



حرفه مدیریت ساخت

(سند Capstone، از مراجع اصلی اخذ مدارک CMAA)

بخش چهارم: فناوری‌های نوین در زمان ارائه خدمات مدیریت ساخت

ارائه دهنده:

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What we will learn?

- ☐ Section Objectives
- ☐ Technology
- ☐ Technology Management

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Section Objectives

Section objectives

- ☐ Understand the **importance** of **technology management**.
- ☐ Identify the **important aspects** of **using technology** to manage projects including documentation, BIM, drones, machine learning, and sustainability

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Technology

- ❑ One of the exciting aspects of construction management is the **adoption** of **new and emerging technologies**.
- ❑ Over the past several years, the construction industry has been **rapidly evolving** through the advent and adoption of virtual design and construction techniques.
- ❑ Those advances in technology have **impacted the management** of other important areas such as safety, risk, and sustainability.

Technology Management

- ❑ It's crucial for **CMs** to be at the **forefront** of **technology advances** in the construction industry.
- ❑ CMs who have **interest** and **experience** with
 - ❖ technology,
 - ❖ video games,
 - ❖ virtual reality (VR), and
 - ❖ augmented reality (AR)often find that those skills are helpful **when evaluating new tools and techniques** to use in construction management.

Documentation

❑ One of the most important aspects of managing a project is

- ❖ receiving,
- ❖ sending,
- ❖ sharing,
- ❖ accurately storing,
- ❖ updating, and
- ❖ protecting documents —

both hard copy and electronic formats.

❑ Increasingly, the **entire industry** is adopting the sharing and storage of **documents** in **electronic format** as **more efficient**.

- ❖ This includes the use of tablets, smartphones, and apps on the **job site** to manage documentation.

Documentation

❑ When choosing a **form** of **document management**, the CM should consider

1. The type of project,
2. Where and by whom the documents will be needed, and
3. The most effective storage system to meet these requirements.

❖ The choices range from

1. Local access only (say, the field office) to
2. Cloud-based storage (that can be accessed by authorized users from anywhere with internet access).

Documentation

❑ Many **commercial off-the-shelf (COTS) industry-specific software** options are available to support **detailed file management**.

❖ The methods of

1. Collaboration,
2. Registration of document ownership, and
3. Management of user permissions

must also be considered, and

options selected that will match the **owner's expectations** for control of documents.

Documentation

☐ **Regardless** of the **method** chosen,

the **CM needs** to be aware of the **importance** of

1. Protecting information and
2. Having a backup plan

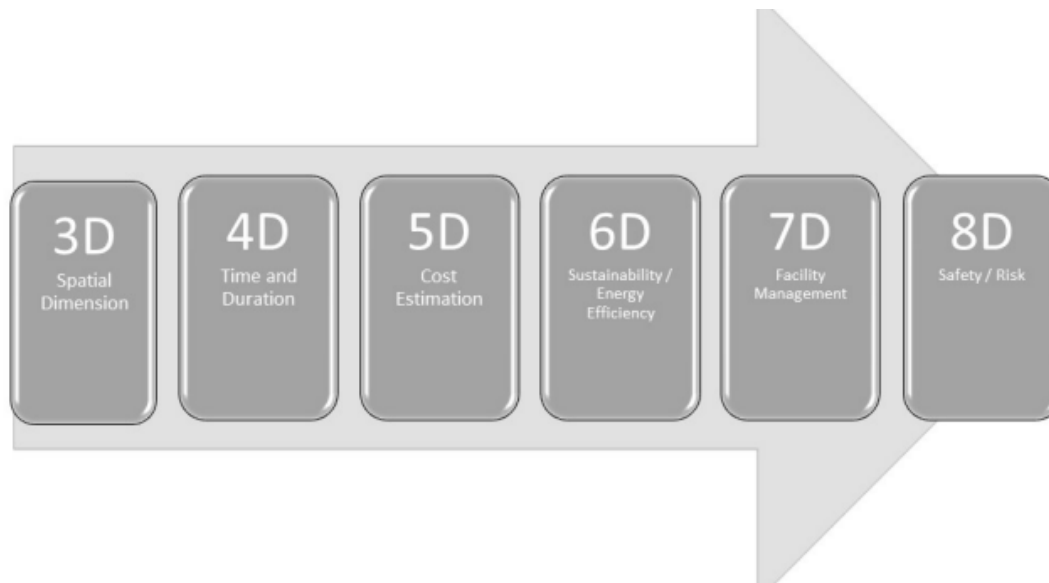
if there is an **issue** that prevents the documents from being accessible.

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Building information modeling (BIM)

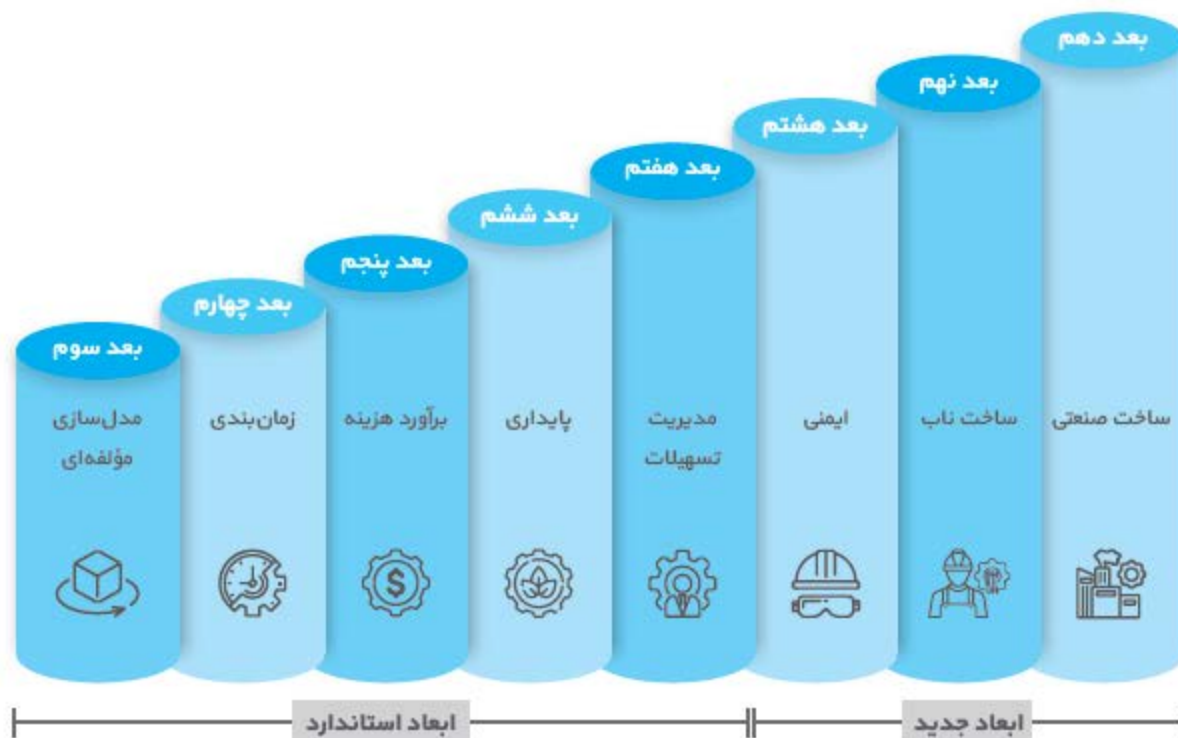
- ❑ **Before technological advances** made modeling more accessible, buildings relied on **two-dimensional drawings** to depict the height and width of a project.
- ❖ **Initially**, BIM allowed a more comprehensive representation by providing a spatial **dimension (3D) view** to include depth.
 - ✓ As advancements have been made, BIM technology continues to develop and can now represent
 - Time/duration (4D),
 - Cost estimation (5D),
 - Sustainability/energy efficiency (6D),
 - Facility management (7D), and
 - Safety/risk (8D).

