

# DESIGN AND CONSTRUCTION DELIVERY METHODOLOGIES FOR DATA CENTER PROJECTS

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## 1. Overview

There are many different methodologies used for the delivery of construction projects in the United States and abroad, and the selection of the delivery methodology is a milestone decision that can dramatically affect the success – or failure - of any project. For data centers, which are very complex, expensive, and risk-sensitive project types, this decision is crucial, and the wrong decision can have huge repercussions to not only the project, but to the Owner’s overall business.

The intent of this White Paper is to help data center Owners and developers make informed decisions on the construction delivery methodology in order to minimize risk and increase success. We begin with an overview of the typical construction delivery methodologies used in commercial projects, followed by the pro’s and con’s of each, the criteria for making a selection, and an analysis of the trends in data center design and construction. At the end is an overview of CBRE’s Data Center Solutions group.

## 2. The Typical Methodologies

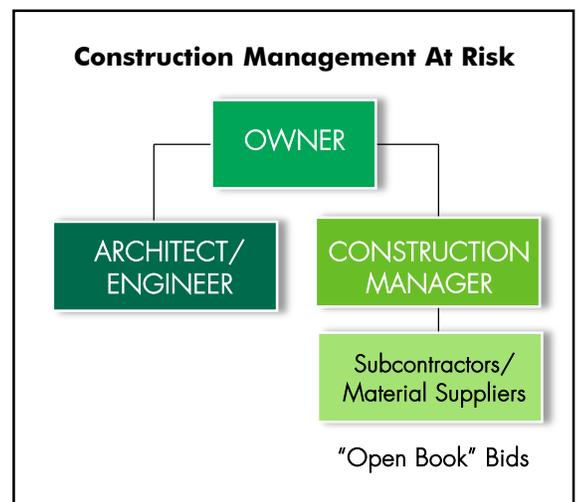
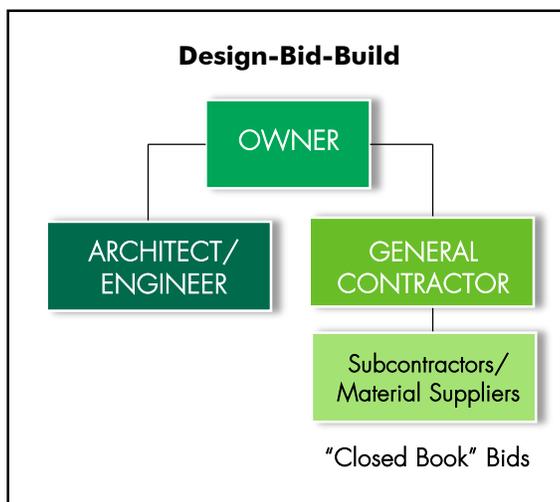
The Construction Management Association of America (CMAA) lists three primary types of construction delivery methodologies. Below is a brief overview of these three types:

### Design-Bid-Build (DBB)

In this methodology, the Owner hires an architect and engineer to design the project in its entirety, creating Construction Documents (CD’s) that identify all the project parameters. General Contractors (GC’s) then submit competitive Lump Sum bids to build the project in accordance with the CD’s. Typically, the lowest qualified bidder is awarded the job, although a higher-priced GC may be selected based on expertise or reputation. The actual subcontractor costs are typically “closed book” to the Owner, and the General Contractor takes on the financial risk for the contracted amount.

### Construction Management At Risk (CMAR)

This is a delivery method in which the Construction Manager is retained during the design phase to help develop schedules, budgets, constructability reviews, etc., and then assumes the risk for construction performance, holding all trade subcontracts during the construction phase. The Construction Manager may be contracted for the work based on a Guaranteed Maximum Price (GMP) at the completion of the CD’s, or with a percentage mark-up to the subcontractor costs – often referred to as “Cost Plus” -, which are “open book” to the Owner.



