



حرفه مدیریت ساخت (سند Capstone، از مراجع اصلی اخذ مدارک CMAA)

بخش اول: معرفی دنیای مدیریت ساخت

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What we will learn?

- ☐ Foreword
- ☐ Construction management definition
- ☐ A brief history
- ☐ Construction industry outlook
- ☐ Professional association
- ☐ Primary roles and responsibilities
- ☐ Employment opportunities
- ☐ CM certifications

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What we will learn?

❑ Owners and project types

- ❖ Understanding owners and projects
- ❖ Project delivery
- ❖ Understanding delivery methods
- ❖ The CM project delivery method
- ❖ CM's body of knowledge and their roles
- ❖ CM services

❑ بخشنامه‌های شرح خدمات همسان سال ۱۳۹۲ و ۱۴۰۱

Owners and Project Types

(Project delivery)

Construction management

AN OWNER'S GUIDE TO PROJECT DELIVERY METHODS



Understanding Your Role

CM/PM Responsibilities
by Project Delivery Method

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AN OWNER'S GUIDE TO CONSTRUCTION AND PROGRAM MANAGEMENT

*Enabling Project Success
Under Any Delivery Method*

CMAA

Advancing Professional Construction
and Program Management Worldwide

Project delivery

❑ In the construction industry, “**project delivery**” refers to

the **process** of

1. Planning,
2. Designing,
3. Building, and
4. Completing

a project.

❑ A project delivery method is a **system** designed to

achieve the **satisfactory completion** of a construction project from

conception to occupancy.

Project delivery

Editor's Note: No singular delivery method is superior. Instead, try focusing on the following: what's the best project delivery method for each opportunity? The good news is that the variety of alternatives offers owners and CMs more flexibility in choosing an appropriate and effective system for the project.

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Project delivery



Project delivery

❑ Project delivery methods **vary** in how they **allocate**

1. Project responsibility and
2. Associated risk

among **project stakeholders**.

❖ For each situation, there will be **advantages** and **disadvantages** to using any method.

- ✓ The **owner** needs to **carefully assess** the project requirements, goals, and potential challenges and **choose** the delivery method that offers the **best opportunity** for success.

Project delivery – Agency CM

- ❑ **Regardless** of the project delivery method that is selected, owners may use the **concept** of an owner's agent, or agency CM, as the **principal agent** to
 1. **Advise** on specific phases of the project or
 2. **Manage** the process from beginning to end.
- ❑ The **agency CM** provides a **service** to the owner as a **method** for **managing** a project **as opposed** to the owner using a project delivery method.
- ❖ In fact, at the **beginning** of a **project**, the owner may **use** the **services** of an agency CM to **determine** the best delivery method to use.

Project delivery – Agency CM

❑ Is the role binding or not?

The degree of authority varies, and the owner should assign the agent CM enough authority to be effective. Whether responsibility for making binding decisions is retained in-house or outsourced, a decision regarding the nature of the relationship between the owner and the agent CM should be made promptly and then clearly defined in all contractual relationships associated with a project.

All members of the construction team should understand the agent CM's agency obligation to the owner. An agent is someone authorized to act on behalf of another. In the agency CM context, this means that the agent CM is acting on behalf of the owner. For an agency CM in a leadership capacity to be successful, the owner must empower the agent CM to make key project decisions in a timely manner.

The owner must be clear about the role and responsibilities of the agent CM and avoid having another layer in the project structure, which can be counterproductive. If the agent CM has little decision-making authority during the design phase or in the field, the owner has essentially hired an organization that is little more than an intermediary. Often, this type of agency arrangement results in an administrative role rather than the intended leadership role. In contrast, if the agent CM has substantial decision-making authority during the design and construction phases, potential for delay is substantially diminished.

AGC

Project delivery – Agency CM

❑ Is the role binding or not?

3.1.7 Management Options 124

3.1.7.1 Construction Manager as Agent 124

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3.1.7.3 Program Management 124

3.1.7.2 Construction Manager as Advisor

In the Construction Manager as Advisor (CM-Advisor) management method the construction manager acts as the owner's advisor. Unlike the CM-Agent, the CM-Advisor may not participate in the day-to-day project activities and may only advise the owner about project activities. While the CM-Advisor may offer many of the same services offered by the CM-Agent, the CM-Advisor does not have the authority to act or make binding decisions on behalf of the owner. The CM-Advisor does not enter into any agreements except with the owner.

CSI

Project delivery – Agency CM

- ❑ The **agency CM** acts as the owner's principal agent and does **not perform** design or actual construction work.
 - ❖ It is a **common misconception** that agency construction management represents a **distinct project delivery system**.

A common misconception is that agency CM is a *project delivery method*. An agent CM is not contractually responsible for delivering the bricks and sticks construction. Rather, the agent CM is responsible for furnishing the management services necessary to deliver construction. Thus, it is more accurate to describe agency CM as a *construction management system*, a way to manage the process of construction, not a way to physically deliver construction. Consequently, agency CM can be considered a type of project or program management, as described in the previous chapter.

AGC

Project delivery – Agency CM

Agency construction management is a management system based on an owner's agreement with a qualified construction management firm to provide coordination, administration, and management within a defined scope of services. The agent CM works throughout the various phases of a project and cooperates with the project team in furthering the interests of the owner. A key feature of this management system is that the contracting entity operates as an agent to the owner, operating under traditional legal obligations pursuant to an agency relationship. While agency CM is not limited to projects of a certain size, agency CM is frequently used effectively on large, complex projects where the owner desires to supplement its in-house staff and expertise.

AGC

Project delivery – Agency CM

❑ In fact, the CM as agent provides a **set of services** that are applicable to any project delivery method.

❖ These services can be **used by the owner** as necessary to

1. **Extend** or **supplement** the owner's own staff and in-house expertise,
2. As well as to **manage** the construction process to help **address some** of the **shortfalls** of the chosen project delivery system.

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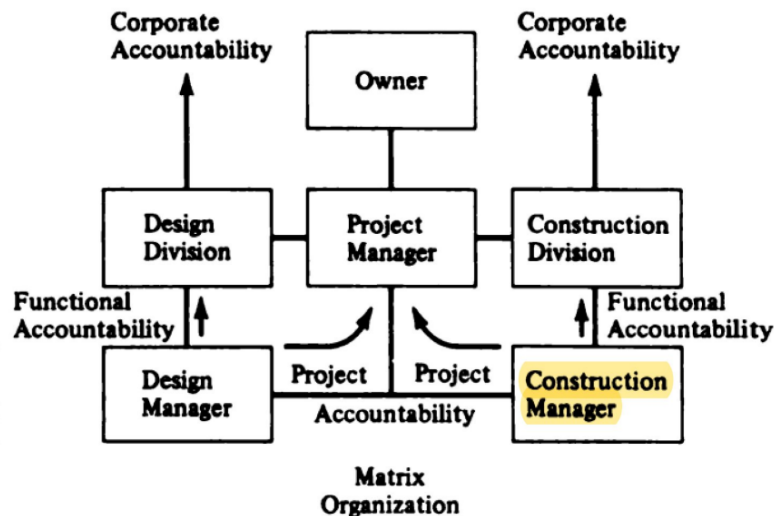
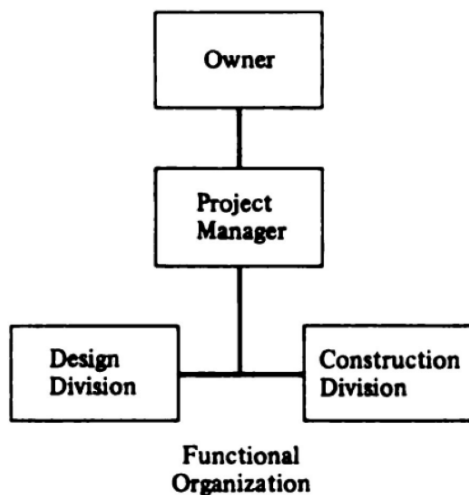
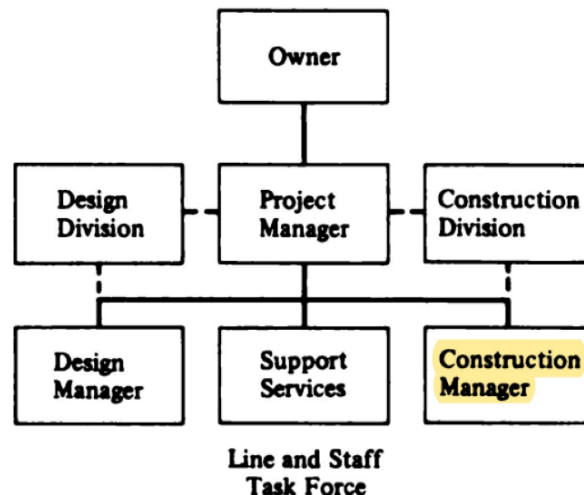
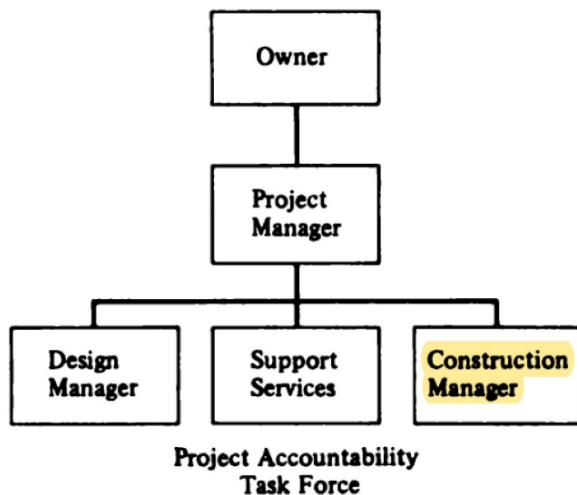
Project delivery – Agency CM

- ❑ A good example is **Massachusetts** where the CM as an owner's agent is a **requirement**.
 - ❖ There, the **position** is referred to as the owner project manager (OPM).
 - ❖ It is defined by **law** in the **Owner's Project Manager Guidelines (M.G.L. c. 149, §44A1/2)**.
 - ❖ This law, effective **July 19, 2004**, inserted a **new provision** that **governs public building procurements** in Massachusetts.

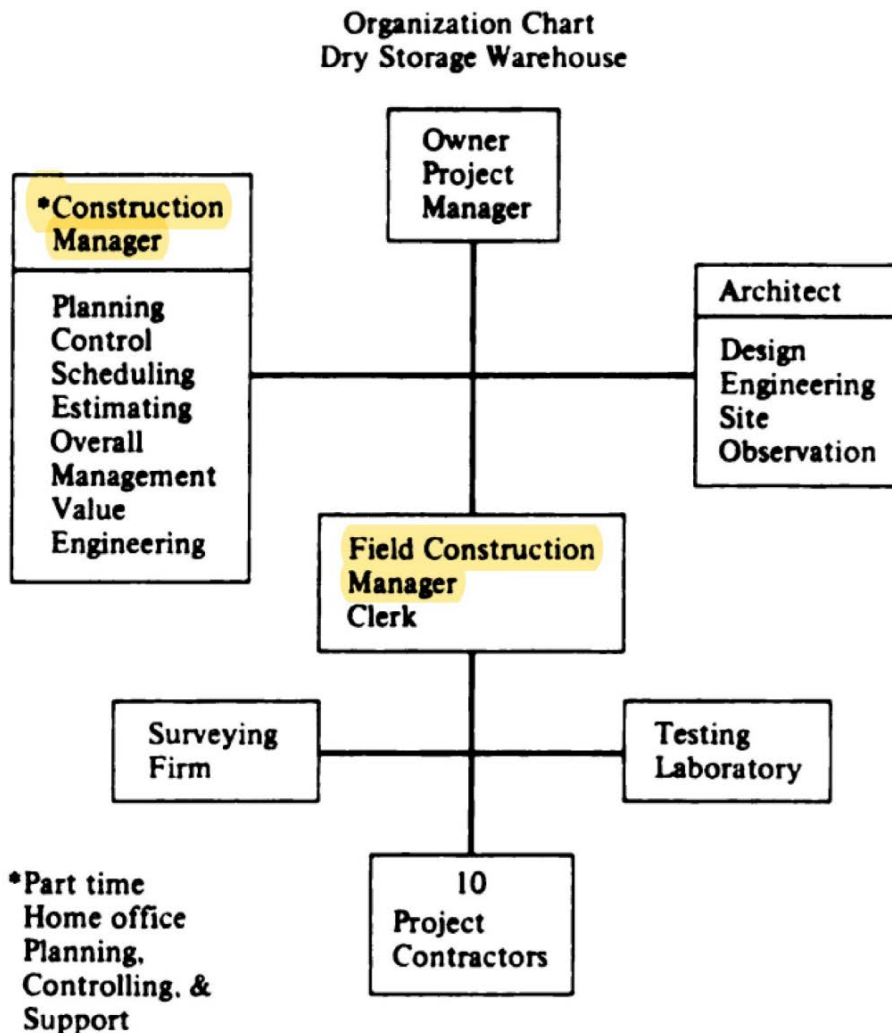
Project delivery – Agency CM

- ❑ The **provision** requires **public awarding authorities** to engage the services of an OPM on **all building projects** **estimated** to cost \$1.5 million or more.
 - ❖ The law requires that the OPM
 1. Be **hired before** the project designer,
 2. **Meet** required standards, and
 3. Be **selected** through a “**qualifications-based**” selection process.
- ❑ The OPM acts as the awarding authority’s agent and consultant throughout the project,
from design through completion, and
must be **completely independent** from the designer, GC, and any subcontractors involved in the project at all times.