Building information modeling (BIM)



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Building information modeling (BIM)



شکل ۱۰-۱. ابعاد استاندارد و جدید مدل‌سازی اطلاعات ساخت

Building information modeling (BIM)

❑ **BIM** assists the CM with

planning, coordination, and control of the project

from inception to operations in all eight categories of responsibilities (also refer to CMAA Standards of Practice document).

- ❖ They are: 1. Contract Administration 2. Cost Management 3. Professional Practice 4. Project Management 5. Quality Management 6. Risk Management 7. Safety Management 8. Time Management

Building information modeling (BIM)

- ❑ A “**BIM Use**” is a method of applying Building Information Modeling during a **facility’s lifecycle** to achieve **one or more specific objectives**.
- ❑ CMs **might not actually create** the model themselves, but they need to be able to **effectively manage** the use of BIM to allow for a **successful project** and to **maximize** the **benefits** of BIM.

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Building information modeling (BIM)

- ❑ While BIM has **traditionally** been used on “**vertical**” projects, more “**horizontal**” projects are discovering and leveraging the **benefits** of modeling including several state **transportation departments**.
 - ❖ As that **trend continues** to grow, it’s up to **CMs** to **stay current** on the advances in modeling.

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The drone zone

❑ **Unmanned aerial vehicles (UAV)** are more commonly known as drones and represent a **well-known type of remotely operated device**.

❖ These flying robots can be managed by

1. Remote control,
2. GPS software, or
3. A smartphone/tablet app.

✓ Having been **used in the military for years**,

drones are now **commonplace in industries** like

filmmaking and real estate,

not to mention private use by hobbyists.

The drone zone

❑ Thanks to technology and innovation, **UAVs have advanced**

- ❖ video capabilities,
- ❖ large media storage,
- ❖ extended flight times,
- ❖ increased speeds,
- ❖ better hover accuracy,
- ❖ more accurate obstacle sensors, and
- ❖ detailed flight logs.

The drone zone

❑ Implementing **drones** at a construction project can **help** by

- ❖ **Obtaining information** that may be used in
- ❖ **Creating models** of existing conditions,
- ❖ Obtaining accurate **site survey data**,
- ❖ **Tracking** project progress, and
- ❖ Even **improving safety** by identifying potential problems before they become issues.

The drone zone

- ❑ Drones are particularly beneficial for **tasks** that are **not easily accessible** such as
 - ❖ inspecting pipes,
 - ❖ going inside tanks or containers, and
 - ❖ monitoring wetlands or difficult terrain.
- ✓ The uses continue to grow, which means it's **important for CMs** to remain **informed** of
 - The types of drones and
 - Their abilities

in order to recommend usage on a construction project.

The drone zone

- ❑ Also, the **use of drones** on projects adds an additional regulatory dimension to the project.
- ❑ UAVs that are **above a certain weight limit** or used for **certain purposes**
 - ❖ must comply with Federal Aviation Administration (FAA) regulations, and
 - ❖ **operators** of certain drones are required to **maintain appropriate licensure** or **certification**.

The **tech-savvy CM** will stay **apprised** of this fast-changing landscape.

Machine learning and artificial intelligence

- ❑ “**Machine learning**” is a phrase that refers to **algorithms** that have been designed to intuitively process and interpret data to improve project performance.
- ❖ That relates closely with **Artificial Intelligence (AI)** which has the capability to **proactively assist** with **managing critical issues** such as budget, schedule, risks, safety, and sustainability.
- ✓ The **ability** to expeditiously process and accurately analyze the **large volume of data** that construction projects **routinely produce** is **vital** to improving **productivity**

Sustainability and technology

- ❑ **Green technology solutions** have emerged as a viable option for supporting and enhancing sustainability initiatives.
- ❑ Solar panels and wind energy techniques have been **improved by advances** that
 1. Have reduced equipment size and
 2. Increased efficiency.
- ❑ **Technology** has also been instrumental in advancing **green transportation options**.
- ❑ **Kinetics** is being explored as a way to generate and store energy by **designing buildings** that allow for **movement without** affecting the structure's integrity.

Also see the Sustainability section.

Emerging technologies

- ❑ Documentation management, modeling, and drones are just the **beginning** of the **industry's focus** on technology to improve project processes.
- ❑ There are other developments as well:
 - ❖ Tablet/app advancements.
 - ❖ Improved safety equipment such as headsets, clothing material, and cameras for site monitoring.
 - ❖ Task management software for improved progress tracking and organization.
 - ❖ Online applications that interact with project tools such as GPS gear, laser survey equipment, and real-time communication capabilities.
 - ❖ Wearable sensors for collecting site information on safety, materials, and workflow.



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بخش پنجم: رهبری و توسعه حرفه‌ای مدیران ساخت

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What we will learn?

- ☐ Section Objectives
- ☐ Leadership
- ☐ CM Responsibility
- ☐ Professionalism

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Section Objectives

Section objectives

- ❑ Understand how to develop **better leadership skills** because it's crucial to a CM's professional success.
 - ❖ Explore **personal leadership** program advantages.
- ❑ Learn the **methods available** for **professional development**.
 - ❖ Understand the **responsibilities of a CM** when managing a project.
- ❑ Review the **importance of professionalism and ethics**.
 - ❖ Learn why marketing services, proposals, and CM fees require thoughtful consideration.

