



The Role of Construction Management in the US Construction Industry

**Presented by
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CMAA, CH2M HILL

2010 CM Seoul Forum

April 28-30, 2010

Agenda of Presentation

- CMAA
- History of CM in US
- CM market today in US
- Future Trends



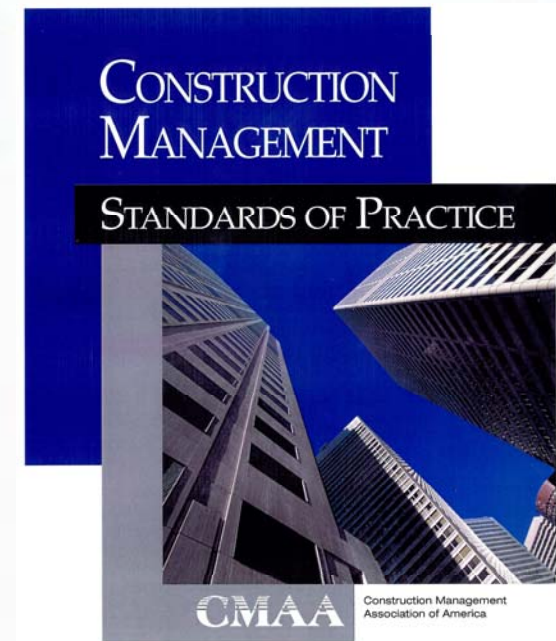
Overview of CMAA

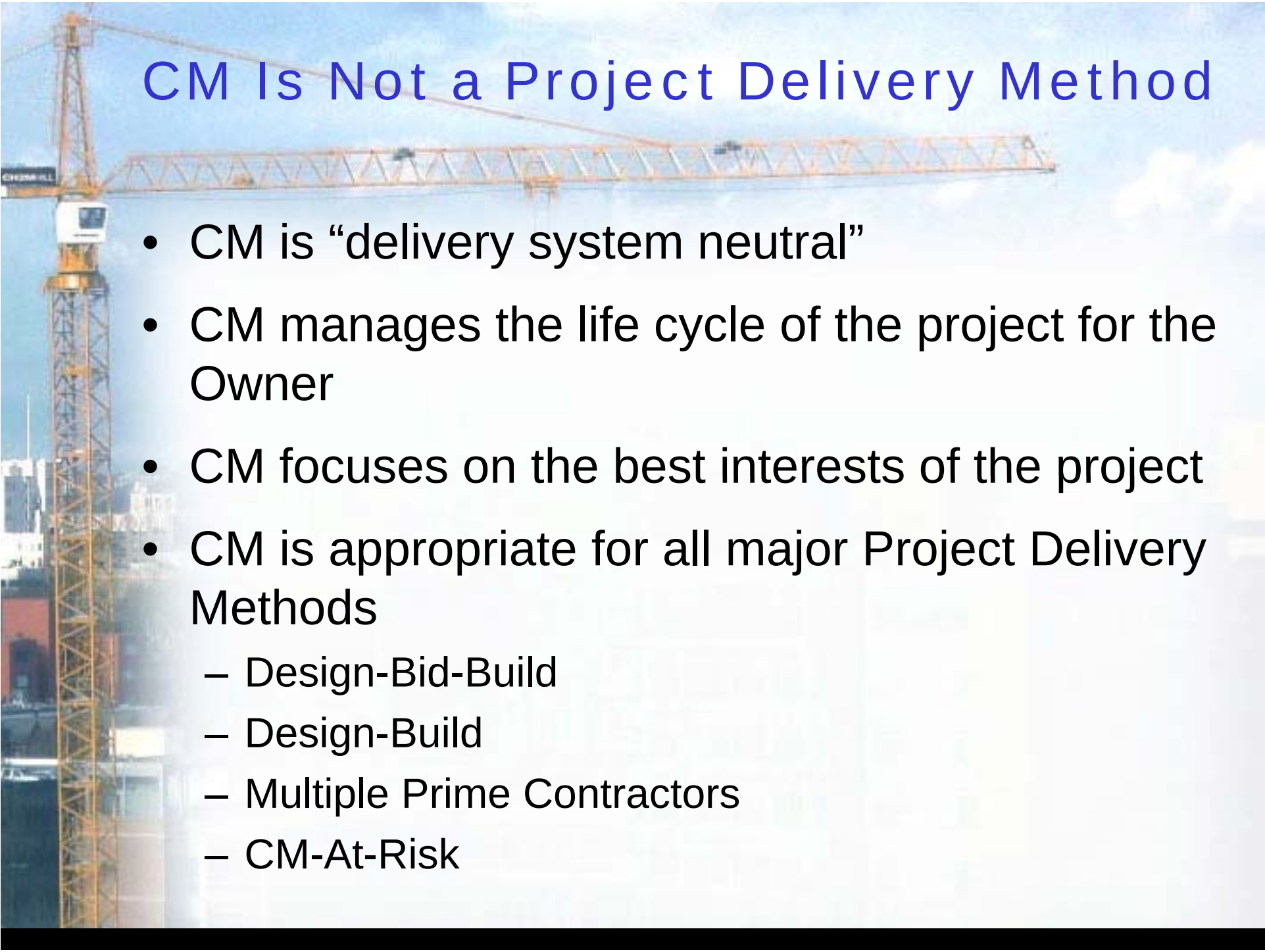
- Founded in 1981 as the voice for the construction management profession
- Now has more than 6,000 members including Owners, CM companies, CM individuals, CM academics, CM students, other related professionals
- CMAA's certified CMs = 1,300
- CMAA programs include:
 - Professional development
 - Publications
 - Conferences
 - Advocacy of CM with governments
 - Alliances with world-wide organizations including CMAA, CIOB, SAME, and many others
- www.cmaanet.org