Project delivery – Agency CM



Project delivery – Agency CM



Project delivery – Agency CM

- ❑ The law provides a **listing** of the **required duties** of the **OPM** as follows:
 - ❖ The duties of the owner's project manager shall include, but need not be limited to,
 - ✓ Providing advice and consultation with respect to
 - design,
 - value engineering,
 - scope of the work,
 - cost estimating,
 - general contractor and subcontractor pre-qualification,
 - scheduling,
 - construction and the selection,
 - negotiation, and
 - oversight of a designer and a general contractor for the project,

Project delivery – Agency CM

- ❑ The law provides a **listing of the required duties** of the **OPM** as follows:
 - ❖ The duties of the owner's project manager shall include, but need not be limited to,
 - ✓ Ensuring the **preparation** of time schedules which shall serve as **control standards** for monitoring performance of the building project, and
 - ✓ Assisting in **project evaluation** including, but not limited to,
 - written evaluation of the performance of design professional, contractors, and subcontractors

Project delivery – Agency CM

Remember this?

- ❑ The use of an agency CM, whether through an in-house resource for the owner or from a third-party firm, can be effective regardless of the chosen form of contract or project delivery method.

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Project delivery

Remember this?

- ❑ Construction management is a discipline uniquely tailored to the planning, design, and construction process of capital projects. Construction management has been used successfully in all contracting methods and delivery systems by owners who do not continuously maintain the staff or numbers necessary to deal with the complex responsibilities involved in the management of major projects.

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The evolution of delivery methods

- ❑ Prior to the late 19th century, most construction projects in the United States were **completed by owners/ builders** using many of their own employees for design and construction.
 - ❖ Contracts were typically **negotiated** as they **became necessary**.
- ❑ During the 20th century, with the **significant increase** in the **number of projects** by government agencies,
 - publicly-bid lump sum general contracts** gained popularity as an effective method for procuring construction services.
 - ❖ That **soon became** the **traditional approach** to project delivery.
 - ✓ **Owners** typically contracted with **architectural/engineering firms** to provide **design services** under professional services contracts whose terms and conditions were **negotiated**.

The evolution of delivery methods

- ❑ Since that **delivery method** highlighted the sequential elements of the design and construction process, it became known as **design-bid-build**.
- ❖ Construction for private sector clients was **still typically** performed through **individually negotiated** construction contracts.

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The evolution of delivery methods

❑ In the 1960s, a **new occupation** called “construction manager” was created to fulfill an **identified need**.

❖ The CM

1. **Worked directly** for the **owner** of the project under a professional services agreement and
2. **Filled the role** of a GC by **managing** the construction process and the trade contractors.
 - o The CM assumed **no construction performance risk** since the **contracts remained** with the owner.

❑ This delivery method became known most commonly as Multiple Prime or Trade Contracting and helped develop the **concept of fast-tracking** a project.

The evolution of delivery methods

- ❑ By the **mid-1980s**, both public and private construction projects were **rife** with **disputes** and **litigation**, and consequently, delays were common.
 - ❖ **Owners** began demanding (and in some cases originating) **specialized changes** to standard contracting and delivery methods.
- ❑ In response, **GCs** started offering hybrid services where
 1. They functioned as **consultants** during the design phase and
 2. Then assumed **construction** and **delivery risk** for the construction phase.
 - ✓ Some contractors offered **guaranteed maximum price (GMP)** **contracts** as a way to assume **most of the risk** for cost overages.

The evolution of delivery methods

- ❑ Over time, this **delivery method evolved** and became known as **CM at-risk (CMAR)** with **detailed terms and conditions** that enabled **both parties** of the contract to
 1. **Clearly identify** and
 2. **Accept** various construction **risks**.
- ❖ It also **created construction opportunities** for CM firms that previously only provided consulting or **agency CM services**.

The evolution of delivery methods

- ❑ The 1990s saw a return to the idea of single responsibility for design and construction with renewed interest in the **design-build (D-B) delivery method**.
- ❖ This led to many jurisdictions passing legislation to permit the use of D-B for public sector projects, enabling it to become a common delivery option for public owners.

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The evolution of delivery methods

□ Today, the professional CM's primary function is to

successfully deliver a completed project or program for an owner

regardless of the **delivery method** or **contracting strategy**.

❖ **Every project** has different requirements, and owners have their individual constraints and resources.

✓ Since 1999, CMAA has maintained a position of being

1. **neutral** on **project delivery methods** and

2. does **not advocate** any particular delivery system.

The evolution of delivery methods

□ If

1. A **CM firm** has been **selected** because it **specializes** in a specific delivery method, or
2. The **owner** has already decided on the **delivery method** to be used, then the **professional CM's role** is to help **ensure** that the **delivery** will be as **successful as possible** using that method.

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The evolution of delivery methods

❑ If the **CM firm** is in a **position** to advise the owner,

then based on experience and training,

the **CM's role** may be to

1. Identify and evaluate **all of the issues** that could **impact** the **successful completion** of the project at **hand** and
2. Recommend the **delivery method** that will **best satisfy** all of the project **requirements** with the **resources available**.

Quite simply, the **CM** should be an advocate for project success,

not a salesman for a **preconceived notion** that
one delivery method is **best suited** for all projects.

The evolution of delivery methods

- ☐ Many projects have been **successfully completed** using **each of** the delivery methods.
- ☐ There have also been some **significant failures** with **each method**.
- ☐ By **learning the differences** in delivery methods and **how to identify** the important project requirements and the owner's constraints,
CMs are able to provide a **valuable service** to their clients.

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Factors that influence project delivery

- ☐ From the **owner's perspective**, factors having an influence on successful project delivery include:

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Factors that influence project delivery

❑ Budget.

- ❖ The **owner** has an obvious need to **determine** a realistic budget **before design** to
 1. Evaluate project feasibility,
 2. Secure financing, and
 3. Use when choosing designs or site locations.
- ❖ Once the budget is determined,
the project must be completed **at** or **near** the established amount **without excessive overruns**.

Also, see the Cost Management section.

Factors that influence project delivery

❑ Design.

- ❖ Since the design of the facility must be buildable and properly communicated in order to be useful,
the owner requires design documents that are constructible, complete, and coordinated.
 - ✓ The **documents** should properly incorporate **unique features of the site** to include subsurface conditions, interface with adjoining properties, access, and other characteristics.
- ❖ The **key role** of the CM is to **clarify** the intentions and expectations to the **design team**.

Factors that influence project delivery

❑ Schedule.

- ❖ The **date** of **completion** of a new facility can be **critical**, either in terms of
 1. **Generating revenue** from the facility or
 2. Providing **needed functional space** by a specific deadline.
- ❖ Therefore, a **realistic assessment** of
 1. Project duration and
 2. Sequencingneeds to be performed **early** in the planning process.
- ❖ The **schedule** should then be **monitored** throughout design and construction.

Also, see the Time Management section.

Factors that influence project delivery

❑ Owner's Level of Expertise.

❖ The

1. **Owner's familiarity** with the construction process and

2. Level of in-house **management capability**

will have 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.

Factors that influence project delivery

❑ Risk Assessment.

- ❖ In **construction**, issues of risk are closely tied to schedule and budget.
- ❖ The **owner** needs to **understand** the **risks** involved in construction to make a conscientious decision regarding the **allocation of those risks**.
- ❖ In considering risk allocation, the owner should strive to **assign risks** to the **parties** that **exercise control** over those aspects.

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Factors that influence project delivery

❑ Risk Assessment.

- ❖ For example, it would typically be **problematic** to **require** that the **contractor correct problems** due to design errors at no extra cost since the contractor generally has **little control** over the cause or magnitude of such errors.
- ❖ A **key role** of the **CM** is to develop and communicate an **accurate assessment** of the **owner's risk tolerance perspective** to the stakeholders so everyone can exercise appropriate levels of judgment.

Also, see the Risk Management section.

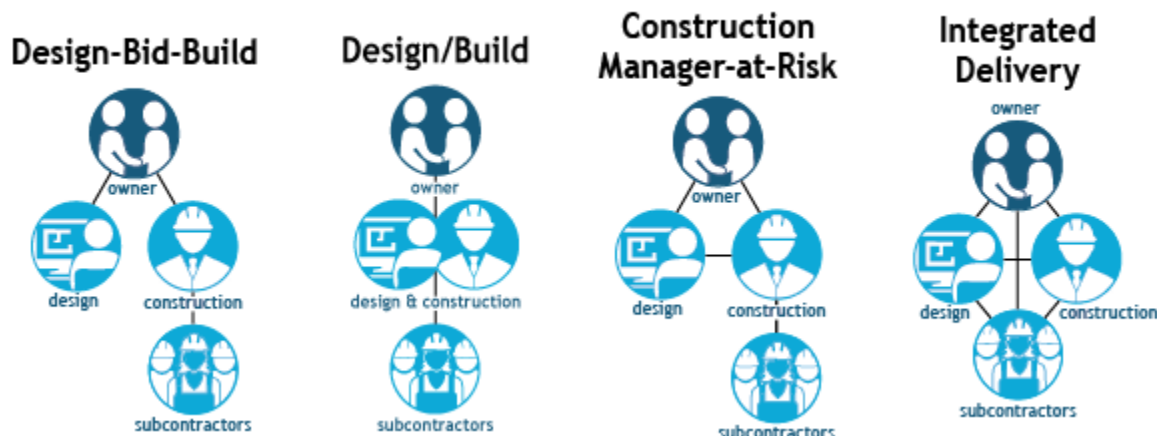
Owners and Project Types

(Understanding delivery methods)

Understanding delivery methods

❑ The **four basic forms** of project delivery are

1. Traditional approach or design-bid-build (D-B-B),
2. Multiple prime contracting,
3. Construction manager at-risk (CMAR), and
4. Design-build (D-B).



Understanding delivery methods

- ❑ Each one has its own **advantages** and **disadvantages**,
so it's important to **evaluate them carefully** to ensure the most appropriate
method is used for the project.