Leadership

Introduction

- ❑ The **topic of leadership** is covered throughout the Capstone because it's a **crucial part** of a **CM's professional success**, and it's **more than** processes and procedures.
- ❖ Leadership needs to be studied, researched, observed, and practiced.

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- ❑ **CMAA** has conducted **many surveys** over the years, gaining input from hundreds of domestic and international project owners.
- ❖ **Most owners believe** that one of the **major problems** in the construction industry is a lack of leadership on projects.
 - ✓ Given this perception, it's important that CMs develop their **own leadership skills on and off the job.**



Leadership based on CMAA definition



Leadership based on CMAA definition

- ❑ Virtually **every group** needs a **leader** if it is to **accomplish any task**.
- ❖ It's easy to **recognize presidents** of companies as **leaders**.
 - ✓ However, leadership is necessary at **all levels** of an organization.
 - Field teams need leadership.
 - Cost estimating groups need leadership.
 - Sustainability goals need leadership.

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Personal leadership program

- ❑ It is important for CMs to **take initiative** and **not wait** for a title or an assignment to **put them** in a **leadership position**.
- ❖ If a **formal** Leadership Development **Program** is **not accessible**, CMs can take the **initiative** by finding a mentor and creating their own program.
 - ✓ That's a perfect way to lead by example.

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Personal leadership program

☐ Create your own personal leadership program:

1. Identify a proven leader or mentor to help.
2. Identify opportunities for personal growth based on strengths and weaknesses.
3. Volunteer to lead activities outside the workplace such as non-profit organizations.
4. Establish personal goals.
5. Describe the desired outcomes.
6. Identify the process and necessary resources.
7. Develop a timeline for the plan.
8. Review the plan with a mentor to stay on track.
9. Document the plan in a simple matrix format.

Professional development

- ❑ If CMs want to **specialize** in a **market sector** such as transportation, they should **gain experience** in the **many facets of managing** those projects such as
 - ❖ cost control requirements,
 - ❖ governmental requirements and constraints,
 - ❖ schedule requirements,
 - ❖ client relations, etc.
- ❑ For experience managing different types of projects, **CMs can vary**
 1. **their areas of management**, as well as
 2. the **project types** they work on.

Professional development

❑ Market sectors may include

- ❖ bridges/dams,
- ❖ commercial,
- ❖ US defense,
- ❖ education,
- ❖ entertainment/hospitality,
- ❖ government,
- ❖ healthcare,
- ❖ industrial/manufacturing,
- ❖ infrastructure,
- ❖ oil/gas/chemicals,
- ❖ power/energy,
- ❖ transportation,
- ❖ utilities, and
- ❖ water/wastewater.

Professional development

❑ Once a CM has received **credentials as a professional**, there may be requirements for occasional **formal testing** in the future.

❖ **Formal testing** usually comes in the form of

1. Continuing education or
2. Professional development requirements,

but the real test of a professional comes in **everyday work life**.

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Professional development

Best Practice: CMs should constantly seek out continuing education and other methods for improving leadership skills and learning about construction management, the industry, and emerging trends.

Organizations

❑ **Peer recognition** is generally best achieved through

1. **Active participation** within a profession and
2. Its **industry associations**.
 - i. Establishing a **strong network** of friends and colleagues at the beginning of a professional career and
 - ii. **Maintaining** it through the years
can be beneficial.

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CM Responsibility

CM responsibility

- ❑ After the **CM is hired** by a client (or project owner) either individually or as part of a firm,

the **first step** is for the CM to

- ❖ **Review** the needs statement from the owner or
- ❖ **Help** to develop one if necessary.

- ✓ The **statement of needs** is the most important document in the **initial phase** of project development.

- ❑ It should be written so that it can be **easily understood** by a diverse group of professionals such as
architects, engineers, accountants, attorneys, and others who will be involved in the project.

CM responsibility

- ❑ **Construction management** is a service business and the CM performs those **services** that are **specified** in its **contract** with its client, the owner.
 - ❖ Those services should be established in **consultation** with the **owner** and **documented** in the service contract.
- ❑ It is best to take a contract-based approach in determining the **role** and **responsibilities** of a CM with respect to the **multiple services offered** by a CM from the pre-design planning through the design, procurement, construction, substantial completion, occupancy by the owner, and final completion of the project.

CM responsibility

❑ **Determining** the CM's role and responsibilities for a project can **occur after** the **following** have been **completed**:

1. The **scope** of CM services is **clearly defined**.
2. The **type** of owner-CM contract is **chosen**.
3. The responsibilities **among** the CM and other project **participants** are fully **coordinated**.

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CM responsibility

❑ The CM's role and responsibilities are **affected** also **by**:

- ❖ Laws that regulate the construction management practice (e.g. those requiring certification, licensing, or registration),
- ❖ Federal and state statutes, and
- ❖ Case law interpretations.

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Professionalism

Professionalism

- ❑ The concept of **professionalism** has always been closely associated with **ethics**.
- ❖ **Most professional associations** have developed **codes of ethics** to guide the professional behavior of their members.
 - ✓ The **guidance** is intended to help ensure that the **profession's members** act in such a manner that their reputation and integrity, and that of the Association, will be protected and held in **high regard by society**.

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- ❑ Whereas **ethical codes** are important and serve as **general guides**,
they usually do **not address** all the **many facets** of **ethical concerns** that are
intimately woven into the fabric of **everyday practice** in our profession.
“Is it ethical to do many of the things we do every day?”

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❑ For example,

- ❖ Speaking negatively about a client or employee is probably immoral.
- ❖ Is it ethical to wine and dine a client to obtain business?
- ❖ How much can be spent on a client before it becomes ethically questionable?
- ❖ Is it ethical to make political contributions to gain work?
- ❖ Is it ethical to try to take work away from another firm?
- ❖ Is it ethical to try to gain an advantage by attempting to maliciously injure the competition?
- ❖ Is it ethical to low-ball a fee?

- ☐ The **standards of ethics** adopted by the profession can provide guidance on **how** a **professional practitioner** should behave in these situations.
- ☐ Additionally, the organization that the **professional represents** may have its **own guidelines or standards** that establish the limits on situations like these.

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CMAA code of professional ethics

❑ It is the **responsibility** of the CM to **successfully deliver** a construction project to completion in an **ethical manner**.

❖ **Ethics** is generally accepted to be a set of moral standards or values that guide actions and thoughts.

✓ Since 1982, the Construction Management Association of America (CMAA) has taken

a **leadership role** regarding **critical issues** impacting the **construction and program management industry**, including

the **setting of ethical standards of practice** for the Professional Construction Manager.