CMAA Defines CM As...

CM is a professional service that applies effective management techniques to the planning, design, and construction of a project from inception to completion for the purpose of controlling time, cost, and quality.



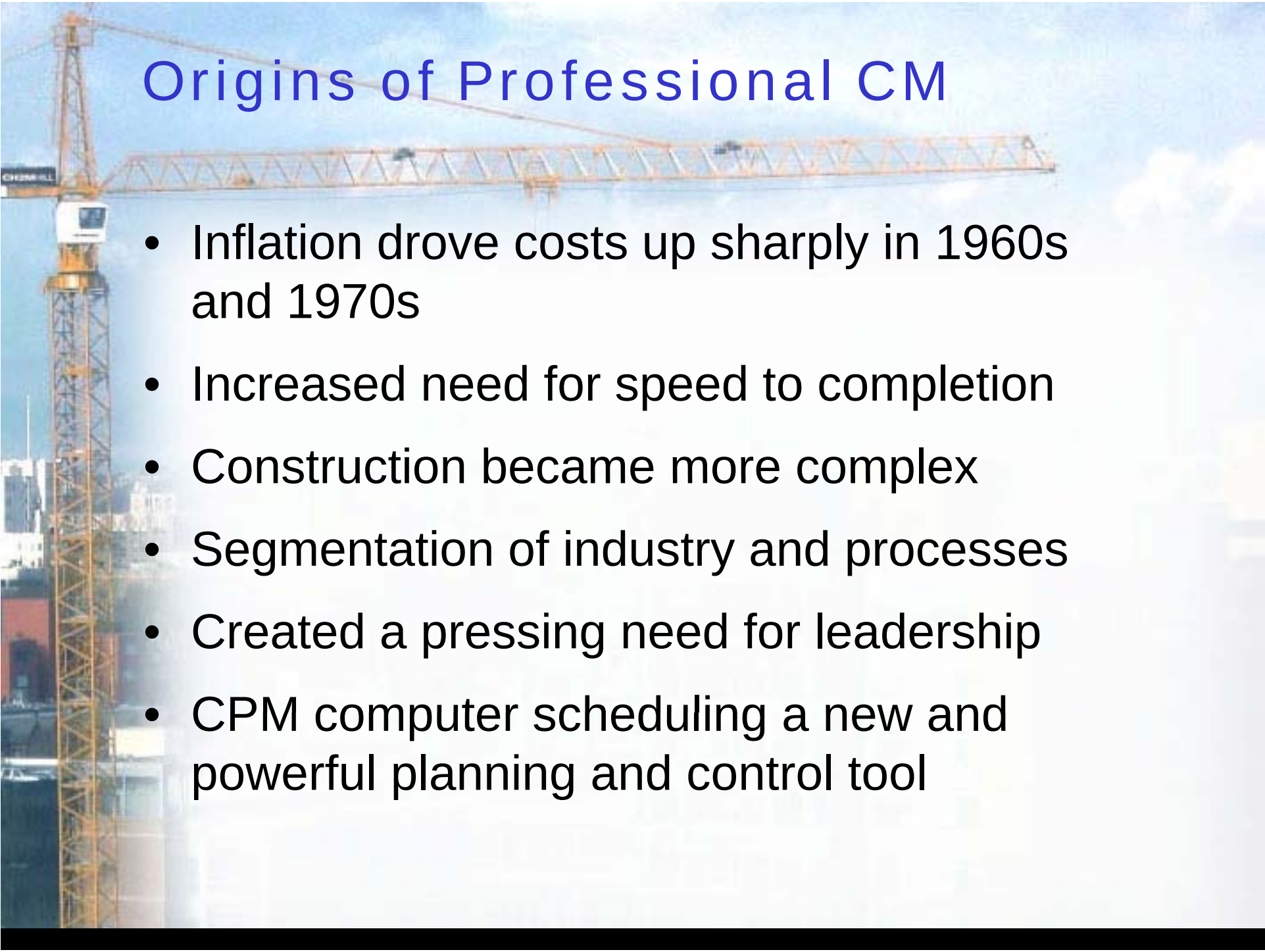


CM Is Not a Project Delivery Method

- CM is “delivery system neutral”
- CM manages the life cycle of the project for the Owner
- CM focuses on the best interests of the project
- CM is appropriate for all major Project Delivery Methods
 - Design-Bid-Build
 - Design-Build
 - Multiple Prime Contractors
 - CM-At-Risk

