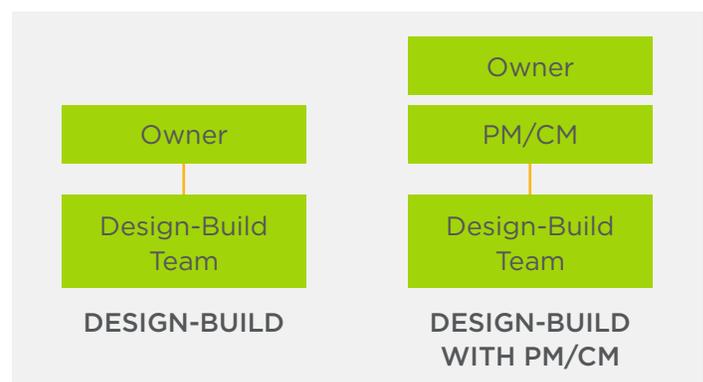
## Design-Build (DB)

### Description

The design-build project delivery system has grown in popularity, and is seen by some in the industry as a solution for addressing the limitations of other methods. For an owner, the primary benefit is the simplicity of having one party responsible for the design and construction of the project. While the other delivery systems often give rise to disputes among various project participants, with the owner acting as referee (or party ultimately to blame), in DB many of these disputes become internal DB team issues that may not affect the owner.

Under this system, the owner contracts with a DB team, which can be a joint venture of a contractor and a designer, a contractor with a designer as a subconsultant, a designer-led team with a contractor as a subcontracted entity, or a single firm capable of performing both design and construction. Since contractors are most comfortable in the role of risking corporate capital in performing projects, they usually are the lead members of this sort of team. One variation of the typical DB team structure, known as fee-paid developer, involves the owner engaging a developer, which then selects its own designer and contractor partners. However formulated, the DB team performs the complete design of the facility, usually based on a preliminary scope or design presented by the owner.

At some point early in the process, through a prescribed process, the DB team will establish a fixed price to complete the design and construction of the facility. Once underway, the DB team is then responsible for construction of the project, and for all coordination between design and construction.



## Risk Analysis

Since the design-build team is working together from the outset, DB offers the opportunity to save time and money. However, the advantages of the system are offset by a significant loss of control and involvement by the owner and other stakeholders. Accordingly, it is difficult for the owner to verify that it is receiving the best value for its money without having a great deal of transparency in the DB team.

The primary caution for an owner considering DB is that the owner should carefully consider the level of involvement it requires for a successful project. First, the owner needs to recognize the effort and completeness that must be behind its initial scope/preliminary design that forms the basis of its contract with the design-builder. Often, the owner will require additional consultants to help it develop the scope or preliminary design, in the role of a traditional design firm.

Owners with highly specialized program needs may not find it advantageous to turn over responsibility to an outside DB team without ensuring adequate levels of oversight and communication. For example, a government owner constructed a high-technology research facility involving highly specialized equipment using the DB delivery method. During project development, the DB team made several key design and equipment selection decisions without full involvement of the owner, resulting in an unsatisfactory facility that required costly changes before the facility could be used as intended.

With this lesson in mind, DB is best-suited to conventional projects for which project requirements can be clearly defined and for which expertise is widely available. For example, an office facility might be a project ideally suited for DB. In a project of this type, the owner is not assuming undue risk in conceding control over the project, and may benefit from the advantages of DB.

Another primary consideration of the owner is proper selection of the DB team. Since the owner selects a team that has been created prior to selection, it may be difficult for the owner to maintain the proper balance of design expertise, financial capability, construction experience, and experience in DB team roles. In particular, the owner should strongly favor DB teams with a successful track record working together on previous similar projects in the same DB roles. More so than in any other delivery system, the success of a DB project may hinge on the initial selection process.

### Advantages:

- DB can produce a project more quickly than a conventional DBB
- There is a single point of accountability for design and construction
- Cost efficiencies can be achieved since the contractor and designer are working together throughout the entire process
- Change orders would typically arise primarily from owner changes

### Disadvantages:

- Less design control and involvement by the owner and stakeholders
- Owner must be highly responsive in its decision making to take full advantage of the speed of DB
- The owner does not receive the benefit of the checks and balances that exist when it contracts separately with a designer and a general contractor
- May be problematic when there is a requirement for multiple agency design approvals
- May be inappropriate if the owner is looking for an unusual or iconic design

## Contracting and Procurement Methods

One common contracting method in the DB delivery method is to initially enter into an agreement with the DB team for a fixed-fee contract for design and pre construction costs and an agreed general conditions costs and construction fee given as a percentage of total construction costs.