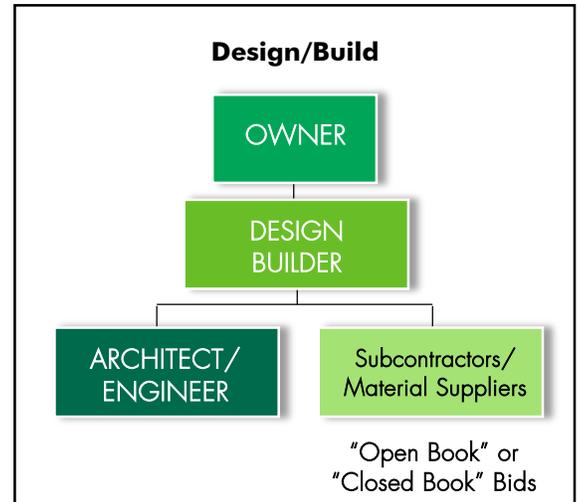
## 2. The Typical Methodologies

### Design-Build (DB)

This project delivery method combines architectural and engineering design services with construction performance under one contract. The Design Builder may directly retain the services of outside design consultants, or deliver all the design and construction services in-house as an integrated DB firm. Often the Design Builder specializes in a particular market or building type. As with CMAR, the contract may be based on a GMP or Cost Plus.

In addition to these three primary types, a fourth type, Construction Manager as Agency (CMA), is often cited. In this model, a Construction Manager is hired based on a negotiated fee to help the owner manage and make critical decisions about a project, but does not have contractual responsibility to deliver the project on-time or on-budget, and does not enter into subcontracts with trade contractors. In actuality, though, this is not truly a construction delivery methodology. CMA is a method for managing, not delivering, projects, and is a service best provided by independent Project Managers.

In the United States, DBB is the most common methodology for delivering construction, accounting for approximately 60% of projects, while Construction Management at Risk accounts for 25%, and Design-Build for 15%. As we will see, these percentages are very different for data center projects.



## 3. The Pros & Cons

Each of these construction delivery methodologies has a proper place, based on the needs of the Owner and the requirements of the project. Below is a list of pros and cons for the three typical methodologies discussed in Section 2:

### Design-Bid-Build

Pros:

- ✓ Well-known Deliver Methodology, familiar to most Owners and Contractors
- ✓ Single point of responsibility for construction
- ✓ Complies with most public bidding policy
- ✓ May results in the lowest costs, only if the CD's are complete and coordinated

Cons:

- Can create adversarial relationships between Owner and General Contractor over change orders and out of scope items
- The actual construction price is not known until the project design is fully designed
- The Contractor has no builder input during design
- High potential for change orders if the CD's are incomplete or uncoordinated
- There is no Owner involvement in selection of subcontractors

### 3. The Pros & Cons

#### Construction Management At Risk

Pros:

- ✓ Construction input during design for development of budgets and schedules
- ✓ Transparent bid process & selection of subcontractors
- ✓ Ability to begin construction before completion of CD's
- ✓ Construction costs are known early in the project
- ✓ Single point of responsibility and risk for construction

Cons:

- May result in higher initial costs than DBB
- May result in unexpected change orders if subcontractor bids are incomplete

#### Design/Build

Pros:

- ✓ Builder input during design
- ✓ Guaranteed price
- ✓ Single point of responsibility for both design and construction
- ✓ Fast-track delivery opportunity

Cons:

- Potential loss of Owner control
- Loss of checks & balances between Architect and Contractor
- May result in underdeveloped design documents and details
- May limit subcontractor involvement

### 4. Choosing The Right Methodology

There are many factors that effect the selection of the most beneficial methodology. These factors include:

- The Owner's experience, capability, internal policies/compliance requirements
- The function of the project
- Budget constraints
- Schedule requirements
- Operational Impact
- Location of the project
- Availability of qualified design and construction resources
- Local and regional regulatory restrictions

All these must be carefully considered when selecting a delivery methodology, but among all these factors, every project consists of three essential parameters – Scope, Cost, and Schedule - often called the “Project Triangle”:

## 4. Choosing The Right Methodology

**Scope:** The operational function and purpose of the project.

**Cost:** The overall construction and consultant costs of the project.

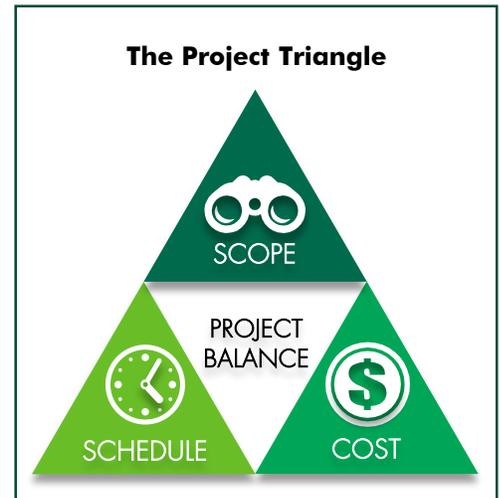
**Schedule:** The date that the project needs to be completed.