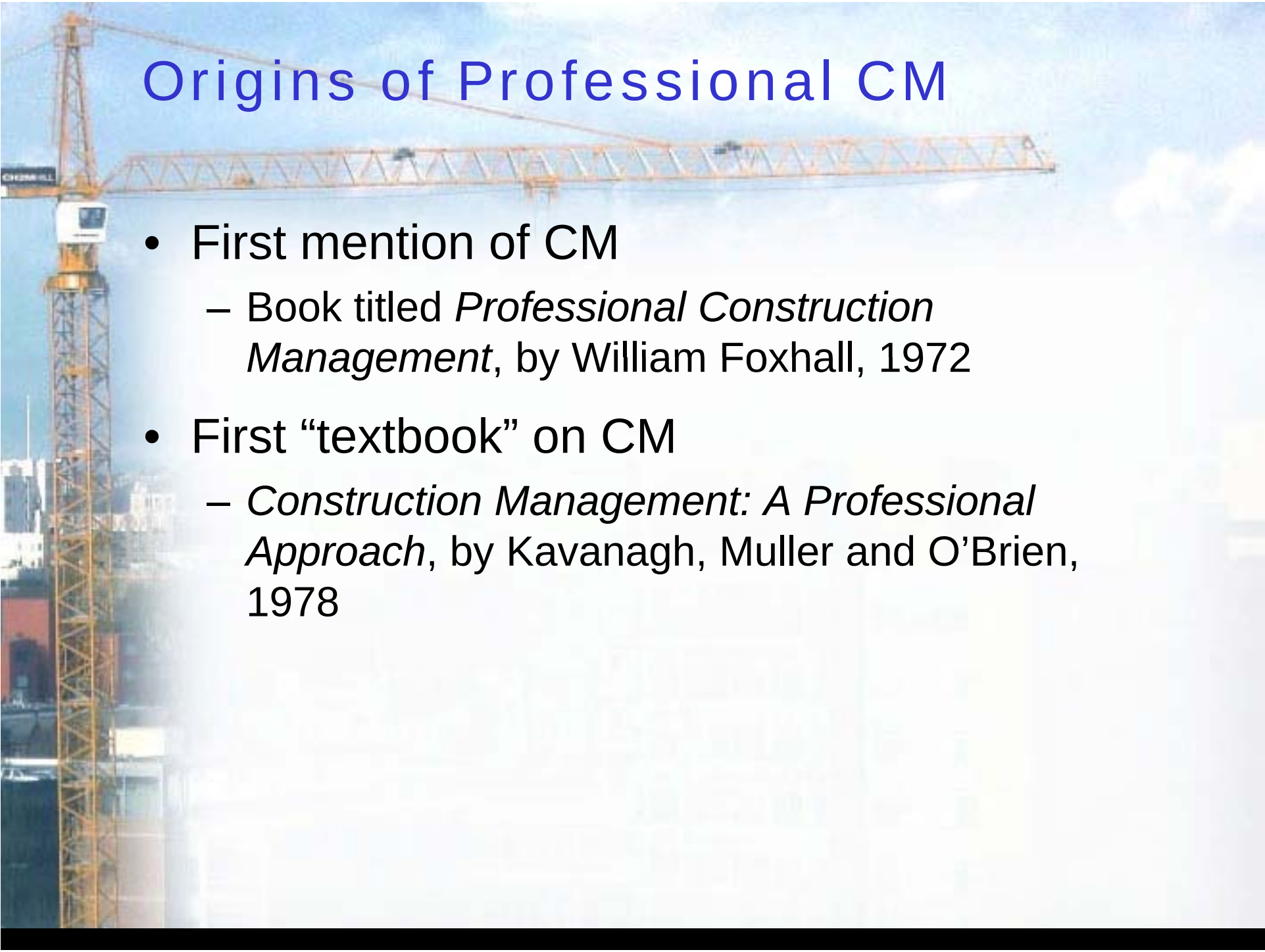


History of CM in the US



Origins of Professional CM

- Inflation drove costs up sharply in 1960s and 1970s
- Increased need for speed to completion
- Construction became more complex
- Segmentation of industry and processes
- Created a pressing need for leadership
- CPM computer scheduling a new and powerful planning and control tool



Origins of Professional CM

- First mention of CM
 - Book titled *Professional Construction Management*, by William Foxhall, 1972
- First “textbook” on CM
 - *Construction Management: A Professional Approach*, by Kavanagh, Muller and O’Brien, 1978

Early Uses of CM

- Most closely resembled CMAR
- Examples:
 - Madison Square Garden, NYC (1968)
 - John Hancock Center, Chicago (1969)
 - World Trade Center, NYC (1971)
- US Government General Services Administration – largest public building owner in the world:
 - First projects using CM in 1975
 - In 1980s and 1990s, GSA became a major force for use of CM





Founding of CMAA

- Leaders from AIA, AGC, ACEC met in Indianapolis in 1981
- Agreed to launch new association
- First meeting of CMAA in 1982 in Denver
- Founding Board of Directors included CH2M HILL, Hill International, Heery, Parsons Brinckerhoff, and others



Development of CM

- CMAA developed standards of practice, certification, and industry advocacy
- No licensing system for CM in US
 - Only 1 state, Idaho, licenses CM
 - CM usually covered by contracting or engineering licensing requirements
- Today there are an estimated 551,000 CMs

(US Bureau of Labor Statistics, 2008-18 Job Outlook in Brief)
- There are 62 accredited baccalaureate programs and 22 masters and PhD programs in CM