CMAA code of professional ethics

- ❑ The Board of Directors of CMAA has adopted the **following Code of Professional Ethics** of the Construction Manager, which applies to **CMAA members** in the performance of their services as Construction and Program Managers.

This Code applies to individuals and to organizations who are members of CMAA.

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CMAA code of professional ethics

- ☐ I. OBLIGATIONS TO THE PUBLIC
- ☐ II. OBLIGATIONS TO THE CLIENT
- ☐ III. OBLIGATIONS TO THE PROFESSION
- ☐ IV. OBLIGATIONS TO THE ENVIRONMENT

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CMAA code of professional ethics – Obligations to the public

☐ Representation of Qualifications and Availability:

- ❖ I will **only accept assignments** for which I am **qualified** by my education, training, professional experience and technical competence, and
- ❖ I will **assign staff** to projects in accordance with their qualifications and commensurate with the **services** to be provided, and
- ❖ I will only make **representations** concerning my qualifications and availability that are **truthful** and **accurate**.

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CMAA code of professional ethics – Obligations to the public

☐ Legal Compliance:

- ❖ I will **not discriminate** in the performance of my services on the basis of race, religion, national origin, age, disability, gender, or sexual orientation.
- ❖ I will **not knowingly violate** any law, statute, or regulation in the performance of my professional services.

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CMAA code of professional ethics – Obligations to the public

☐ Fair Competition:

- ❖ I will **represent** my project **experience accurately** to my prospective clients and **offer** services and staff that I am **capable** of delivering.
- ❖ I will develop my **professional reputation** on the basis of my **direct experience** and **service provided**, and
- ❖ I will only **engage** in **fair competition** for assignments.

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CMAA code of professional ethics – Obligations to the public

☐ Public Contracts:

- ❖ I will **not offer nor make** any payment or gift to a **public official** with the intent of **influencing** the **official's judgment** in connection with
 - ❖ An existing or
 - ❖ Prospective project.

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CMAA code of professional ethics – Obligations to the public

☐ Safety:

- ❖ I will take an **active role** in developing a **culture of safety**, consistent with the CMAA Policy Statement on Safety and the Construction Manager.

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CMAA code of professional ethics – Obligations to the client

☐ Client Service:

- ❖ I will **serve my clients** with honesty, integrity, candor, and objectivity.
- ❖ I will provide my services with competence, using reasonable
 - ✓ care,
 - ✓ skill, and
 - ✓ diligence

consistent with

 1. The **interests** of my client and
 2. The applicable standard of care.



CMAA code of professional ethics – Obligations to the client

☐ Conflicts of Interest:

- ❖ I will **endeavor** to **avoid** conflicts of interest; and
will **disclose** **conflicts** that in my opinion may **impair** my objectivity or integrity.

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CMAA code of professional ethics – Obligations to the client

❑ Fair Compensation:

- ❖ I will **negotiate** fairly and openly with my clients in establishing a **basis for compensation**, and
- ❖ I will **charge** fees and expenses that are **reasonable** and **commensurate** with the services to
 - ❖ be provided and
 - ❖ the responsibilities and
 - ❖ risks to be assumed.



CMAA code of professional ethics – Obligations to the client

☐ Release of Information:

- ❖ I will only make **statements** that are **truthful**, and
- ❖ I will keep information and records **confidential** when appropriate and protect the **proprietary interests** of my clients and professional colleagues.

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CMAA code of professional ethics – Obligations to the profession

☐ Industry Standards:

- ❖ I will furnish my services in a manner **consistent** with the **established** and **accepted CMAA Standards of Practice**, which define the **parameters** for the CM profession, and the **laws** and **regulations** that govern its practice.

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CMAA code of professional ethics – Obligations to the profession

☐ Honesty:

- ❖ I will not make **misleading, deceptive, or false** statements or claims about my professional qualifications, experience, or performance, and shall accurately state the scope and nature of my responsibilities in connection with work for which I am claiming credit.
- ❖ In my business, I will **not engage** in bribery, fraud, or corruption in all professional services to help customers plan, design, implement, manage, and construct project activities in which I am engaged.
- ❖ I will be especially vigilant to maintain appropriate ethical behavior even **where** payments of gratuities or bribes are institutionalized practices.

CMAA code of professional ethics – Obligations to the profession

☐ Professional Development:

- ❖ I will continue to **develop my professional knowledge** and **competency** as a Construction Manager, and I will contribute to the advancement of the construction and program management practice as a profession by fostering research and education.
- ❖ I will recognize and fulfill my obligation to **nurture fellow professionals** as they **progress through** all stages of their career, **beginning with professional education** and continuing throughout their career.

CMAA code of professional ethics – Obligations to the profession

☐ Integrity of the Profession:

- ❖ I will **avoid** actions that promote my own **self-interest** at the expense of the profession, and
- ❖ I will **uphold** the standards of the construction management profession with **honor** and **dignity**

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CMAA code of professional ethics – Obligations to the environment

☐ Sustainability:

- ❖ I will **conduct myself** and **encourage** others in keeping with environmental and sustainable business practices,
providing for the **needs** of the **present without compromising** the needs of future generations.

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Marketing CM services

❑ For a CM, **marketing** generally refers to **all the activities** necessary to earn and maintain a **positive image** in the marketplace.

❖ It can range from

1. a construction management **firm** that uses **professional marketing services** to
2. an individual **CM** who relies on “**word of mouth**” to find assignments

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Marketing CM services

- ❑ While a **good marketing program** is essential, construction management services can be **susceptible** to overselling.
- ❖ It's important for CMs to be honest about their experiences and abilities.
 - ✓ It's always best to
“under-promise and over-deliver.”

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Marketing CM services

- ❑ There is often a **fine line** between creative writing and misrepresentation of facts.
- ❖ Did the CM really **play** the **key role** in successfully delivering that mega-project or was it more of a **secondary player** on the team?
- ❖ Has the CM really been providing **program management services** on major capital building programs for many years or
was it the **construction** of **two small projects** at the same time for the
same client?
- ❖ Can the CM firm really have a full team of a **dozen top performers** easily available in **60 days** to kick off the new project or is that just wishful thinking?

Marketing CM services

☐ Usually, the **best test** of **ethics** regarding marketing statements is simply:

“Can I justify all of my statements with facts if asked to do so?”

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- ❑ During the **1990s**, **owners** and **their attorneys** began noticing that **some of the claims** that CM firms made about themselves or the promises they made, in their proposals,
were **not being fulfilled** during projects.
- ❖ Soon, **many owners** began including the **CM's proposal** for its services as a **referenced part** of the contract to be executed by the CM and the owner.
 - ✓ CMs should be **careful** what they **promise** because they may be legally liable to deliver on those promises.