Once the design has progressed to a point where a GMP can be established, the contract is converted to a GMP contract, with all fixed costs rolled into the GMP.

Another method used is to enter into a fixed-price sum agreement for the entire DB effort.

On the procurement side, the selection process is typically a two-step process. In a two-step process, step one will involve an RFQ and teams will only submit their qualifications. The owner will then establish a short list of teams and an RFP will be issued to these teams, requesting cost information and a technical proposal that defines the project scope along with the firms' innovations, schedule, and details that define the quality of the delivered project. The owner will then make a selection based on a combination of qualifications, approach, and pricing.

As with other delivery methods, private owners may choose to negotiate directly with pre selected DB teams at any point in the process above.

## Role of the CM

The role of the CM in a DB delivery system is different than in the CMAR delivery method during the design phase, primarily due to the differing relationships. In DB, the designer is part of the builder's team, rather than under direct contract with the owner. There continues to be an important role for the CM, whether provided through the owner's staffing or through a third-party firm. This role is particularly critical if the owner does not have experience with the DB delivery method.

Owners with deliberate and time-consuming decision-making processes may find themselves particularly pressured in DB, since the speed of execution offered by this delivery method relies on the owner's promptness and responsiveness.

As in all delivery methods, it is important to engage the CM as early in the project as possible to guide and assist the owner through all phases of project delivery. It is particularly important in DB because the program of requirements must be thoroughly analyzed and tightly documented. The contractor will ultimately be held to delivering the requirements of these program documents that are the basis for the DB proposal.

In a DB environment, the CM will be the owner's representative with the rest of the project team, acting as the point of contact for the DB team and any other specialty consultants engaged in the project by the owner.

The CM's role in a DB delivery method begins early in the project, assisting with the development of the owner's project requirements and the important selection of the

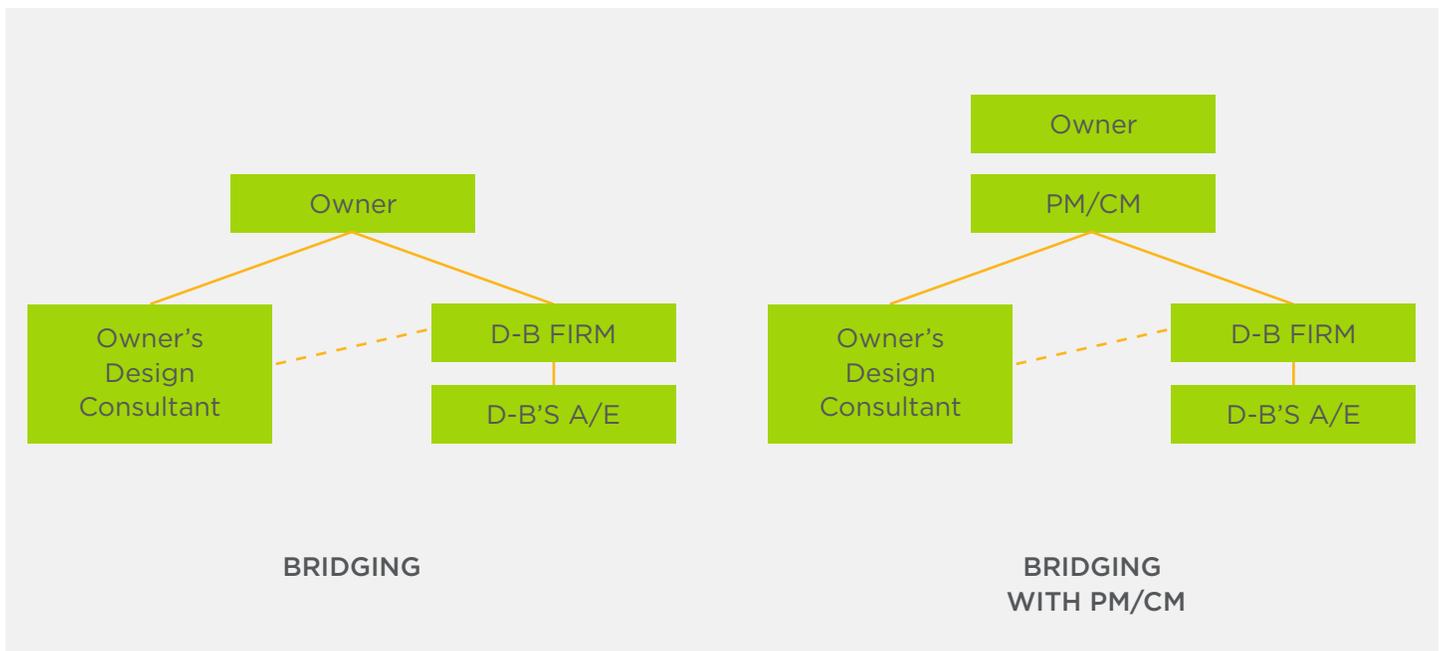
DB team. The role then becomes similar to the CM's role in a CMAR delivery method, with a few differences: since the owner's control over design is not as tight as in other delivery methods, the CM's reviews of the design will need to focus on compliance with the owner's project requirements and overall cost compliance.