It is not only essential that these three parameters be defined, but also that the most important of these – the “Project Driver” – be identified.

In order to identify the Project Driver, the Owner needs to ask:

- Must the cost of the project be limited to a specific amount while it’s OK for the quality to be reduced?
- Must the project be done by a specific date, even if this results in more costs?
- Must the intended functionality of the project operate flawlessly, although it may lead to a later completion or additional costs?

For a successful project, the identification of the driver should occur at the inception of the project and be clearly communicated to the project team. If the driver is not clearly identified and communicated, the team may proceed in the wrong direction, resulting in possible design and construction errors and missed project goals.



## 5. Data Center Design & Construction

Although Design-Bid-Build (DBB) is the most common construction delivery methodology in the United States, Construction Manager at Risk is the most common for data center projects. Given the pros and cons of the various methodologies as discussed earlier, and the Project Drivers for data centers, this is not surprising - for the following reasons:

- I. **Speed to Market:** Because of the need to address new technology or customer demand, most data center projects, whether for enterprise users, colocation developers, or cloud providers, require that the project be built as quickly as possible. DBB, however, tends to be a slow process, requiring that all CD’s be complete before the bid and award of construction. Data centers also houses a large quantity of long-lead items, such as generators, switchgear, and UPS, which typically need to be ordered early in the design process. Both CMAR and D/B address the need for early construction involvement and speed to market.
- II. **Risk Reduction:** Although the Architect and Engineer may have designed a project that works on paper, it’s the Contractor’s responsibility to develop the means and methods for installing the systems in a way that reduces the risk of system downtime or failure in the integration of infrastructure components. For DBB, the GC is bound to bid the drawings as produced, and has limited ability to add input. Both CMAR and D/B provide the ability for the Contractor to perform constructability reviews during the design process, and to develop ways to anticipate and reduce these risks. As noted earlier, though, D/B can reduce the healthy give and take between Engineer and Contractor that often results in creative solutions.

## 5. Data Center Design & Construction

- I. **Value Engineering:** Data Centers are among the most expensive commercial building type, and Owners are always on the look out for ways to cut costs during the design of the project without negatively impacting systems performance. Here, a Contractor's early involvement can be an extremely valuable service. This is where D/B is less effective, because the Engineer works for the Contractor, and both are less likely to challenge the design. Again, because in the DBB process the Contractor comes on board only after the design is complete, value engineering can be difficult and time-consuming to implement.
- II. **Work-Arounds:** Many data center projects occur in operating or occupied facilities, where the risk of adversely affecting existing systems is high. Sequencing construction to minimize these risks is typically outside the scope and expertise of the Architect and Engineer, and therefore will often not be accounted for in a DBB bid. Here, both CMAR and D/B can be very effective in anticipating work-arounds, and including the associated costs in the subcontractor bids.

## 6. CBRE Data Center Solutions

CBRE's Data Center Project Management group has experience with all the delivery methodologies. We know that there is no "one size fits all" solution, and approach each project individually to find the approach that best addresses our client's objectives. Such early involvement can result in significant cost savings and risk mitigation.

In addition, CBRE's strategic sourcing program, named "FUSION", provides clients value creation and technical advice from world-class partners. CBRE manages construction of approximately \$42B+ per year globally, which allows us to drive down prices and secure the highest level of services from consultants, contractors, and materials suppliers. Through this program, CBRE can deliver data center projects utilizing any of the delivery methodologies. Our Data Center FUSION partners includes the following firms:

### Gensler:

The largest architectural firm in the world, with offices in every major market, Gensler was ranked as the #1 Architecture firm in 2015 for data center design by "Building Design+Construction" (BDC) magazine,

### Syska Hennessy:

Named #1 in 2015 for data center engineering by "Engineering New Record" (ENR) Magazine, Syska Hennessy provides Mechanical, Electrical, Plumbing, and Fire Protection design for a wide variety of commercial and governmental clients,

### Holder Construction:

Providing construction to Enterprise, Colocation, and Cloud service providers across the globe, Holder is the largest mission construction firm in the United States, and is ranked #1 in 2015 for data center construction by ENR magazine.



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