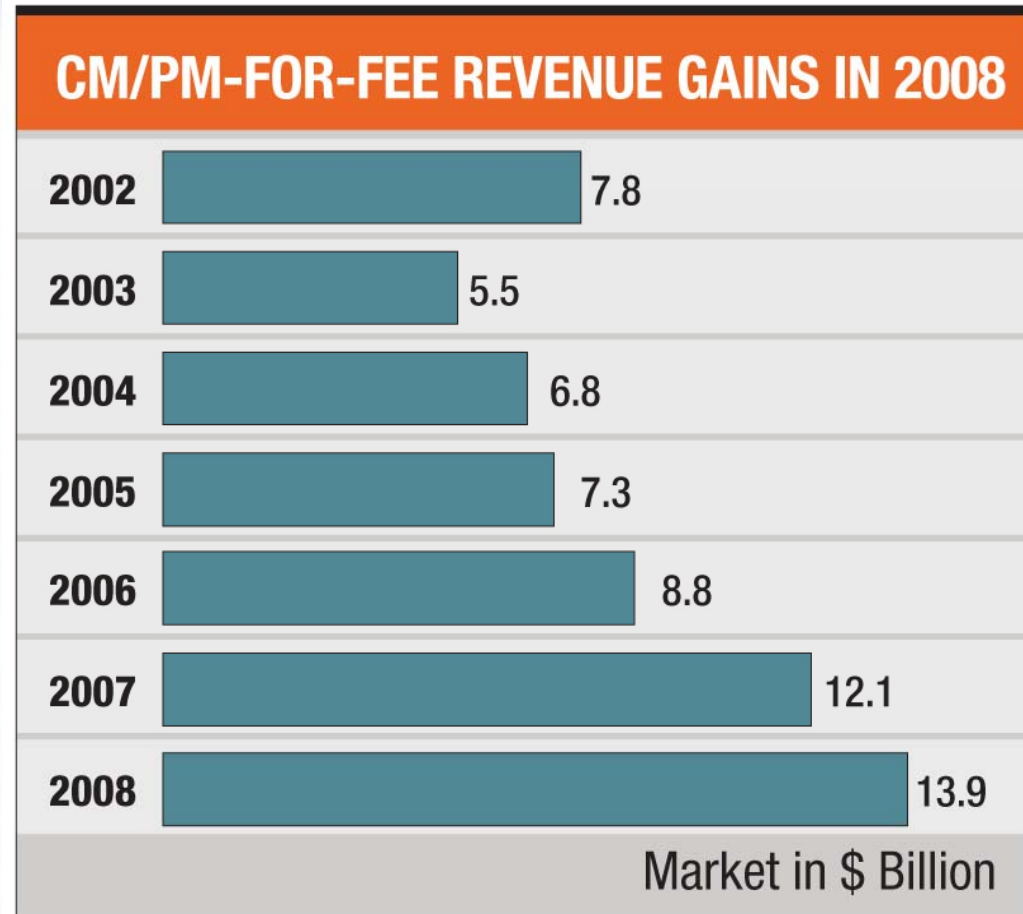
(American Council for Construction Education 2008 Annual Report)



CM Market Today in the US

Growth of CM Market In the US

- CM has grown significantly in the last 6 years
- International CM revenue was 27% of total in 2008 and has grown 58% since 2002
- 2009 report by ENR could show less growth due to economy





Top US Firms for CM

Total revenue, US\$ millions

Bechtel	3,069
CH2M HILL	1,560
Parsons	1,066
Jacobs	940
AECOM	867
PB	753
URS	545
Hill International	381
Jones Lang LaSalle	355
CB Richard Ellis	340

Recent Research On Use of CM

HanmiParsons/CMAA research in 2009:

- Agency CM used on 17 percent of all projects
- Used more often in larger, more costly, more complex projects
- Used most in schools and universities, hospitals, government buildings



Use of Agency CM by Project Size

	% 5 Mil or Less	% >5 Mil to 10 Mil	% >10 Mil to 25 Mil	% >25 Mil to 50 Mil	% >50 Mill	All Projects
Private	12%	10%	13%	18%	20%	14%
Public	10%	16%	21%	24%	25%	18%
Total	11%	13%	17%	21%	22%	16%
Buildings:						
Private	22%	15%	25%	19%	19%	14%