Design-Bid-Build



Multi-prime
CM



CM
at Risk



Design/
Build

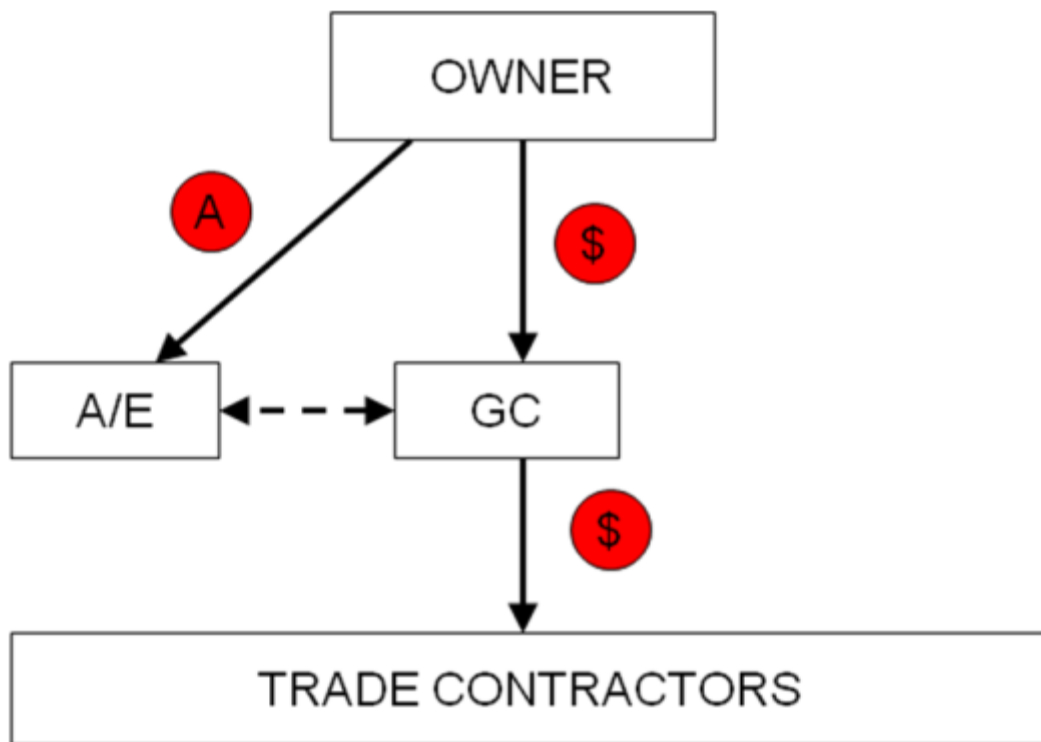
Traditional or design-bid-build (D-B-B)

- ❑ In D-B-B, the parties involved include the owner, the designer, and at least one prime or GC with subcontractors.
- ❑ This delivery system is characterized by **executing the five major phases** of a project in **linear sequence**.



Design-Bid-Build

Traditional or design-bid-build (D-B-B)



Design-Bid-Build

Traditional or design-bid-build (D-B-B)

❑ The **designer** typically

1. Maintains **limited oversight** of the work and
 2. **Responds to questions** about the design on behalf of the owner, usually through a request for information (RFI).
- ❖ The designer may also **assist** the **owner** in administering the construction **contract**, including **determination** of project progress, **for** **interim payments** made to the contractor.



Design-Bid-Build

Traditional or design-bid-build (D-B-B)

- ❑ With D-B-B, the **contractor's** job is to **construct** the project in accordance with the plans and specifications.
- ❖ The contractor may **subcontract** all or a portion of the work to specialty contractors who perform as subcontractors **under general supervision**.
- ❖ The contractor is **responsible** for
 1. Means, methods, and sequence of construction, as well as
 2. Scheduling and coordination of all subcontractors, suppliers, and vendors.
- ✓ The **contractor selected** for construction does **not have any responsibility** to participate in the **design phase**.



Design-Bid-Build

Traditional or design-bid-build (D-B-B)

❑ In the D-B-B approach, the **owner manages** the overall process and administers all contracts.

❖ However, the **owner** can **elect** to have **little involvement** in the day-to-day coordination and performance of the work, **relying on**

1. The **designer** to execute the design and
2. The **contractor** to construct the work.

❖ The **designer** may provide **on-site construction monitoring services** as an **agent** of the owner.



Design-Bid-Build

Traditional or design-bid-build (D-B-B)

❑ The **role** of the **owner** **primarily centers** on

1. **Funding** the design and construction effort,
2. Providing **overall direction** during design,
3. **Furnishing** any pre-purchased equipment, and
4. Providing any **information** and **approvals** required by the construction contract.



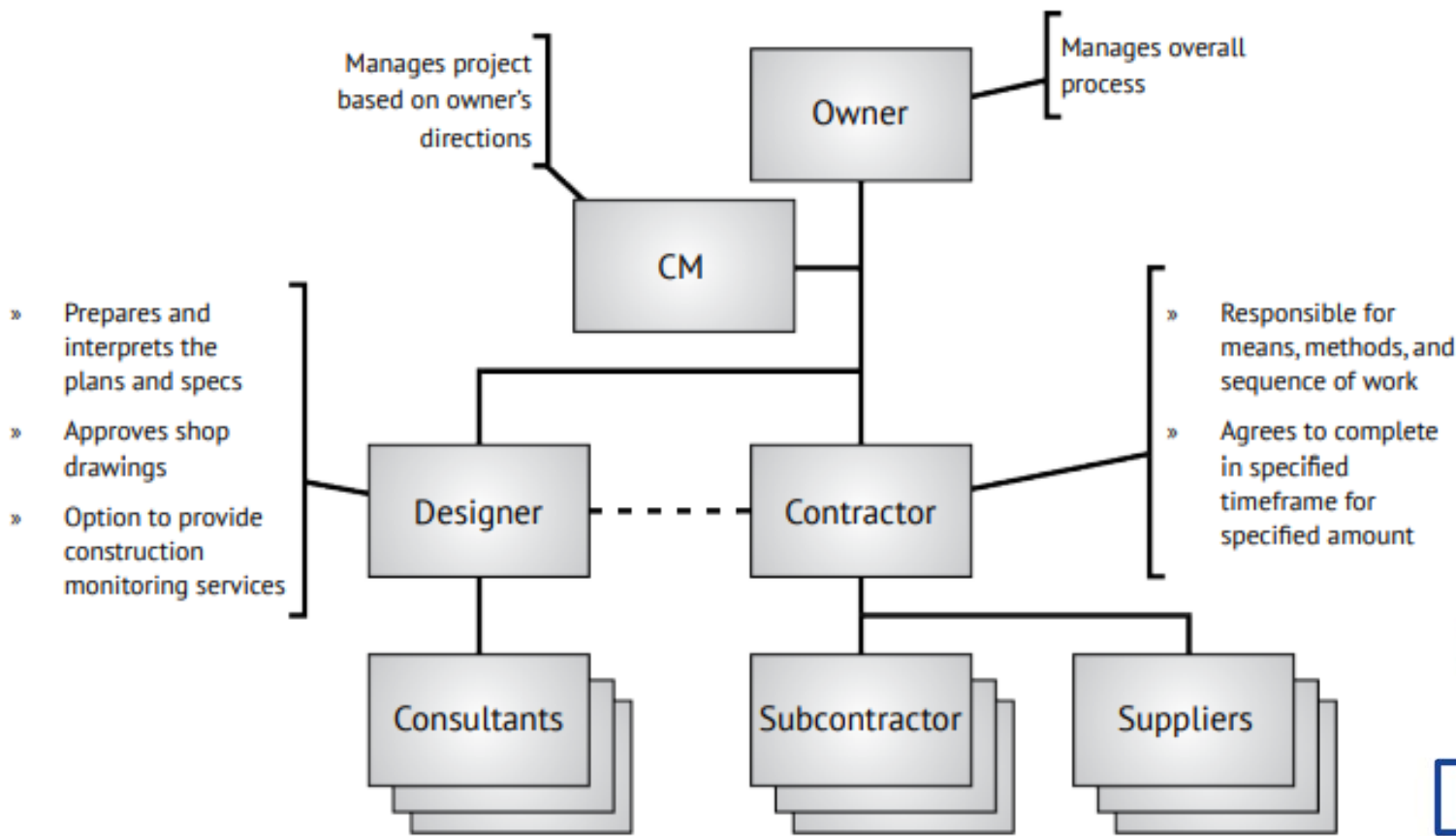
Design-Bid-Build

❑ Some owners may have the **technical resources** to perform all or a portion of the **construction monitoring** services themselves.

❖ However, in **many cases**, an owner will **hire a CM** to help manage the process and administer the contracts.

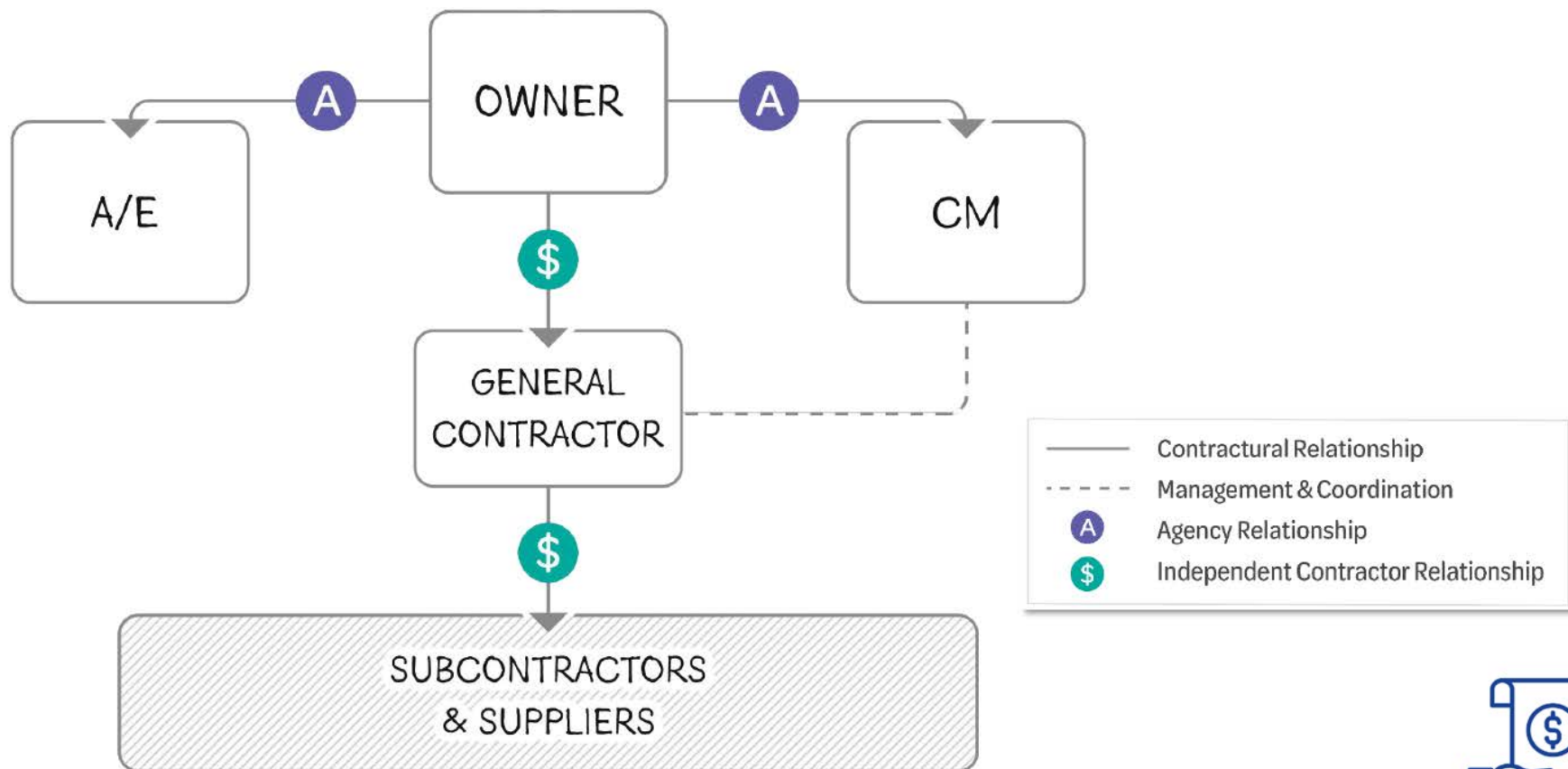
✓ In D-B-B, the **CM functions** as the **owner's agent** throughout the project delivery process.

Traditional or design-bid-build (D-B-B)



Design-Bid-Build

Traditional or design-bid-build (D-B-B)



Design-Bid-Build

Traditional or design-bid-build (D-B-B)

❑ **Construction documents** are usually comprehensive and complete when the D-B-B system is used.

❖ While they may be **modified** through

1. Addenda during the **procurement** phase, or by
2. Change orders during **construction**,

they are **essentially complete** before any cost proposals or bids are made.

❑ Since **all bidders** are working based on **complete documents**, the **normal expectation** is that each bidder will **render its price** based on a proposed and specific form of contract pricing.