❑ There are **some basic rules** to follow when **writing proposals**.

❖ While a CM **might violate** one or more of the rules and **still win a job**, **eventually** the price to be paid can be significant and may **have to be paid** in a **variety of ways**.

- ✓ **Financial penalties** can be significant.
- ✓ **Insurance premiums** and **bonding costs** can be negatively impacted.
- ✓ The **company's reputation** and **ability** to win more work can be hurt.
- ✓ **Employee morale** can be impacted significantly by a **loss of respect** for their company.
- ✓ It is easy to imagine a **host of other negatives** that could result from a **company's false claims** about themselves.
- ✓ What is **worse** is when a **claim hovers around** that fine line—it really is **not false** but is **perceived by others** in the industry to be false.
 - It is best **not to take a chance** and **keep to the truth**.

Establishing CM fees ethically

- ❑ A **clear understanding** of the project scope and scope of services the owner wants to buy is essential to the development of a successful—and ethical—professional relationship.
- ❖ **Clarify** the **scopes** of both in advance and **put them** in proposals to provide services.

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Establishing CM fees ethically

❑ When the price is a **selection criterion**,

there is often a **conundrum** on **what fees** need to be to **win the work**

versus

what level of effort is required to provide the scope of services requested.

❖ This is **particularly true** when a CM has **completed** an **initial phase** of the project or program, and

now has a **true understanding** of what it will take to finish the job.

CMs should give their best price and deal with it fairly.

Establishing CM fees ethically

- ❑ CMs should give their **best price** and deal with it **fairly**.
- ❖ **Inadequate fees** translate into either a poor-quality service or a financial loss.
- ❖ If the CM **cannot** do a quality job for the right price, then the **only option** may be to walk away.
- ❖ **Integrity** is one of a CM's best marketing tools and that have a **huge impact** on their professional reputation.

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Establishing CM fees ethically

☐ Important

1. Do not promise to provide staff that does not exist.
2. Do not “bait and switch” services or staff.
3. Do not sell what you cannot or will not deliver.
4. Always compete fairly with competitors.

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Establishing CM fees ethically

❑ **Failing** to **deliver** what was promised and

attempting to sell services by **discrediting** the **competition** are

among the **most unethical offenses** that a professional or firm can
commit.

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Establishing CM fees ethically

- ☐ **Balancing fees** with resources and quality of services to **meet professional standards** is probably the **biggest challenge** facing the CM.
- ☐ **Project control** becomes all **too important**.
- ☐ **Lack of adequate control** can put a CM in a position of **making the decision**,
 1. “Do I put what I need into this project to finish and deliver a quality job and lose money, or
 2. do I cut back and minimize my costs to avoid a loss?”

Establishing CM fees ethically

- ❑ This becomes both a business and ethical **issue** and it presents a difficult dilemma.
- ❑ **Most reputable** firms will put reputation **above loss**;
however, the firm would have to have the **resources** to **absorb the loss**.
- ❖ The obvious answer is to **not contract** for inadequate fees, to maintain **enough project control**, and to
make the **necessary decisions** that will **avoid** this **predicament**.

Establishing CM fees ethically

❑ The ethical aspects of project delivery are as follows:

- ❖ Deliver what is promised. No matter what, follow through on commitments.
- ❖ Balance fees against resources needed and the scope of services.
- ❖ Implement project controls that will maintain that balance.
- ❖ Maintain professional standards.
- ❖ Do not compromise quality for schedule.
- ❖ Do not assign responsibility where the training or experience is not adequate.
- ❖ Take ownership of errors and mistakes.
- ❖ Be candid with the client.



Establishing CM fees ethically

- ❑ **Training** and **recruiting** also present ethical issues.
- ❑ The **two most common complaints** of people leaving construction management firms are:
 1. Being given a **job without proper** training or direction as to what they are to do.
 2. **Not performing** the **role** that was **promised** when hired.

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

بخش ششم: خدمات مدیریت پروژه و طرح توسط مدیر ساخت

ارائه دهنده:

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(PhD, PMP, CMIT)

CMAA Authorized Trainer

دانشگاه Illinois Tech آمریکا



What we will learn?

- ☐ Section Objectives
- ☐ Management
- ☐ Management Professionals & Plans
- ☐ Managing the Project
- ☐ Program Management
- ☐ Partnering

☐ بخشنامه‌های شرح خدمات همسان سال ۱۳۹۲ و ۱۴۰۱

Section Objectives

Section objectives

- ☐ Understand the **three components** of project management and **how** they are related.
- ☐ **Recognize** the **areas** that a **CM** should **focus** on **when managing** a project.
- ☐ Understand
 1. How program management **evolved**,
 2. How it **differs** from project management, and
 3. The roles typically involved.
- ☐ Learn how **partnering** can contribute to the success of a project.

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Management

Introduction

❑ While **leadership** is a **crucial** part of being a CM, solid management skills are also important.

❖ These skills will help CMs

1. Act as effective leaders and problem-solvers,
2. Advance **job performance**, and
3. Possibly lead to **other opportunities**.

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Management Professionals & Plans

Management professionals & plans

❑ To improve processes and optimize resources, an organization uses varying levels of the **three Ps** of project management—

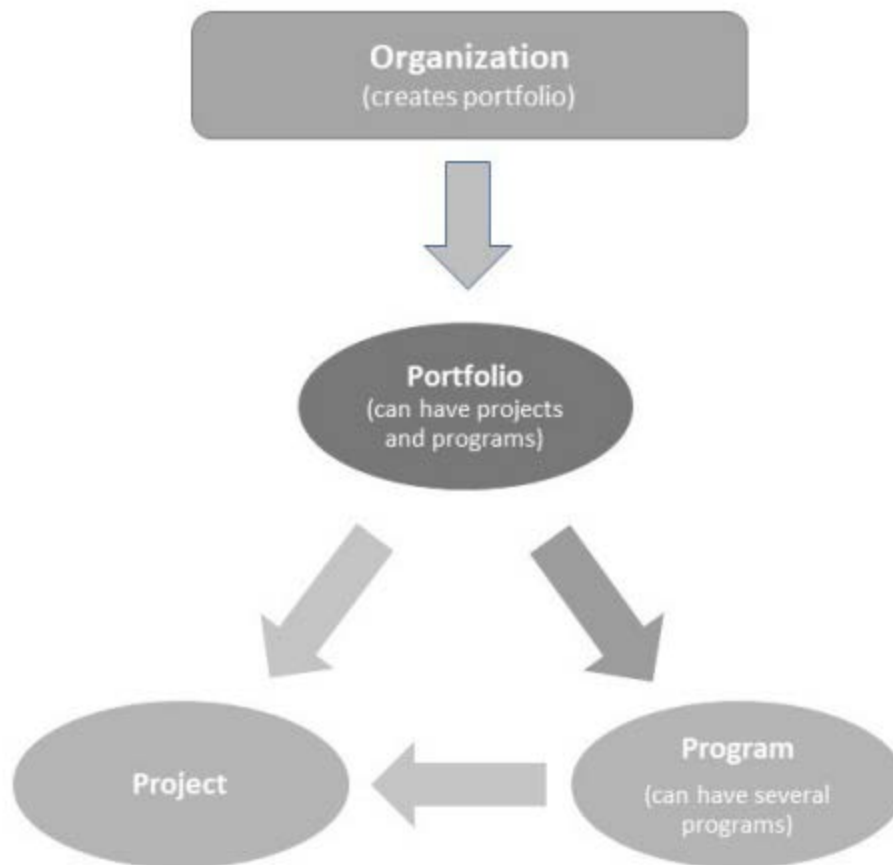
1. Project,
2. Program,
3. Portfolio.