Public	11%	19%	35%	19%	16%	24%
Total	11%	14%	19%	22%	22%	17%
Nonbuilding:						
Private	57%	0%	0%	14%	29%	19%
Public	16%	21%	34%	19%	10%	14%
Total	11%	12%	14%	18%	21%	14%
All Public:						
County	15%	21%	38%	17%	9%	22%
Federal	10%	10%	20%	40%	20%	11%
State	7%	18%	25%	23%	27%	12%
Total	10%	16%	21%	24%	25%	18%

Use of Agency CM by Project Type

Structure Group	% Projects Surveyed w/ CM Agency	% Valuation Surveyed w/ CM Agency
Schools K-12	28%	28%
College/University	24%	31%
Schools – Other	19%	34%
Dorms	13%	15%
Hospitals	24%	30%
Medical Clinics	13%	15%
Office	12%	12%
Hotels	13%	17%
Retail	15%	34%
Recreational	23%	17%
Auto Garage/Service	21%	18%
Government Buildings	27%	34%
Religious	9%	7%
Manufacturing	12%	40%
Transportation Terminals	12%	21%
Warehouses	11%	8%
Multifamily	13%	19%

Structure Group	% Projects Surveyed w/ CM Agency	% Valuation Surveyed w/ CM Agency
Bridges	6%	5%
Streets	11%	35%
Sewer	15%	14%
Water	16%	10%
Electric Power/ Gas/Comm	17%	19%
Dams/Harbors/ etc	10%	13%
Nonbuilding – Other	22%	14%
ALL STRUCTURE GROUPS:	16%	22%
TOTAL BUILDING	17%	23%
TOTAL NON-BUILDING	14%	17%