Design-Bid-Build

Traditional or design-bid-build (D-B-B)

❑ Main Characteristics

- ❖ Phases are linear
- ❖ Construction documents are usually complete before bids are received
- ❖ The contract may be negotiated or competitively bid
- ❖ Unlimited number of subcontractors



Design-Bid-Build

Traditional or design-bid-build (D-B-B)

❑ Advantages

- ❖ This delivery method is **widely applicable** and **well-understood**, with **well-established** and **clearly defined roles** for the parties involved.
- ❖ Furthermore, it offers the **owner** a **significant amount of control** over the **final product**, particularly since the **facility's features** are fully determined and specified prior to the selection of the contractor.
- ❖ While the **owner bears all major project risks** prior to construction, once the construction **contracts are signed**, that means the **cost** has been **established**, and the **major risk** belongs to the **contractor**.
- ❖ Getting the **reliable price** information before construction starts can be **helpful to the owner** when obtaining any required project or contract approvals and **securing** any necessary **financial commitments**.
- ❖ In addition, the **owner** can **benefit** from open price competition.



Design-Bid-Build

Traditional or design-bid-build (D-B-B)

❑ Disadvantages

- ❖ The **process** is **time-consuming** 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** or **increased owner risk** as to the feasibility of the project during design.
- ❖ The **absence** of the **contractor's input** into the project design may **limit** the effectiveness and constructability of the design.
 - ✓ **Important design decisions** affecting both
 1. the types of materials specified and
 2. the means of construction
 may be **made without** full consideration of a **construction** perspective.



Design-Bid-Build

Traditional or design-bid-build (D-B-B)

❑ Disadvantages

- ❖ The **owner** generally faces **exposure** to **contractor claims** over design and constructability issues since the **owner** **accepts liability** for design in its contract with the contractor.
- ❖ This approach tends to promote **more adversarial relationships** rather than cooperation or coordination among the contractor, the designer, and the owner.
- ❖ The **contractor** pursues a **least-cost approach** to completing the project, requiring increased oversight and quality review by the **owner**.
- ❖ **Many general contractors** perform little or no work themselves, **increasing the complexities** of the scheduling, coordination, and logistical support required and have **resulted** in placing the increased burden and potential risk on the owner and other project participants.



Design-Bid-Build

Multiple prime contracting

❑ One **alternative to the traditional** procurement system is Multiple Prime Contracting,

where the **owner** holds **separate contracts** with contractors of various disciplines, such as

general construction, structural, mechanical, plumbing, and electrical.

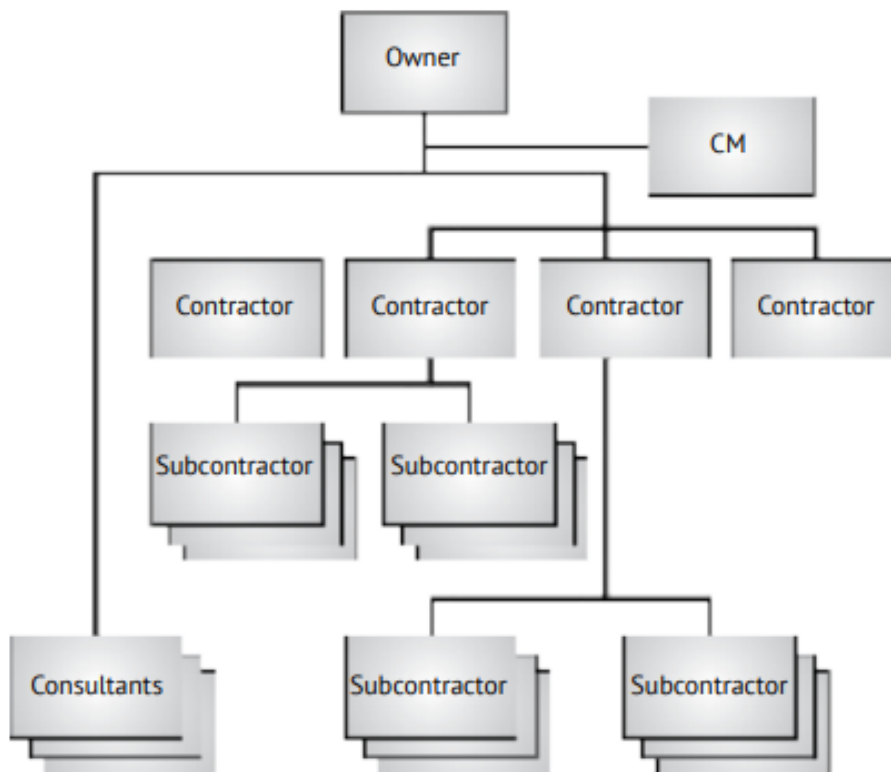
❖ In this system, the owner, **often through the CM**,
manages the overall schedule and budget during the entire construction phase.



Multi-Prime CM

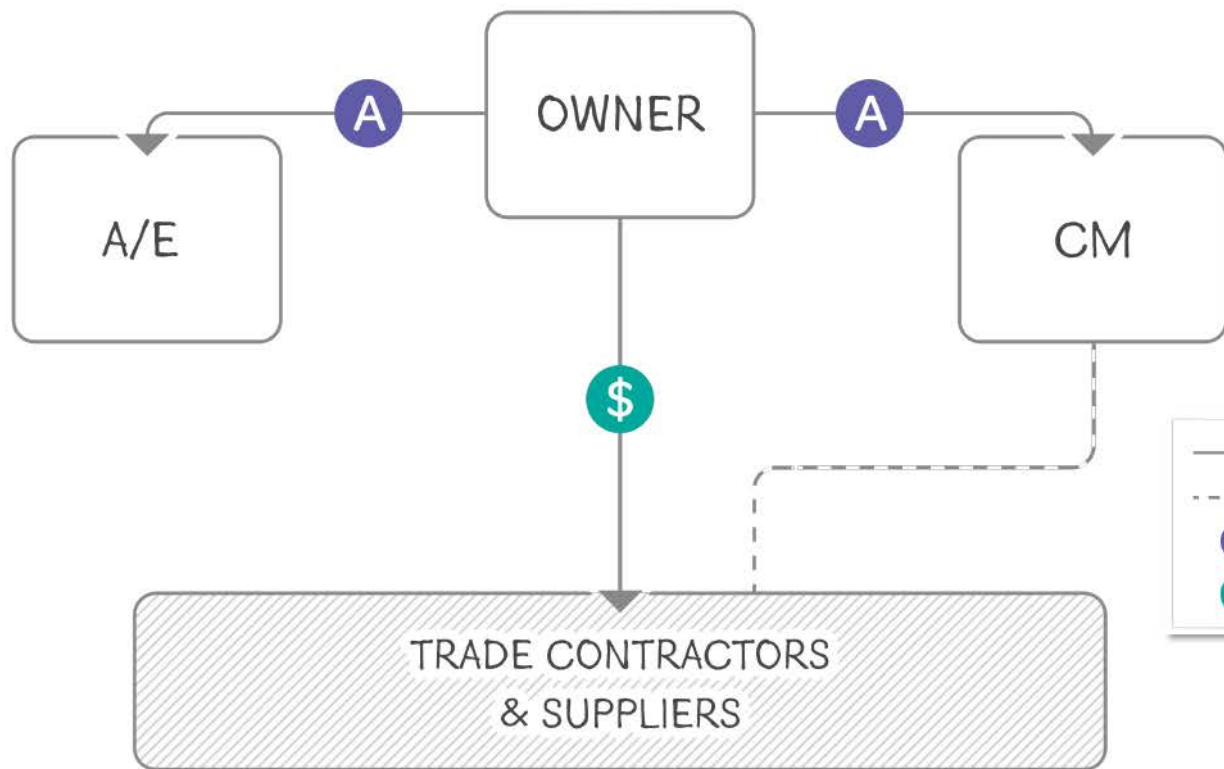
Multiple prime contracting

The Multiple Prime Approach



Multi-Prime CM

Multiple prime contracting



Multi-Prime CM

Multiple prime contracting

- ❑ This method, which is **required in some jurisdictions** for public construction, was **originally intended** to preserve the **opportunity** for local small trade contractors to compete for **public work**.
- ❑ In this system, the owner executes and holds individual contracts such as design, construction, and equipment.
- ❑ Trade construction contracts may be competitively bid or negotiated directly, and the **contractors** are responsible for the means and methods of construction.
- ❑ The **owner** usually maintains the right and authority to **approve** and **enforce** schedule and **compensate** the contractors directly.



Multi-Prime CM

Multiple prime contracting

- ❑ In **jurisdictions** where Multiple Prime Contracting is required,
the **number of prime contracts** is usually small and
may include general construction, HVAC, plumbing, and electrical.
- ❑ Often, the **owner** will
 1. Manage these contracts **directly** with in-house staff, or,
 2. In the **absence** of a separate CM,
will **impose** additional coordination duties on the **general construction prime contractor**.



Multi-Prime CM

Multiple prime contracting

❑ However, in **many public projects** and in the **private** sector, Multiple Prime Contracting will **usually** involve a **CM hired** by the owner as an **agent** to administer multiple contracts.

❖ With a **CM available** to manage administration and coordination, additional prime contracts are typically awarded, with **work broken down** into many smaller units based on typical trade subcontractor bid packages.



Multi-Prime CM

Multiple prime contracting

❑ There are **two basic types** of Multiple Prime Contracting:

1. Phased construction and
2. Trade contracting (full multiple prime).



Multi-Prime CM

Multiple prime contracting

❑ Phased Construction

- ❖ Phased construction is **typically selected** **when** work must start **before** plans and specifications are **complete**.
- ❖ The **project** is bid in phases such as
 - ❖ Site work,
 - ❖ Site utilities, and
 - ❖ One or more general construction packages for the buildings and/or other facilities.
- ❖ The owner gets the benefit of time savings, cost savings, and better control due to the **direct contracts** **managed** by the CM.
- ❖ The CM takes on the duty of managing and coordinating the contracts in the **owner's interest** to maintain the **overall schedule**.



Multi-Prime CM

Multiple prime contracting

❑ Phased Construction

❖ This creates the **opportunity** for the owner to have **better control** over the project **schedule**

since its **CM sets** the **schedule** for bidding individual portions of the work.

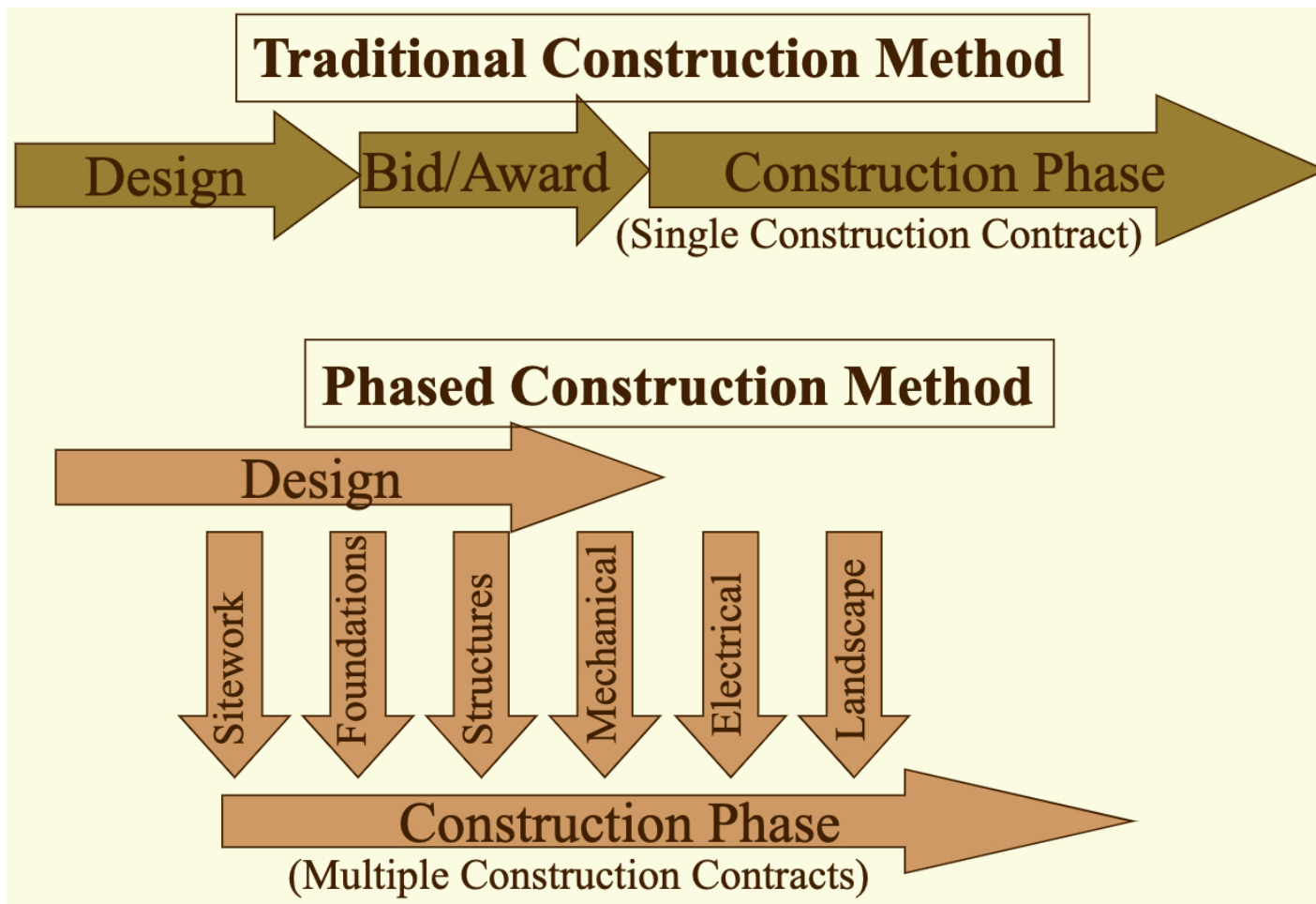
❖ For example, if an **initial phase of construction** (such as foundation construction) is **delayed**,