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Management professionals & plans

- ☐ Projects focus on the **tactical aspects** such as budget, scope, and schedule;
- ☐ Programs are used to **control** those **projects** for effective delivery,
programs are comprised of **multiple projects** and
focus on managing the **interdependencies** between projects; and
- ☐ Portfolio supports the organization's strategy by focusing on
 1. Leadership and
 2. The alignment of goals.

Management professionals & plans



Management professionals & plans

- ❑ On **some** programs or projects, in **addition** to the CM,
there **may be** a **management professional** such as those
certified by the Project Management Institute.

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Management professionals & plans

❑ One of the mainstays of project management is the **written plan**—

the **Project Management Plan (PMP)**—

which is **approved** by the owner and

defines

1. Vision,
2. Implementation strategy,
3. Schedule and budget criteria, and
4. The policies, procedures, and standards for the program.

Management professionals & plans

☐ It is a **living document** that should be updated periodically because

it is the **master reference document** for

the **entire** project/program team throughout the life of the program or project.

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Management professionals & plans

- ❑ **Depending** on the **structure selected** for the **PMP**,
the **construction management plan (CMP)** can be
 1. A component of the PMP or
 2. A stand-alone document/strategy that is incorporated into the PMP by reference.
- ❑ The **CMP** typically **outlines** the **approach** that
 1. Will be used to **manage** the **project** and
 2. Identifies **possible impacts** on the area around the project.
 - ❖ The **CMP** may also **detail** construction schedules, costs, and the tasks to be accomplished.

Management professionals & plans

☐ If there is **no PMP** on the job,

those **responsibilities** may be **handled** by the **CM**.

☐ Either way, the CM **must** have the **ability** to

- ❖ Plan,
- ❖ Coordinate,
- ❖ Budget,
- ❖ Manage,
- ❖ Supervise, and
- ❖ Lead

the construction project.

Management professionals & plans

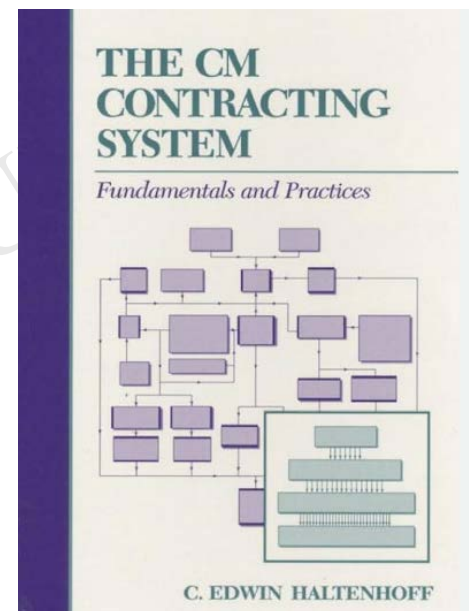
❑ Project Procedures Manual (PPM)

- ❖ A written, project-specific plan that outlines project's scope, organization, and the specific approach to be undertaken to accomplish the various management tasks for the project.
- ❖ These **quality management guidelines** should be **integrated** into the various **sections of the PPM** to maintain a focus on **project quality**.
 - ✓ On certain **large projects**, it may be appropriate for the **CM to prepare a separate** Quality Management Plan (QMP) which elaborates upon the **quality guidance** aspects of the PPM.

Managing the Project

CM body of knowledge

1. Budget management
2. Contract management
3. Decision management
4. Information management
5. Materials/Eqt management
6. Project management
7. Quality management
8. Resource management
9. Risk management
10. Safety management
11. Schedule management
12. Value management





CM body of knowledge

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بخش ششم: خدمات مدیریت پروژه و طرح توسط مدیر ساخت



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CM Core Competencies

CMAA's Standards of Practice include construction management core competencies and accompanying body of knowledge that must be learned and successfully mastered before becoming a professional construction manager/project manager. CMAA's publications include competencies around the following subject areas:

CONSTRUCTION MANAGEMENT CORE COMPETENCIES

A Guide to the Construction Management Core Competencies and their Body of Knowledge

CM PROFESSIONAL PRACTICE	1
CM PROJECT MANAGEMENT	4
COST MANAGEMENT	7
TIME MANAGEMENT	9
QUALITY MANAGEMENT	10
CONTRACT ADMINISTRATION	12
SAFETY MANAGEMENT	15



Roles of CM

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بخش ششم: خدمات مدیریت پروژه و طرح توسط مدیر ساخت

Trends in Expectations about Duties and Responsibilities of Construction Managers

David Arditi, M.ASCE¹; S. M. Reza Alavipour, Ph.D.²; and
The Committee on Management Practices in Construction (ASCE Construction Institute)

<https://dralavipour.com/blog/view/CM-roles>

❑ As a leader, manager, and influencer, the CM must focus on specific areas of the project:

1. Contract Administration
2. Cost Management
3. Information Management
4. Project Management
5. Quality Management
6. Risk Management
7. Sustainability Management
8. Time Management



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Code of professional conduct

Professional construction management

Project management

Cost management

Time management

Quality management

Contract administration

Safety management

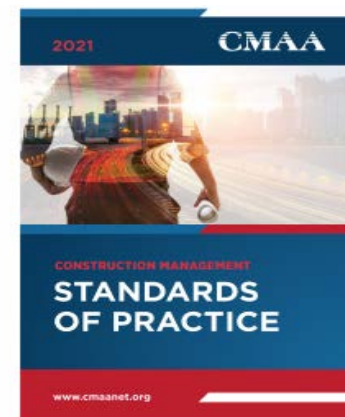
Sustainability

Technology management

Risk management

Program management

✓ Stakeholder, PGMO, MIS, Scope, Procurement





Understanding Your Role

CM/PM Responsibilities
by Project Delivery Method

Acknowledgments

Like all professional associations, the Construction Management Association of America (CMAA) relies on its members' efforts for success. We gratefully acknowledge the following team members who made this manual possible.