Future Trends

Trend 1 - Massive Infrastructure Rebuilding Required in US

- ASCE Report Card finds that US infrastructure badly in need of repair and replacement
- ASCE estimates total cost of \$2.2 trillion

TABLE A ★ 2009 Report Card for America's Infrastructure

Aviation	D
Bridges	C
Dams	D
Drinking Water	D-
Energy	D+
Hazardous Waste	D
Inland Waterways	D-
Levees	D-
Public Parks and Recreation	C-
Rail	C-
Roads	D-
Schools	D
Solid Waste	C+
Transit	D
Wastewater	D-

NOTES Each category was evaluated on the basis of capacity, condition, funding, future need, operation and maintenance, public safety and resilience

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

AMERICA'S
INFRASTRUCTURE G.P.A.

D

ESTIMATED 5 YEAR
INVESTMENT NEED

\$2.2
TRILLION

Report Card on US Infrastructure – Costs

- Every major infrastructure sector has major needs
- Even with recent economic stimulus spending, only 47% of needs to be met
- Roads, bridges have greatest needs

TABLE B ★ Estimated 5-Year Investment Needs in Billions of Dollars

CATEGORY	5-YEAR NEED (BILLIONS)	ESTIMATED ACTUAL SPENDING *	AMERICAN RECOVERY AND REINVESTMENT ACT (P.L. III-005)	FIVE-YEAR INVESTMENT SHORTFALL
Aviation	87	45	1.3	(40.7)
Dams	12.5	5	0.05	(7.45)
Drinking Water and Wastewater	255	140	6.4	(108.6)
Energy	75	34.5	11	(29.5)
Hazardous Waste and Solid Waste	77	32.5	1.1	(43.4)
Inland Waterways	50	25	4.475	(20.5)
Levees	50	1.13	0	(1.13)
Public Parks and Recreation	85	36	0.835	(48.17)
Rail	63	42	9.3	(11.7)
Roads and Bridges Discretionary grants for surface transportation	930	351.5	27.5 1.5	(549.5)
Schools	160	125	0**	(35)
Transit	265	66.5	8.4	(190.1)
	2.122 trillion***	903 billion	71.76 billion	(1.176 trillion)

Total Need** \$2.2 trillion**

* 5 year spending estimate based on the most recent available spending at all levels of government and not indexed for inflation

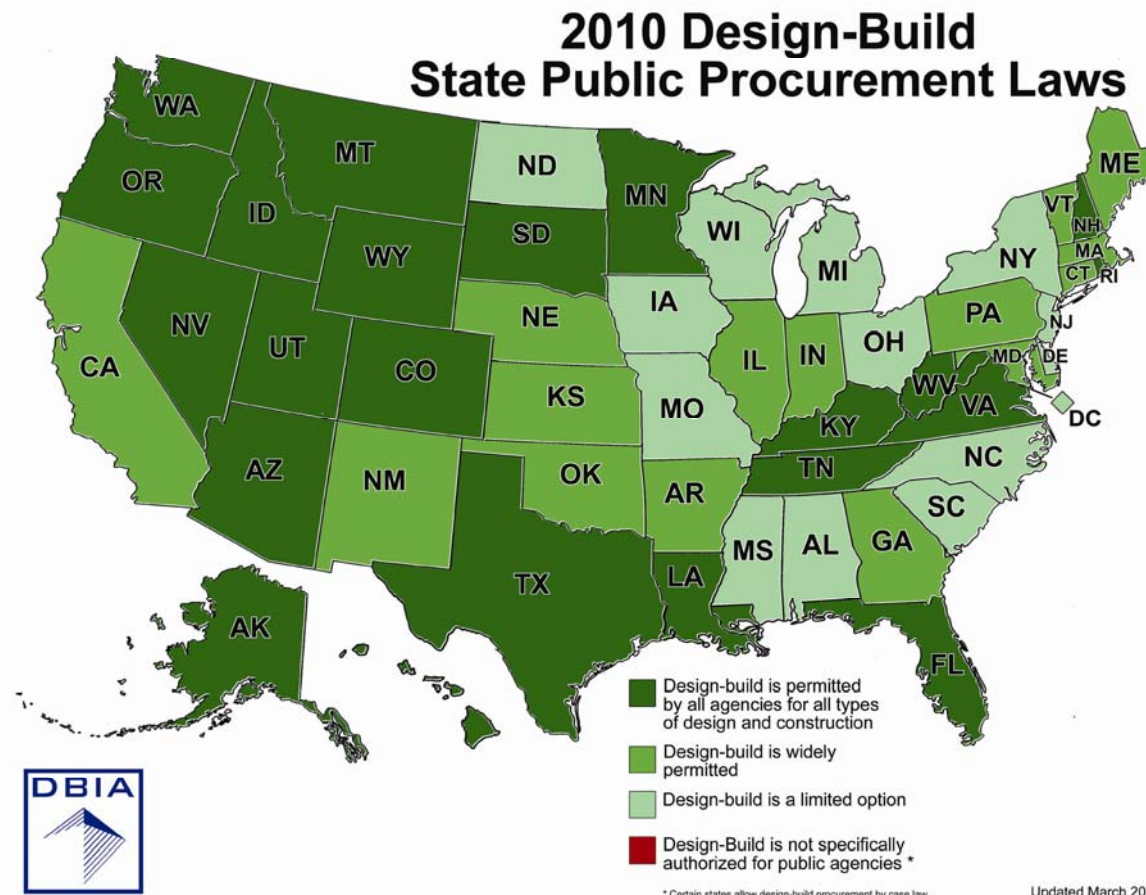
** The American Recovery and Reinvestment Act included \$53.6 billion for a State Fiscal Stabilization Fund for education, as of press time, it was not known how much would be spent on school infrastructure.