## Bridging

### Description

Bridging is not DB in the typical sense, but makes use of a design-build form of agreement between the owner and the contractor. In bridging, the owner has its own bridging architect (also referred to as the owner's design consultant or ODC). The ODC and its consulting engineers, working with the owner, prepare preliminary design documents along with bid documents for a DB form of agreement.

The ODC, and/or the owner's CM, will assist the owner in obtaining proposals and award of the DB contract, later review the construction documents prepared by the contractor's designer for payment recommendation, and represent the owner throughout the construction with full typical construction phase services as design consultants normally provide except for the detailed checking of shop drawings.



The DB contractor, along with a design subconsultant or an in-house design division, prepares the final construction documents. The construction documents may be thought of as an enormous set of shop drawings and should not be confused with the bridging contract documents.

## Risk Analysis

The bridging approach provides a good alternative for owners who like the benefits that the DB approach can bring to a project, but who would like more control over the ultimate design of the project.

Significant advantages of bridging arise from the method's focus on communicating the owner's intentions for the project. Other potential advantages are that the owner obtains a firm price for the construction in less time and less design cost as compared with typical DBB pricing, and reduced exposure for the owner to contractor-initiated change orders and claims. With bridging, the owner has an opportunity to retain the desired level of control of the design, design details, quality of engineering, and quality of construction.

## Role of the CM

The role of the CM in a bridging delivery system will fall somewhere between the CM's role in a CMAR delivery system and in a DB delivery system. This role can be filled either through owner's staffing or through a third-party firm.

Tasks that will remain with the CM include verification of schedule, overall project cost-tracking, quality control, administration of all contracts, and coordination with all owner stakeholders.

## Public-Private Partnership (P3 or PPP)

### Description

Public-private partnership is a delivery method whereby a public entity partners with a private entity for the purpose of delivering public infrastructure. The National Council for Public-Private Partnerships identifies 18 variations of P3s. In the most typical of these variations, the private entity will be composed of a design-build team, a maintenance firm, and a lending firm. This entity will design, build, finance, maintain, and/or operate the facility for a set number of years, agreeing to meet specified performance criteria in exchange for lease payments or some other compensation. At the end of the specified period, the facility is returned to the public entity.

Various forms of P3 compensation include a fee contract, in which the P3 firm receives its compensation through a fee charged to the owner, and a concession contract, in which the P3 firm receives its compensation directly from the consumers rather than the owner.

## Risk Analysis

P3 has gained much attention due to its ability to provide a funding option for public entities that may be struggling to identify adequate sources of capital. While this approach is a good option as a means of bringing a project to reality, it is also a very complicated and deliberate process that needs to be carefully considered.

P3 can benefit public projects in the following ways:

- Targets alternative revenue and funding sources to close a funding gap
- Allows use of low-cost tax-exempt or taxable financing
- Transfers risk to the private sector
- Not subject to capital budget allocations or voter referendums
  - Accelerates construction starts
  - Reduces construction cost and interest rate risks
- Takes advantage of private-sector efficiencies and innovations in construction, scheduling, and financing
- Provides efficiencies in long-term operations and maintenance
- Presents an opportunity to combine public and private uses in mixed-use developments to leverage economic development

Disadvantages of P3 include:

- The owner may experience higher total life cycle costs.
- The proposal process can be very expensive for all involved.
- A high level of expertise is required to execute a P3 project.