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Budget management

❑ Encompasses **all project-related cost** aspects of CM practice, from the first estimate to the final accounting.

- ❖ Providing conceptual estimating
- ❖ Conducting feasibility studies
- ❖ Generating construction cost estimates
- ❖ Familiarity with labor, material and equipment costs
- ❖ Familiarity with equipment and labor production rates
- ❖ Providing cost accounting services

Contract management

❑ Involvement of the CM in the operational and administrative provisions of the contract.

- ❖ Understanding types of contracts
- ❖ Understanding of contract language
- ❖ Familiarity with standard contracts
- ❖ Knowledge of contract law
- ❖ Recommending a contracting structure to the owner
- ❖ Knowledge of traditional contracting procedures

Decision management

❑ **Consistently extracting decisions** from the project team which are in the **best interest of the owner** without alienating the team members.

- ❖ Understanding business structures, organizations, practices, procedures, motivations, and philosophies
- ❖ Understanding the services provided by the members of the team
- ❖ Inducing a productive system of decision-making checks and balances
- ❖ Creating fair processes when decisions are contended
- ❖ Understanding alternative dispute resolution methods

Information management

- ❑ Collecting, documenting, disseminating, safe keeping, and disposing of verbal and graphic project-related information
 - ❖ Effectively communicating and managing project information
 - ❖ Familiarity with information management systems
 - ❖ Familiarity with computer-based information systems
 - ❖ Organizing and running efficient meetings of project team members
 - ❖ Strong sense of ethics

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Material/equipment management

- ❑ Planning, specifying, bidding, acquiring, expediting, receiving, handling and storing owner-purchased material and equipment for the project in conformance with the owner's purchasing policies.
 - ❖ Identifying those materials and equipment that would provide an economic advantage to the owner if purchased in the design phase
 - ❖ Writing technical specifications
 - ❖ Familiarity with purchasing techniques
 - ❖ Familiarity with material and equipment costs

Project management

❑ **Making** the project delivery system **work** from the beginning of design to the end of the warranty period.

- ❖ Providing leadership and expertise in carrying out responsibilities
- ❖ Effectively organizing design, contracting and construction
- ❖ Effectively organizing the activities of the team members

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Quality management

❑ **Coordinating** the activities of the owner in stipulating quality requirements,

1. of the designer in designing to achieve these requirements, and
2. of the contractor by inspecting that these requirements are met.

- ❖ Assisting with technical specifications writing
- ❖ Testing materials and products
- ❖ Being able to assess the quality performance of contractors

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Resource management

- ❑ Selecting, organizing, directing and using all project resources, both human and physical.
 - ❖ Understanding and motivating the project's resources in order to extract the best results
 - ❖ Understanding of human resources and labor relations
 - ❖ Familiarity of conflict management

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Risk management

❑ Identifying, evaluating and disposing of risks such that **economic loss** to the owner is **minimized**.

- ❖ Eliminating risks whenever possible
- ❖ Assigning risks to other parties if appropriate
- ❖ Accepting risks and managing them to minimize their consequences if they occur
- ❖ Understanding insurance and bonding

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Safety management

❑ **Promoting** safe practices at the **construction site** in accordance with prevailing regulations.

- ❖ Urging contractors to have organized safety practices in place
- ❖ Including safety provisions in all contracts
- ❖ Familiarity with safety practices and safety programs
- ❖ Thorough understanding of OSHA

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Schedule management

❑ **Combining** the elements of time and resources from the **start** of **design** to owner occupancy.

- ❖ Proficiency in using scheduling tools
- ❖ Obtaining the team members' cooperation in scheduling project activities
- ❖ Obtaining the team members' cooperation in implementing scheduling decisions
- ❖ Planning, predicting, analyzing and tracking project activities and events

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Value management

❑ **Managing** the **relationship** between the project's cost versus its value.

- ❖ Identifying those elements that deserve consideration for Value Analysis
- ❖ Motivating the designer to use Value Engineering as early in the design phase as possible
- ❖ Familiarity with materials, equipment and methods of construction in order to be able to advise the designer and/or contractor on value engineering decisions.

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❑ Construction management services may include:

- | | |
|--|--|
| » Alternative Project Delivery Solutions | » Program Management |
| » Asset & Facilities | » Project Controls |
| » Building Information Modeling (BIM) | » Project Management |
| » Claims & Contract Solutions | » Project Monitoring |
| » Commissioning Services | » Quality Management |
| » Construction Management | » Regulatory Compliance |
| » Cost Management | » Risk Management |
| » Energy & Sustainability Solutions | » Safety & Environmental Health Mgmt. |
| » Inspection Services | » Schedule Management |
| » Operations & Maintenance | » Virtual Design & Construction Services |

Management the project

❑ As a leader, manager, and influencer, the CM must focus on specific areas of the project:

- ❖ Contract Administration
- ❖ Cost Management
- ❖ Information Management
- ❖ Project Management
- ❖ Quality Management
- ❖ Risk Management
- ❖ Sustainability Management
- ❖ Time Management

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Contract administration

- ☐ As the **owner's representative**, the CM is responsible for the operational and administrative provisions of the contracts used on the project.
- ☐ This responsibility does **not extend** to
 1. The writing of contracts or
 2. Related legal servicesbut does **include** recommending appropriate contract **provisions**.

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Contract administration

❑ It is the **CM's responsibility** to **help establish** the contracting format for the project, including

each contractor's and consultant's **requirements** as covered in Formats.

❖ To support the format,

the CM should see that appropriate contract provisions are inserted for **contract administration**,

which meet

1. Basic industry standards, as well as
2. The requirements of the project management plan and
3. The project procedures manual.

Contract administration

- ❑ **Each project** must be evaluated from a contracting format perspective, taking into consideration the **unique conditions** and **requirements** of the project and local construction contracting practices.
 - ❖ This includes
 - ❖ The **recommendation** of contract formats to the client,
 - ❖ **Assisting** in assembling contract documents,
 - ❖ **Review** of the documents for the suitability, and
 - ❖ The **coordination** of their use on the project.

Contract administration

❑ The **execution** of these responsibilities requires the CM to have a **thorough understanding** of

1. Contracts,
2. Construction law, and
3. Standard contracting documents.

❑ Knowledge of **traditional**

1. Contracting procedures,
2. Construction management procedures, and

the possibilities for **contracting innovation** is necessary.