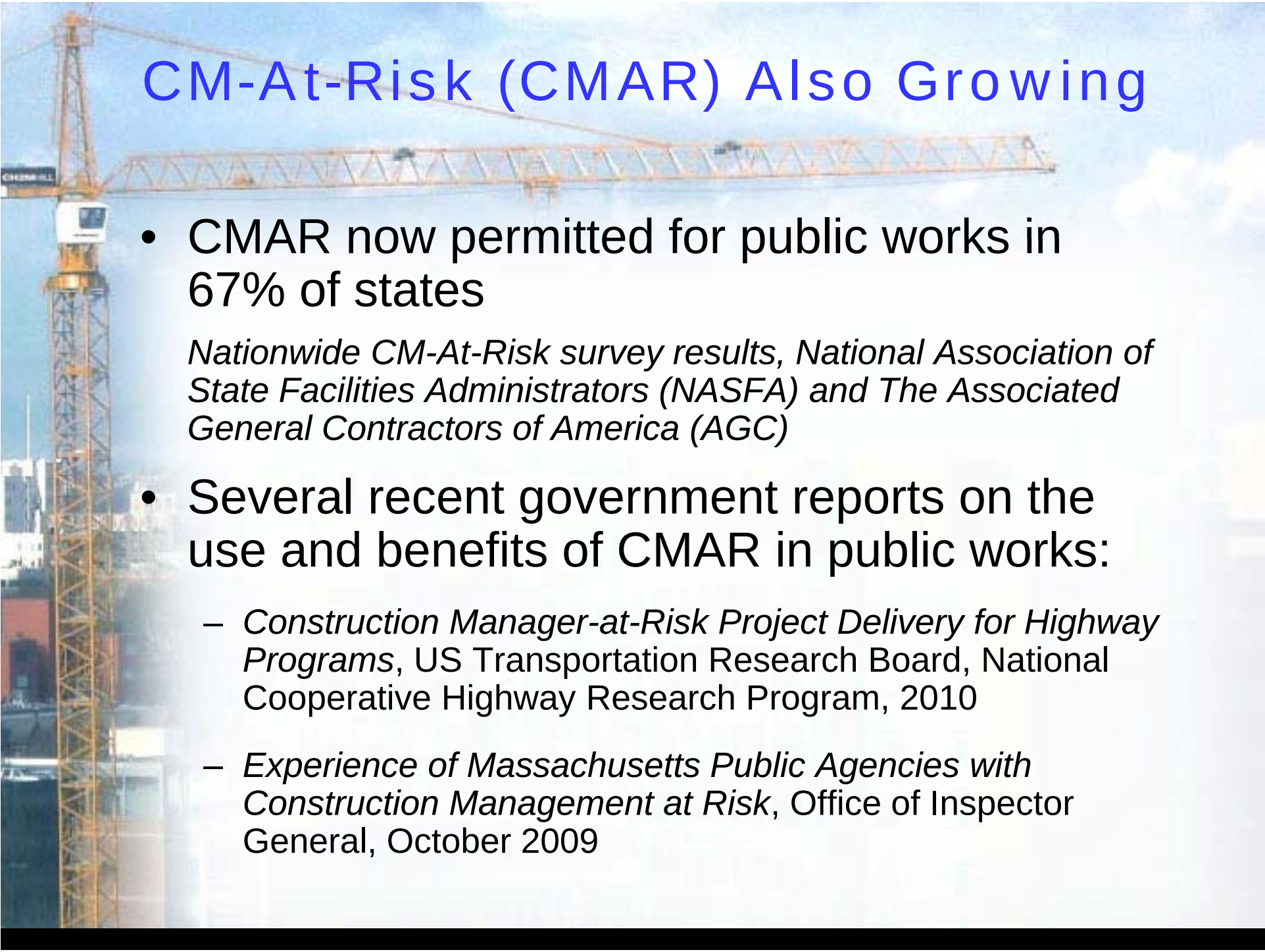
*** Not adjusted for inflation

**** Assumes 3% annual inflation

Trend 2 – Expanding Project Delivery Methods

- Design-Build is growing and is now permitted in all 50 US States





CM-At-Risk (CMAR) Also Growing

- CMAR now permitted for public works in 67% of states

Nationwide CM-At-Risk survey results, National Association of State Facilities Administrators (NASFA) and The Associated General Contractors of America (AGC)

- Several recent government reports on the use and benefits of CMAR in public works:
 - *Construction Manager-at-Risk Project Delivery for Highway Programs*, US Transportation Research Board, National Cooperative Highway Research Program, 2010
 - *Experience of Massachusetts Public Agencies with Construction Management at Risk*, Office of Inspector General, October 2009