the **CM may reduce** owner liability for **delays** by **postponing** the bidding of follow-on work.



Multi-Prime CM

Multiple prime contracting



Multiple prime contracting

❑ Phased Construction

- ❖ This system also provides an opportunity to **manage costs** throughout the **phased procurement** of contracts.
 - ✓ For example, the **CM** can be instrumental in **assisting** the owner **indirectly procuring** major material items— such as structural steel or major mechanical equipment—which may provide significant savings by avoiding contractor markups.
- ❖ Additionally, the **CM** has a **responsibility** to be **sure**
 1. **Initial packages** are bid within budget and
 2. **Subsequent packages** can be bid within budget as the design is finalized.



Multiple prime contracting

☐ Phased Construction

❖ This duty is **particularly important** when the **owner** is **starting work** on a construction site **before most (or all)** of the construction **has been bid**.

✓ In this scenario, the **owner begins work** based upon the **CM's representations**

that the **balance** of the project can be **bid** and **built** for the **budget**.



Multi-Prime CM

Multiple prime contracting

❑ Multiple Prime Trade Contracting

- ❖ In Multiple Prime Trade Contracting, the owner holds **contracts** with **individual trade contractors**

who **specialize** in providing and/or installing **specific elements** of the **overall** construction requirements of a complete project.

- ❖ The owner
 1. Has a **contractual relationship** with **each** of the **trade contractors** and
 2. Gains the **documented benefits** of cost savings in the bidding process and
 3. **Better control** throughout the construction process.



Multi-Prime CM

Multiple prime contracting

❑ Multiple Prime Trade Contracting

- ❖ The CM has a **duty to coordinate** the contractors in the **owner's best interest** even if it's not in the **CM's best interest**.
- ❖ This is in **direct contrast** with the **D-B-B delivery method**, where the **contractor** is managing and coordinating the subcontractors and suppliers in the **contractor's best interest**.
- ❖ Under this approach, the **total construction cost** is
 1. The **sum** of the **individual trade contracts**, **plus**
 2. The CM's construction phase fee and general conditions costs.
- ❖ The project may be bonded at the individual trade contractor level.



Multi-Prime CM

Multiple prime contracting

❑ Multiple Prime Trade Contracting

- ❖ The **success** of Multiple Prime Contracting is largely based on the **effectiveness of the coordination** among the prime contractors and the CM.
 - ✓ By holding **numerous individual contracts** with the various prime contractors, the owner assumes a **greater risk** of performance.
 - ❖ While a **CM** may be **very effective** in coordinating the various primes, **often the lack** of a single point of responsibility for project performance can create **problems**



since **individual prime contractors** cannot be held **responsible for delays or disruptions** caused by other prime contractors.

Multi-Prime CM

Multiple prime contracting

❑ Main Characteristics

- ❖ Owner contracts with multiple entities.
- ❖ Owner maintains coordination role, often via CM.
- ❖ Prime contracts are broken up by trade or divided by law.
- ❖ Risk is assumed by the prime contractors.
- ❖ CM assumes no financial risk.



Multi-Prime CM

Multiple prime contracting

□ Advantages

- ❖ Owner retains design control.
- ❖ Allows for phased or fast-tracked construction.
- ❖ Contractors are involved early in the process.



Multi-Prime CM

Multiple prime contracting

☐ Disadvantages

- ❖ Owner is responsible for project changes and schedule gaps.
- ❖ Providing oversight increases the CM's exposure to safety and other issues.



Multi-Prime CM

Construction manager at-risk (CM at-risk or CMAR)

- ❑ This method, adopted and promoted by **many large general contracting firms**, is **similar** in many ways to the traditional “lump sum” approach.
- ❖ Typically, the **CM** initially becomes involved during pre-construction on a **consulting basis** (similar to an owner’s agent or agency CM) to provide
 - ✓ **Advisory** professional management assistance to the owner prior to construction,
 - ✓ **Offering** schedule, budget, and constructability advice during preconstruction plus
 - ✓ **Other** management aspects such as safety, risk, quality, etc.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Once the **GMP** is established,

the **CM** acts as

1. CMAR or
2. Construction manager/general contractor (CMGC).

❑ The CMAR

1. **Assumes risk** of subletting the **construction work** to trade subcontractors and
2. **Guaranteeing** completion of the project for

a negotiated price following completion of the design in a similar manner as the traditional approach.

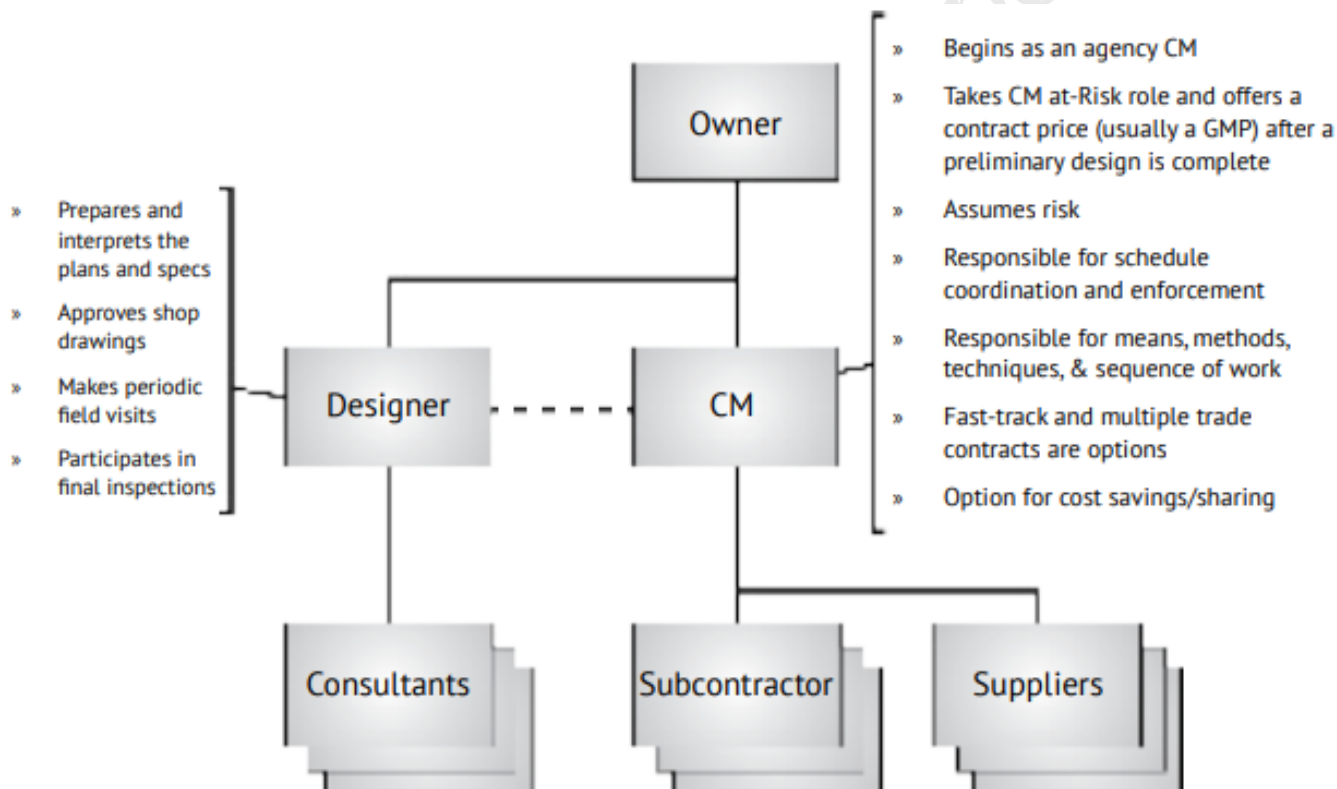
❑ Instead of a traditional GC, the CMAR is a **hybrid** of a CM and a GC that

1. Manages the project and
2. Keeps the owner informed.



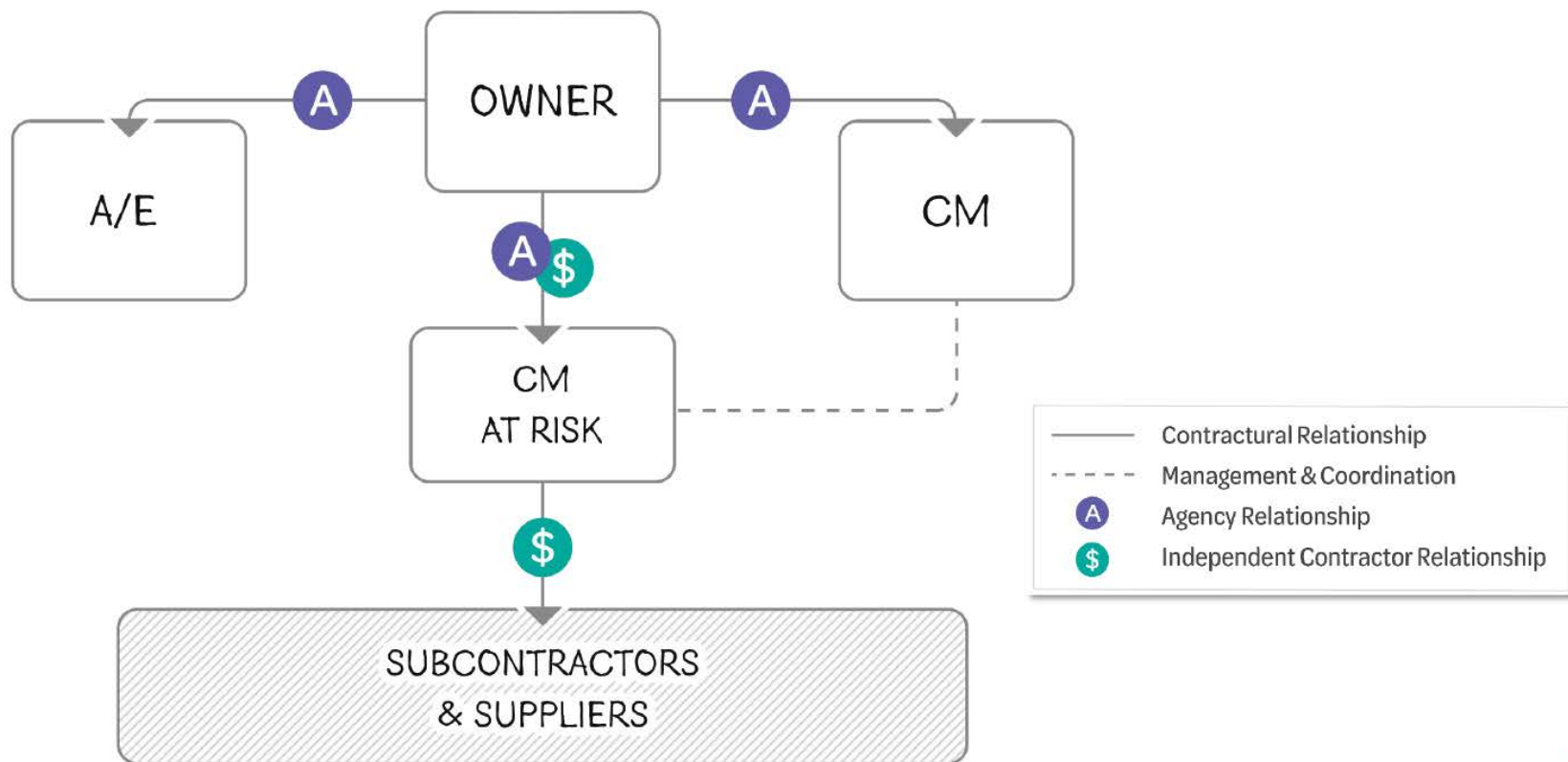
CM at Risk

Construction manager at-risk (CM at-risk or CMAR)