Contract administration

- ☐ The **key components** contained within an **effective** contract administration system and their subtopics include the following.

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Contract administration

1. Design Document Review is generally the **periodic review** of design documents for the **purpose** of managing cost, time, quality, and risks, including:

- ❖ Conducting and documenting **pre-design project conference**.
- ❖ **Constructability reviews** at various stages of design documents.
- ❖ **Analysis** of sequencing and phasing of construction.
- ❖ **Reviews** of coordination, consistency, and completeness of design documents.
- ❖ **Strategies** for contractual risk-sharing between owners and contractors.
- ❖ **Recommendations** for specific contract/agreement **provisions**.
- ❖ **Identification** of impractical material/performance specification requirements.

Contract administration

2. The Procurement Process involves the **establishment** of contracting format and the bidding and contracting procedures to be employed, including:

- ❖ Bidder pre-qualification.
- ❖ Bidders' interest campaign.
- ❖ Organization of bid packaging.
- ❖ Designer selection (if opted by the owner).
- ❖ Preparation of Special Provisions in General Conditions and Contracts.
- ❖ Delivery of bid documents and information to bidders.
- ❖ Pre-bid conference.
- ❖ Bid evaluation and negotiation.
- ❖ Coordination for owner-purchased equipment and materials.
- ❖ Identification of required permits, insurance, and labor affidavits.
- ❖ Assistance with contract negotiations.
- ❖ Construction contract preparation.

Contract administration

3. On-site communications involve **establishing** and **maintaining communication procedures** to be used on-site, including:

- ❖ Pre-construction conference.
- ❖ Communication flow chart.
- ❖ Project directory.
- ❖ Correspondence files.
- ❖ Chain of responsibility and authority.
- ❖ Submittal flow chart and logs.
- ❖ Field orders.
- ❖ Progress and coordination meetings.
- ❖ Shop drawings.
- ❖ Directives and reports.
- ❖ Cost and schedule performance data.

Contract administration

4. Project documentation involves **establishing** and **maintaining recording systems** for receipt, handling, and distribution of project documentation, including:

- ❖ Contract documents.
- ❖ Requests for Information.
- ❖ Owner's directives.
- ❖ Designer's directives.
- ❖ Submittal receipt and approvals.
- ❖ Sustainability compliance documentation.
- ❖ Changed condition notices.
- ❖ Change orders.
- ❖ Minutes of meetings.
- ❖ Project reports.
- ❖ Daily field reports.
- ❖ Payment requests.
- ❖ Photographic and video-based documentation.

Contract administration

5. Material management encompasses **all activities** relating to acquiring materials or equipment between its **specification** and **installation**, including:

- ❖ Identification of early purchase needs.
- ❖ Scheduling and expediting procurement and delivery.
- ❖ Inspections during fabrication and at delivery.
- ❖ Transportation and materials handling.
- ❖ Storage, insurance coverage, lien statutes.
- ❖ Specifying, negotiating, and purchasing.

Contract administration

6. Project closeout involves **developing** and **implementing** closeout procedures. (For more information, refer to the CMAA Project Closeout Guidelines document.) These include:

- ❖ Punchlist inspections
- ❖ Punchlist work
- ❖ Final inspections
- ❖ Operational training
- ❖ Record drawings/As-built drawings
- ❖ Operation and maintenance manuals
- ❖ Occupancy permits
- ❖ Claims investigation and resolution

Contract administration

6. Project closeout involves **developing** and **implementing** closeout procedures. (For more information, refer to the CMAA Project Closeout Guidelines document.) These include:

- ❖ Contract closeout
- ❖ Closeout reports
- ❖ Occupancy plans
- ❖ Move-in coordination
- ❖ Warranties and guarantees
- ❖ Sustainability certification submissions (and possibly finalization)
- ❖ Post-occupancy Inspections



Contract administration

- ❑ For more information, refer to the CMAA Contract Administration Guidelines document.

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Cost management

- ☐ The CM usually has the responsibility to generate and track **all project costs**, from the **initial** conceptual estimate to the **final** accounting.
- ☐ The **detailed project budget**,
prepared by the CM before design begins, becomes the designer's guide as the process moves toward the bidding phase.
- ☐ **After bids** are received,
the **value** of the **accepted trade contractor proposals** provides the basis for **updating** the budget.
- ☐ As construction proceeds,
changes to the contract and expense allocations are **recorded**.
- ☐ **Every aspect** of the project's cost is
estimated as early as possible and **documented** when it occurs.

Cost management

❑ The CM should be able to

1. **reasonably forecast project budgets** based on **preliminary information**
without the aid of detailed drawings and
2. **estimate construction costs** with a **high degree of accuracy** from completed contract documents.

❖ This process of moving from

1. Conceptual estimates for budget purposes into
2. Detailed line item construction budgets

is **essential** for **accurate** project cost control.

Cost management

❑ Establishing a cost management system

applies skills and techniques to ensure that

the project is planned, designed, procured, and constructed

in the **most economical way** while meeting the project's original budgetary requirements.

The project phases which are contained within this system and their subtopics include:

Cost management

1. Pre-Design Cost Investigation

Establishing a **cost management plan**, including all cost components, which becomes the basis and framework within which the **costs** of the project are **controlled**, include:

- ❖ Project feasibility studies
- ❖ Energy conservation studies
- ❖ Conceptual budgeting
- ❖ Cost models
- ❖ Preliminary cash flow studies
- ❖ Project funding studies

Cost management

2. Design Phase Cost Management

Provisioning ongoing estimating and cost management services to **ensure that** the budget is preserved as the designs are developed by the designer include:

- ❖ Lifecycle analysis
- ❖ Trade-off studies
- ❖ Estimating and budget updating at the different **phases of project design** development
- ❖ Value engineering (VE).
 - ✓ VE is a specialized cost control technique that **uses a systematic and creative** analysis of the functions of a project or operation to **determine how best** to achieve the necessary function, performance, and reliability at the minimum lifecycle cost.

3. Construction Phase Cost Management

Establishing and **monitoring** cost management procedures through **completion** of construction include:

- ❖ Change order control system
- ❖ Payment request evaluation
- ❖ Claims cost analysis
- ❖ Final project cost

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For more details about these and other related topics,
refer to the CMAA Cost Management Guidelines document.

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Information management

- ☐ Proper **information flow** is crucial to the success of a project.
- ☐ Should **any party** not receive **critical** information during their work,
all parties can be subjected to
additional costs and
the potential for unexpected liabilities.

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موسسه مهندسی و مدیریت ساخت علوی پور (ACEMI)

دفتر آموزش



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