## Role of the CM

The role of the CM in a P3 delivery system will be very similar to the CM's role in any other DB delivery system, although often there is much more of a program management focus. It would be important for the CM to have experience specific to PPP projects since there are many unique characteristics related to this process.

As always, this role can be filled with qualified personnel either through owner's staffing or through a third-party firm. The CM tasks will include verification of schedule, overall project cost-tracking, quality assurance, administration of all contracts, and coordination with all owner stakeholders.

## Other Variations

There are numerous other variations of DB and/or P3 delivery systems. The National Council for Public-Private Partnerships publishes a list that includes:

- Operations and Maintenance — A public entity contracts with a private entity to provide operations and maintenance of a public asset.
- Operations, Maintenance, Management — A public entity contracts with a private entity to operate, maintain, and manage a public asset.
- Design-Build-Maintain — Similar to a design-build contract on a public project, but the private entity is also contracted to maintain the public asset for some defined period.
- Design-Build-Operate — A public entity contracts with a private entity to design, build, and operate a public asset.
- Design-Build-Operate-Maintain — A public entity contracts with a private entity to design, build, operate, and maintain a public asset.
- Design-Build-Finance-Operate-Maintain — A public entity contracts with a private entity to design, build, operate, and maintain a public asset. Additionally, the private entity will also finance the project in exchange for either user fees, lease payments, or some other revenue stream.

## Integrated Project Delivery (IPD)

### Description

Integrated project delivery contracts are a relatively new entry into the U.S. marketplace and very few projects have been carried out using these contracts; however, the concepts of IPD have been around for many years. Pure IPD, in its contractual

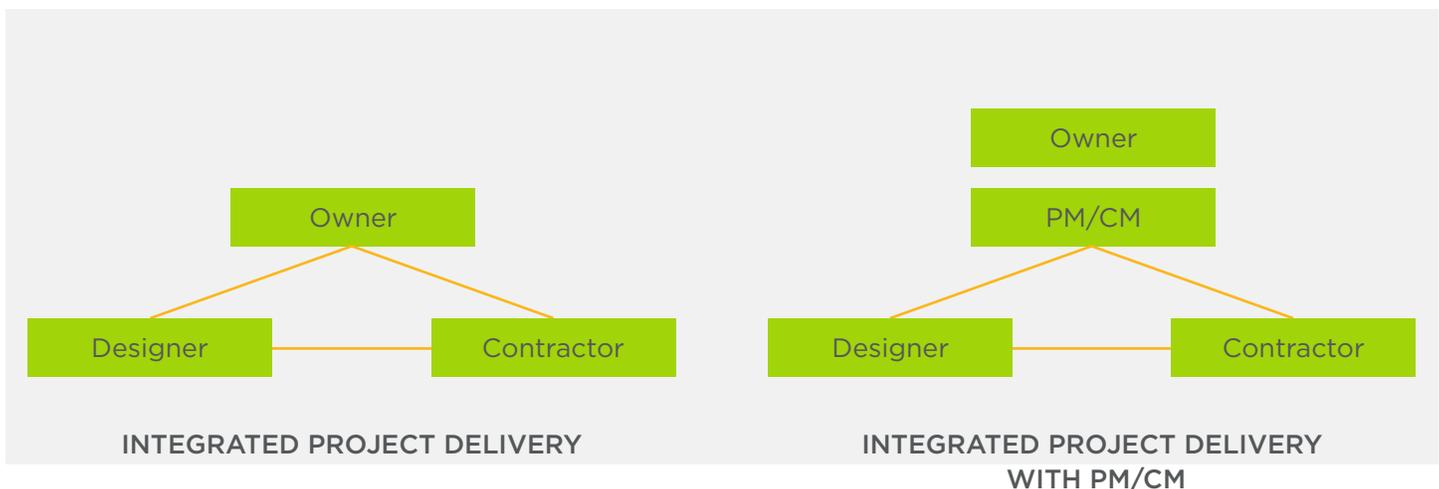
sense, requires a multiparty agreement among the prime players in the design and construction process — at least the owner, the designer, and the builder — but this agreement can include many of the important subconsultants and subcontractors as well. The intention of the multiparty contract — or the closely integrated family of contracts — is a team-based approach that, according to “Integrated Project Delivery, A Working Definition, Version 2,” AIA California Council and McGraw-Hill Construction, 6/13/2007:

*“... integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication and construction.”*

IPD is an attempt to properly reflect, in contract, the working relationships and efforts that are possible when a team is working in an integrated fashion to complete a design and construction project.