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ The CM's **dual roles** typically function as follows:

❖ The CM

1. **Begins** work during pre-design and design phases (or joins the team later in the process) and
2. **Serves** in an advisory role and as an agent of the owner while being **compensated** either on
 1. An **hourly basis** or
 2. For a **set fee** which was **negotiated** as “**pre-construction services**” in the initial contract.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ The CM's **dual roles** typically function as follows:

- ❖ During **these phases**, the CM will work with the **owner** and the **design** team to
 - ✓ Provide **input** on the method of construction and
 - ✓ Develop **preliminary estimates** of various alternatives to assist in developing the **most cost-effective design**.
- ❖ At some point when the **design is sufficiently complete** (e.g. plans 50% complete and specs 80% complete), the CM
 1. **Prepares** an estimate for **construction performance** and
 2. **Offers** the **owner** a total project cost usually in the **form** of a **GMP** with a **guaranteed** completion date.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

- ❑ Often, the **large projects** are best suited for GMP (or GMax), which is the **most used**.
 - ❖ The **lump sum** method may be better for **smaller projects** where the **CM** might **self-perform**.
- ❑ GMP budgets provide “**open book**” **cost breakdowns** that include fees and GCs that are typically **fixed** and **billed** on a percentage basis, while the fixed lump sum price is all-inclusive with **varying percentages** for profit and General Requirements/Conditions based on the **level of risk** that the **GC is willing** to take on.
- ❑ If for some reason an **agreement cannot** be reached on the **price** for construction performance, the **CM** may continue to **perform as an agent** of the owner.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ When the CM provides either

1. A GMP (which often includes a CM contingency if the designs are not 100%) or
2. Lump sum,

the **CM (now CMAR)** assumes the **risk** to deliver the project on time and within a fixed budget.

❖ The CMAR is also then **free to act** within

1. The confines of the contract and
2. Its implied conditions.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

- ❑ While the **risks** associated with a **lump sum price** are **clear**,
the risk assumed by the **CMAR** under a **GMP contract** can vary and will
depend on
the **fee** and **financial incentive** arrangements ultimately **agreed to** by the
parties.
- ❖ For example,
1. The CMAR's guarantee may be
 - I. its **fee**, or a **portion** thereof, if the **price is exceeded**.
 - II. Or, it could be for the **excess of the GMP** (total project construction costs).

Regardless, the CMAR becomes a general or independent contractor.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ In a **GMP scenario**, the CMAR (or CM firm) **typically**

1. **Interviews** for the job and

2. Provides

i. General conditions costs (fee, staff, etc.),

ii. Staff resumes, and

iii. Other pertinent information.

❖ Once the job is **awarded**,

the CMAR or firm **helps with pre-construction** and

often develops a document that

1. Summarizes and

2. Tracks

the **GMP** like the following example.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

ITEM #	DESCRIPTION	BUDGET	GMP AMOUNT
1	Demo/cleaning	49,674	34,884
2	Concrete	2,400	Incl. in 1
3	Metals	22,000	22,500
4	Carpentry/finishes	99,052	101,350
5	Specialties	4,595	10,000
6	HVAC	387,573	763,200
7	Equipment	57,500	Incl. in 6
8	Plumbing	70,757	Incl. in 6
9	Electrical	205,431	129,030
	SUBTOTAL	898,982	1,060,964
	ALLOWANCES		
1	Permits	0	1,800
2	Relocating Mechanicals	0	14,000
3	Design Completion	105,442	---
4	Contingency of 3%	30,133	30,133
	PROPOSED GMP	1,034,557	1,106,897



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ The **top section** of this document

1. **Itemizes material** costs and

2. **Compares**

i. **pre-construction budget** (acting as an agency CM) with

ii. **Changes** in the budget.

❖ The **next section** gives a **breakdown of allowances** such as

✓ Permits,

✓ Design completion, and

✓ Contingencies

to cover **unexpected costs**.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Main Characteristics

- ❖ Similar to the D-B-B approach but with earlier constructor involvement.
- ❖ Trades may involve competitive bids or negotiated contracts.
- ❖ CMAR may perform portions of the work.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Advantages

- ❖ **Earlier** development of **effective working relationships** for the project team.
- ❖ **Trades** may involve competitive bids or negotiated contracts.
- ❖ The benefit of the **contractor's input** during the **design** phase.
- ❖ **Potential cost security** for the owner, the **guarantee of the construction costs** before the contract documents are complete.
- ❖ **More transparency** in the subcontracting process to determine **costs** of the project.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Advantages

- ❖ **Cost savings/sharing incentives** if the final construction cost is **less than the GMP** (**some may claim** this as a negative because of the potential for a conflict of interest).
- ❖ **Less exposure** for the **owner to safety issues** compared to Multiple Prime Contracting.
- ❖ **Less exposure** to the **owner** for the responsibilities of **schedule** and **coordinating** the trade contractors, compared to Multiple Prime Contracting.
- ❖ **Less exposure** to change orders (as compared to D-B-B) by providing **expertise early** in the process and having a contingency fund.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

□ Advantages

- ❖ In addition to providing the owner with the **benefit of pre-construction services**,
the **CMAR scenario** offers the opportunity to **begin construction prior to completion of the design**.
- ❖ The **CM** can **bid and subcontract portions of the work** at **any time**,
often **while the design of unrelated portions** is still **not complete**.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Advantages

❖ In **this circumstance**, the CM and owner **negotiate** the GMP or fixed price based on

a **partially completed design**, which includes

the **CM's estimate** of the cost for the remaining design features.

✓ Furthermore, CMAR may allow performance specifications or reduced specifications to be **used** because

the **CM's input** can lead to **early agreement** on preferred

1. Materials,
2. Equipment types, and
3. Other project features.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Disadvantages

❖ The **primary disadvantages** of the CM at-risk method involve the **contractual relationship** among the designer, CM, and owner once **construction begins**.

✓ Once construction is underway, the CM **converts** from the **professional advisory role** of a construction manager (CMAR) to the **contractual role** of a GC.

○ At that time, there are **no longer** any explicit or implied **duties of loyalty and care** to the owner.

➤ **All trade contracts** are **usually held by the CMAR** and

contain the **necessary provisions** to allow the **CMAR** to **manage and control** the trade contractors to **assure performance** in terms of time, cost, and quality.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Disadvantages

- ❖ The CMAR has the **right** to **enforce** the schedule, **pay** the trade contractors, and **terminate** them if such action becomes **necessary**.
- ❖ **Trade contracts** may involve taking competitive bids or negotiating direct contracts.
- ❖ The CMAR also has the option of **performing portions of the work** with **its own resources** (unless prohibited by law on certain public projects).
- ❖ The CMAR is **responsible** for
 - the means, methods, techniques, and sequence of construction.
 - ✓ The CMAR usually will **leave** the means and methods to the **trade contractor** though **they ultimately** have the responsibility to the means and methods.
 - It also will depend on the **CM-owner contract**.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Disadvantages

- ❖ This **modified relationship** raises the **question** as to whether CMARs, with their own entrepreneurial and financial interests, can **balance** the needs of the project and the owner's interest **if tensions** over construction quality, the completeness of the design, and impacts to schedule and budget arise.
- ✓ Interests and stake-holding can become very **similar** to the design-bid-build system, and adversarial relationships may result.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Disadvantages

- ❖ While the fixed price or 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**.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Disadvantages

- ❖ One **mitigating approach** to this problem is for the CMAR to **share with the owner** its subcontractor bids to ensure **openness** in the process.
- ❖ The CMAR 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 **contract price**.
- ❖ In addition, **arrangements** can be made regarding
 1. Risk-sharing and
 2. Profit-sharingif there are **overruns** or **underruns** in the GMP.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Disadvantages

❖ The CMAR also assumes the **primary responsibility** and **liability** for **safety** on the project.

❖ As the **contractor** responsible for the **project**,
the CMAR **must ensure** the means and methods for creating and maintaining a **safe work environment** are in place.



CM at Risk

✓ This represents a **significant shift** in the CM's duties and obligations **from the agency role**,

in which the CM **advises** and **recommends**, but does not direct or control compliance with safety regulations and practices.

Construction manager at-risk (CM at-risk or CMAR)

❑ Other potential disadvantages of the CMAR system include:

- ❖ The **owner** may have little or no control over **cost contingencies**.
- ❖ On **public projects**, the CMAR who guarantees the cost of a project **may not have the right to self-perform** the work **if all work** is required to be **bid**.
- ❖ The **contract price** is often based on scope documents and disputes can arise as to the **understanding** of the **final contract documents**.
- ❖ **Possible bid shopping** after the contract price is rendered (illegal in some jurisdictions).
 - ✓ **Bid shopping** is the practice of divulging a contractor's or subcontractor's bid to other prospective contractor(s) or subcontractor(s) **before the award** of a contract in order to **secure a lower bid**.



CM at Risk

Construction manager at-risk (CM at-risk or CMAR)

❑ Other potential disadvantages of the CMAR system include:

- ❖ Possible slow payment to trade contractors (unless covered by the law, e.g. in Massachusetts **all trade contractors** must be **paid within 30 days** in the private sector and similarly in public contracts **based on the 2004 Construction Reform Law**).
- ❖ The **potential failure** of the CMAR to schedule and coordinate the trade contractors or subcontractors.
- ❖ The **possible absence** of project controls that benefit and preserve the interests of the owner.



CM at Risk

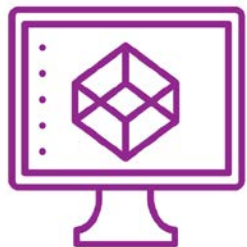
Design-build (D-B)

- ❑ For the owner, the primary benefit of D-B is the **simplicity of having one party** responsible for both the development of the design and the execution of the construction for the project.
- ❑ **While the other systems** often give rise to **disputes** among **various project participants**—

with the **owner acting** as the **referee** (or party ultimately to blame)—

in D-B, many of these disputes become **internal team issues**, which do **not directly** affect the owner.

- ❖ **Indirect effects** of D-B team issues may include **impacts** to schedule, budget, and time if **not carefully controlled**.



Design / Build

Design-build (D-B)

- Although this approach has been around for a **long time**,
a **key factor** to its recent growth is the **increased desire** of **owners** to have a
single point of responsibility for their projects to
reduce their risk and the potential for **disputes**.