Compensation for parties in the IPD delivery method, other than the owner, is typically composed of three components: Cost reimbursement, incentive for achieving or bettering agreed project cost targets, and rewards for accomplishing set project goals. Ideally all costs, bases of costs, and cost inputs from all parties to the contract(s) are fully open-book in nature; and all incentive and goal achievement compensation will be agreed to by the team and incorporated in the contracts in advance.

As the entire project team is equally (or similarly) incentivized to achieve the same set of goals, which they have been party to setting or agreeing to, IPD requires the owner to assemble the major players into a contracted team at the very earliest opportunity, ideally as early as project inception and feasibility.



This early creation and agreement of project goals results in earlier engagement of the project team than in other delivery methods. During the pre-design phase, the IPD team designates all of the criteria it will be bound under contract to deliver.

## Risk Analysis

All of the advantages of the CMAR and DB project delivery approaches would apply under an IPD approach. At the same time, the IPD approach addresses the issues discussed related to tensions created by the completion of design, the setting of the GMP and the execution of the construction phase of a CMAR project.

IPD creates a different set of tensions and issues for the owner, not present in the CMAR approach. These tensions include making a team selection that can be based as much on behavioral characteristics as on ability and on belief in total cost more than initial costs.

Advantages:

- The owner gains all the advantages of DB or CMAR.
- The entire team's interests are aligned with the project goals, making the chance of success, once underway, extremely high.

Disadvantages:

- Actual agreement on the criteria and the final IPD contract can be very difficult and can take an inordinate amount of time and effort, for which the owner may be paying, if not in money then in time.
- Industry inexperience with working in non adversarial team relationships makes the chance of failure most dependent on the behavior of individuals within the team. Damaging behavior is very difficult to control or to correct and can cause the breakdown of collaborative processes that are critical to success.
- Objective selection of the team is very difficult to achieve and can rely on little more than instinct for an owner who does not already have a team or teams that it knows and works with well.
- While team members are paid at cost for the work they do, prediction of and control of the effort comprising cost is difficult at the time the team is selected and even after the contract with fully agreed criteria is executed.
- IPD contracts have not yet been tested in law, so the result of a failure within the team is unpredictable.

## Contracting and Procurement Methods

The most common contracting method in an IPD approach is a joint agreement that includes the design firm, the construction firm, and the owner. The typical contract is a cost-plus-incentives-based contract built around target costs for all elements of the project and on the achievement of non-cost-related project goals.

On the procurement side, the selection process is generally a qualifications-based selection, consistent with the objective of making sure all team members make good team partners to enhance the likelihood of the success of this approach.

The selected team enters into a pre design phase and together creates and agrees on the project's target cost, program and definition, achievement goals, schedule, other critical players to bring into the team (and the timing of entry), and other contract basics. At this point, the contract is fully executed and the project process proceeds.

## Role of the CM

The role of the construction manager in an IPD delivery system will be very similar to the CM's role in the CMAR and DB delivery approach in providing the industry and management expertise to represent the owner within the IPD team, whether the CM comes from within the owner's staff or from a third party.

In addition to the owner representation, successful IPD teams require an integrator and leader to keep the team on track, focused on project goals, and to facilitate the IPD behaviors necessary to carry the team to success. This role would encompass initial leadership of the IPD project management team, developing protocols to perform and then managing everyday tasks, such as making recommendations on payment of invoices, managing disputes, resolving issues, and the like.

The CM, as owner's representative, may or may not be party to the IPD agreement. The CM, if playing the role of integrator, would typically be a party to the agreement and would share in the common risk and reward of the contract to an appropriate extent.

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## CONCLUSION

One of the most important decisions made by any owner embarking on a construction project is the choice of the project delivery method — how the project will be designed and constructed. There are many options for delivery methods and many variations within those options.

An owner faced with choosing a project delivery method should consider several factors in making the decision, including:

- Project size
- Type of project
- Legislative and regulatory requirements
- Tolerance for risk
- Schedule
- Local market knowledge
- Desired level of involvement
- Owner's resources and capabilities

When these factors are properly evaluated, a good decision can be made on the selection of a project delivery method that best fits the goals and requirements of the owner and the project.

The use of a qualified construction manager can greatly help in developing a project and in making the decision on project delivery methods, regardless of whether this expertise comes from internal staff or from a third-party provider.

## ACKNOWLEDGMENTS

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