Design / Build

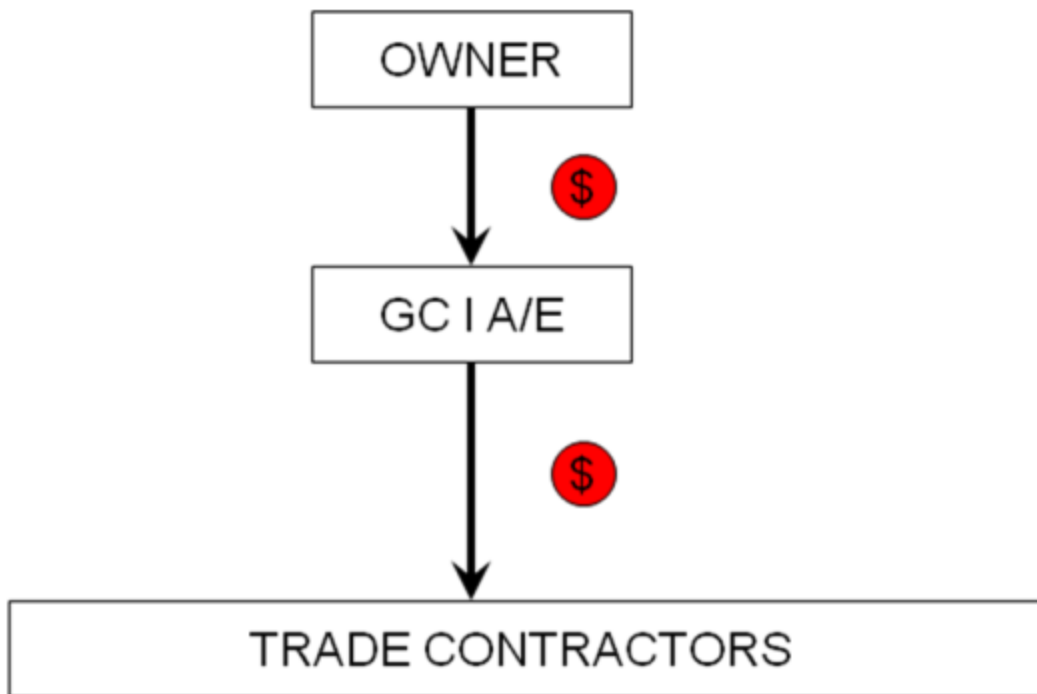
Design-build (D-B)

- ☐ Under this method, the **owner contracts** with a D-B team to plan, implement, and control the entire project through completion, occupancy, or start-up.
- ☐ Then the D-B 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, the D-B team will usually **negotiate a fixed price** to complete the design and construction of the facility



Design / Build

Design-build (D-B)



Design / Build

Design-build (D-B)

- ❑ While there are many D-B firms that provide all the essential services required for project delivery, this approach typically involves a **joint venture**, usually between a GC and a design consultant, with both firms having some **direct or related experience** with the type of facility planned by the owner.
 - ✓ Since **contractors** are comfortable in the role of **risking corporate capital** in performing projects, they are often the **lead members** of this sort of team.



Design / Build

Design-build (D-B)

1. **One variation** of the typical D-B team structure, known as a fee-paid developer, involves the **owner engaging** a developer who then **selects designer** and **contractor** partners.
2. **Another variation** of this delivery form is when a **construction firm** takes on the **total responsibility** and **subcontracts** for the design services.



Design / Build

Design-build (D-B)

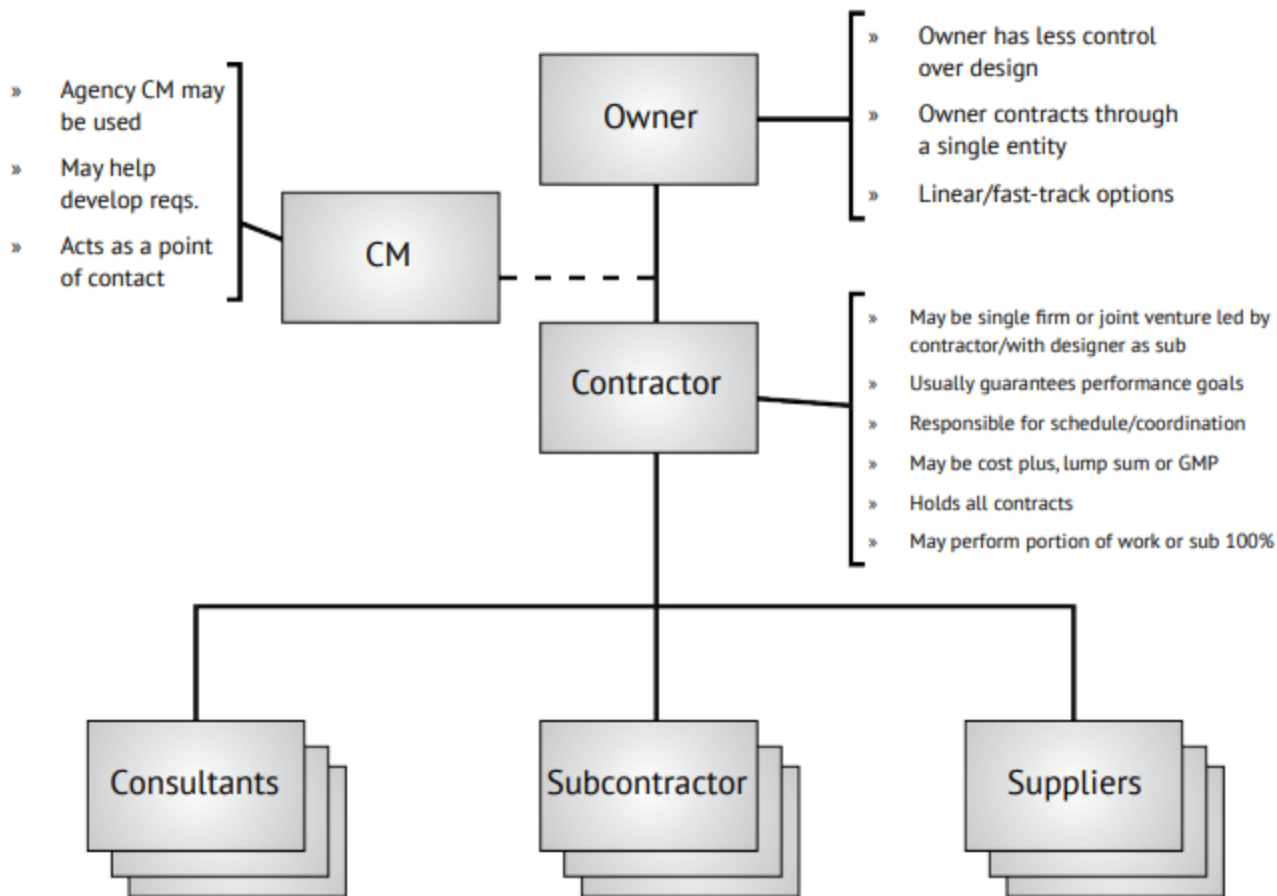
❑ Main Characteristics

- ❖ D-B team holds all design, vendor, supplier, and construction contracts.
 - ✓ Trades may involve competitive bids or negotiated contracts.
- ❖ During the **construction phase**, the D-B firm may **do all the work or subcontract** portions of the work required.
 - ✓ Subcontracts may be negotiated or competitively bid.
- ❖ **Owner** has **little involvement** other than making the **key decisions** that are necessary throughout the process.
 - ✓ Owner may want to **supplement its staff** with an **advisory (agency) CM** to provide **certain technical support services** to assure that the D-B team is achieving the **goals and objectives** established for the **project**.



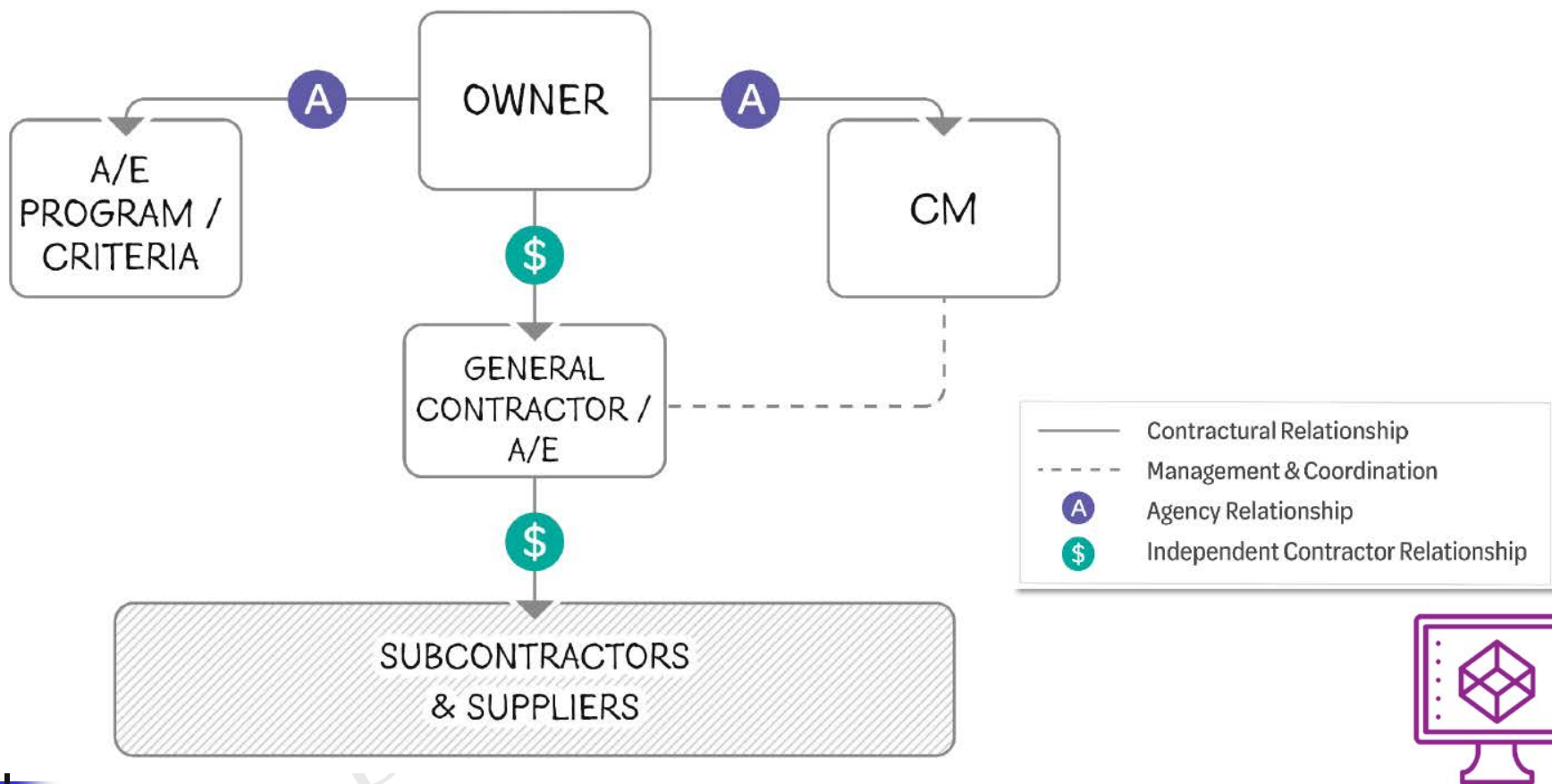
Design / Build

Design-build (D-B)



Design / Build

Design-build (D-B)



Design / Build

Design-build (D-B)

❑ Advantages

- ❖ D-B delivery systems can provide distinct advantages for the owner.
 - ✓ For example, the owner has a **single point** of responsibility for communication.
 - ✓ In comparison, the traditional, Multiple Prime, or at-risk construction management approaches involve **at least two or more parties** contracted by the owner.
- ❖ The D-B approach **minimizes** the **obligation** of the owner to schedule and coordinate the overall project.



Design / Build

Design-build (D-B)

❑ Advantages

❖ It also **reduces** the **potential exposure** to complex claims by

1. **Reducing** the **number of parties** involved and

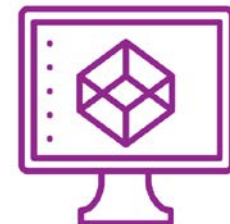
2. At the same time provides for **incentive/shared savings opportunities** such as **renegotiating subcontracts**.

❖ Further, the D-B approach allows the owner to

1. **Begin** a project with very little information,

2. **Proceed** through a project feasibility phase (if necessary), and

3. **Ultimately end up** having a **D-B firm guarantee** that certain performance **characteristics** will be **achieved** when the project is complete.



Design / Build

Design-build (D-B)

□ Advantages

- ❖ For the **contractor**, the D-B approach involves a **high degree** of **risk**.
 - ✓ However, if the approach realizes a **successful project**, the **risks** taken are **offset** by **greater profit potential**.



Design / Build

Design-build (D-B)

❑ Advantages

- ❖ Like the **CM at-risk method**, the D-B approach allows **construction expertise** to be involved in the **design phase**.
- ❖ It also allows for **fast-tracking** and/or **phasing** the project which is a **key advantage** not found with the traditional method
but provides the owner with the **option to use** the traditional linear phasing for its project **if it so desires**.
- ❖ D-B allows **some construction contracts** to be **awarded before all design** is complete and
sometimes before a final price determination is made.



Design / Build

Design-build (D-B)

❑ Disadvantages

- ❖ The **owner** has fewer checks and balances, and **loses** some degree of **control** over design, price, schedule, and technical matters.
- ❖ Under the D-B approach, the **design function** is an obligation of the D-B team and the **designer may not have** any **direct relationship** with the owner.
 - ✓ This can potentially **limit** the **owner's control** of the overall quality and/or performance of the project when a **GMP** or **lump sum** contract is used.



Design / Build

Design-build (D-B)

❑ Disadvantages

- ❖ The **primary caution** for an owner is that D-B considers the **level of involvement** required for a **successful project**.
- ❖ The **owner** needs to **recognize** the extensive **effort** and **completeness** that must be **behind** the initial scope/preliminary design, which forms the **basis of its contract** with the design-builder.
 - ✓ Often, the owner may require **CM involvement** to **select additional consultants** to **develop** the scope or preliminary design, in the **role** of a traditional design firm.



Design / Build

Design-build (D-B)

❑ Disadvantages

- ❖ The owner also has **less** opportunity for **involvement** in and **mitigation** of **problems** when they occur.
- ❖ Accordingly, it is **difficult** for the **owner** to **verify** that it is **receiving** the **best value for its money**, without a great deal of confidence in the D-B team.
- ❖ **Areas of concern** usually involve a **disagreement** over the **details** of
 1. The original scope of work,
 2. Quality,
 3. Controlling the overall time factor, and
 4. The ultimate cost of the project.



Design-build (D-B)

❑ Disadvantages

- ❖ There is also a **greater potential** for changes and disputes over **quality** and/or **performance**, particularly when a GMP or lump sum price is involved.
- ❖ The owner may choose to **use construction management**, where its interests in these areas are expected to be **under control of the CM**, with greater opportunity for **mitigation** when **they occur**.



Design-build (D-B)

❑ Disadvantages

- ❖ Owners with highly **specialized program needs** may not find it advantageous to turn over responsibility to an **outside team** **without** ensuring **adequate levels** of oversight and communication.
 - ✓ *For example, a government agency constructed a technology research facility involving highly specialized equipment using D-B.*
- ❖ During **project development**, the **D-B team** made several key design and equipment selection decisions **without** the **full involvement** of the owner, resulting in an **unsatisfactory facility** that **required costly changes**.
 - ✓ An OPM or CM agent could have avoided the issue by **being involved** in the **process before** the procurement of equipment.



Design-build (D-B)

❑ Disadvantages

- ❖ With this lesson in mind, D-B may be **best suited** to conventional projects where
 1. **Requirements** can be **clearly defined** and
 2. **Required expertise** is **widely available**.
- ✓ For example, a classroom/office facility or dormitory complex project might be ideally suited for D-B.
- ✓ In projects of this type, the **owner is not assuming undue risk** in conceding control over the project and may **benefit** from the **advantages of D-B**.



Design / Build

Design-build (D-B)

❑ Disadvantages

- ❖ Another primary consideration of the owner is the **proper selection** of the D-B team.
- ❖ Since the owner selects a D-B team **prior to start of the design**, it is sometimes **difficult** for the owner to maintain the **proper team balance** regarding design expertise, financial capability, construction experience, and experience in D-B team roles.



Design / Build

Design-build (D-B)

❑ Disadvantages

- ❖ More so than in any other delivery system, the **success of a D-B** project may hinge on the **initial selection process**.
- ❖ The **errors** and **omissions** in design is an important issue to be **handled** in the contract clauses,
particularly in the case of a **GC-A/E D-B team**, and
by **purchasing** appropriate insurance for the project.



Design / Build

Design-build (D-B)

☐ Disadvantages

- ❖ As in the traditional approach, there can be **much brokering** of the construction work and this can result in **more complex logistical** planning, scheduling, and coordination.
- ✓ In addition, this situation can be **compounded** by
 - ❖ Bid shopping,
 - ❖ Inadequate project controls, and
 - ❖ Lack of a change order control process.



Design / Build

Design-build (D-B) and CM

❑ The **role of the CM** in a D-B delivery system is **different from other delivery methods**

during the **design phase** since 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 **D-B delivery method**.



Design / Build

Design-build (D-B) and CM

❑ Owners with deliberate and time-consuming **decision-making processes** may find themselves particularly **pressured in D-B**

since the **speed of execution** offered by this delivery method **relies on**

1. The owner's prompt responsiveness and
2. Level of knowledge about their technical requirements.

❑ 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.



Design / Build

Design-build (D-B) and CM

- ❑ It is particularly important in D-B because the program of **requirements must** be thoroughly analyzed and tightly documented.
- ❖ The **contractor** delivers the requirements of these program documents that are the **basis for the D-B proposal**.
- ❖ In a D-B delivery system, the **CM** will act as
 1. The owner's representative with the rest of the project team, and
 2. The point of contact for the D-B team and any **other specialty consultants** engaged in the project **by the owner**.



Design / Build

Design-build (D-B) and CM

❑ Depending on the **contractual agreement**,

the CM's role in a D-B delivery method is to act as

the owner's agent and **help manage** the owner's exposure to **risk** by

1. Creating complete scope definitions and
2. Performing a thorough pre-qualification of insured bidders.

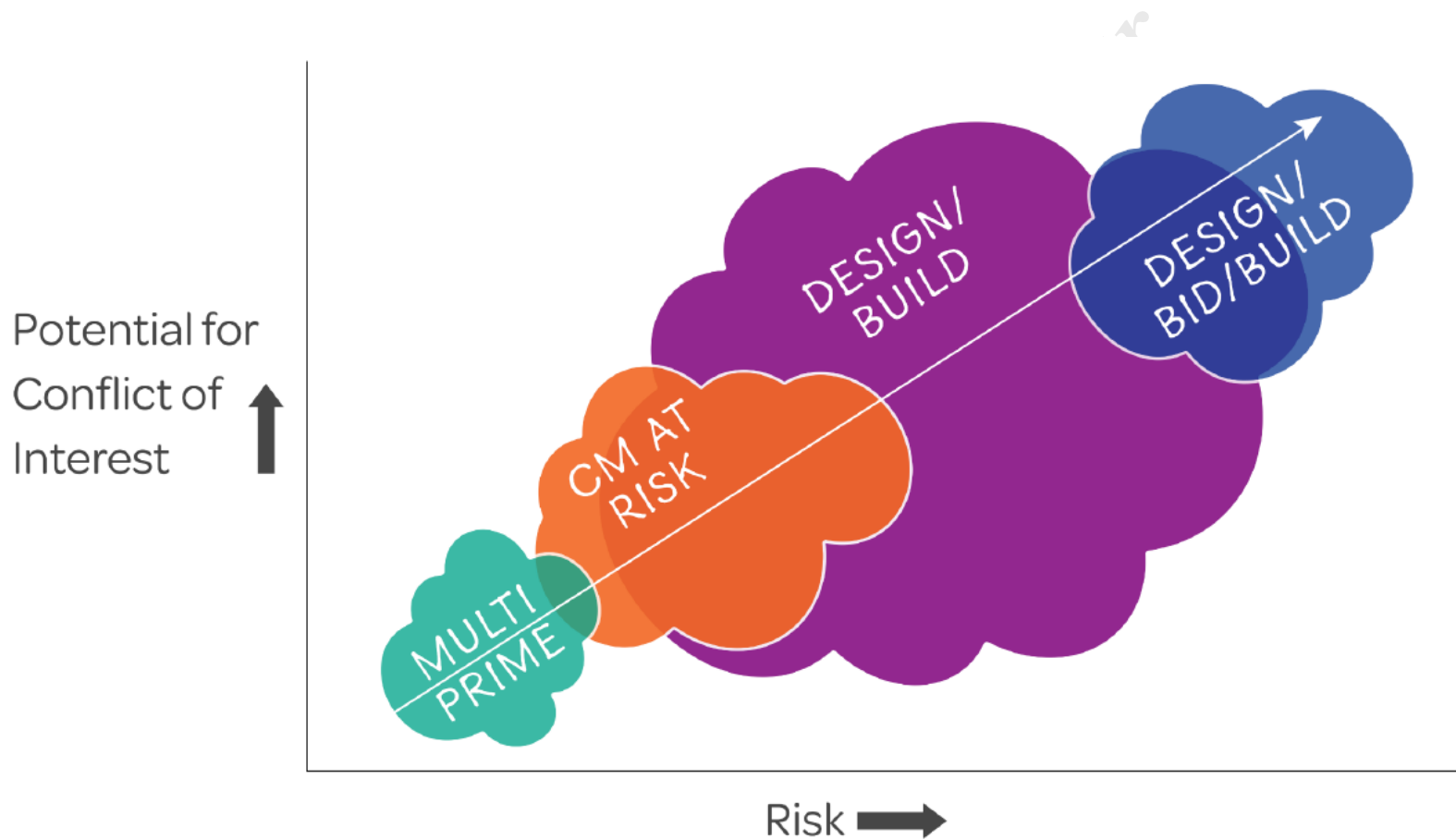
❖ If **contractor issues** occur, the CM will

- ❖ Help find a replacement,
- ❖ Supervise corrective work, and
- ❖ Process bonding claims.



Design / Build

Design-build (D-B) and CM



Other concepts

❑ Other available delivery concepts include

1. Public-Private Partnership (P3),
2. Engineering-Procurement-Construction/Engineering-Procurement-Construction Management (EPC/EPCM),
3. Integrated Project Delivery (IPD), and
4. Lean Construction.

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Other concepts

❑ EPC/EPCM.

- ❖ Engineering-Procurement-Construction is a type of contractual agreement similar to D-B

where the **EPC contractor** is responsible for
project execution and delivery

within a **designated time** and **budget** as identified in the contract.

- ❖ With the Engineering-Procurement-Construction Management contract,
the project is **largely managed** by the owner and
the **contractor** is responsible for the design and management of the
project
on the owner's behalf

but is **not directly involved** in construction.

Other concepts

❑ Integrated Project Delivery (IPD).

- ❖ IPD is a project delivery method distinguished by a **contractual agreement** between a **minimum** of the owner, designer, and builder where risk and reward are **shared equally**.
- ❖ This practice has been used **around the world** for many years and is sometimes called “**Alliancing**.”
- ❖ The **IPD system** is different from the other delivery methods that place the **CM/contractor** in the **lead role** on a project.
- ❖ With IPD, the **entire building team**—owner, architect, contractor, engineers, subcontractors—**works together** through the **phases of construction**.

Other concepts

❑ Integrated Project Delivery (IPD).

- ❖ **Collaboration software** is sometimes used to allow **all members** of the project team to **access files** that might otherwise be **unavailable** in **other delivery** methods.
- ❖ One of the advantages of IPD is **early involvement** of **all stakeholders** and strong project team development based on **equal incentives**.
- ❖ Disadvantages of this method may be
 - ✓ Lack of legal precedent,
 - ✓ Difficulty obtaining insurance, and
 - ✓ No single point of contact/responsible party.

Lean construction

- ❑ According to the **Lean Construction Institute**,

“Lean Construction is a production management-based approach to project delivery to maximize value and minimize waste.”

- ❑ Lean is a philosophy that **originated** from the Six Sigma approach to improving efficiency while **reducing waste**.

- ❑ The **core philosophies** are that Lean Construction can **improve** capacity, customer satisfaction, productivity, profit, quality, and responsiveness while reducing cost, defects, inventory, lead time, space, and waste.

- ❑ **Project delivery methods** can apply Lean Construction principles—and technology such as BIM or virtual reality—to **improve** project delivery and **meet** sustainability goals.

Owners and Project Types

(The CM project delivery method)

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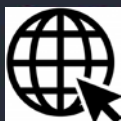
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