Integrated Project Delivery – Perhaps the Most Exciting New Delivery Method

- A way of delivering projects that:
 - Removes barriers to communication and sharing
 - Gets project parties involved earlier into the planning and design
 - Uses integrated information tools and processes to promote more collaboration and teamwork

***IPD is a change in the behavior
of the project participants!***



Common Themes In IPD

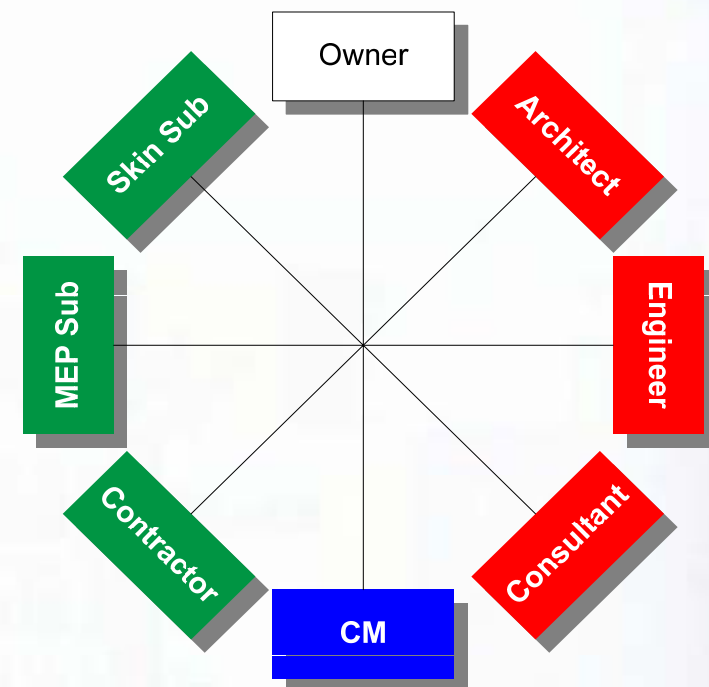
1. **Integrated Agreements:** single agreement among the core team, shared risk and reward, efficient dispute resolution not litigation
2. **Integrated Leadership:** transparency, Owner engagement, management committees, collaborative team selection procedures
3. **Integrated Information:** BIM and PMIS
4. **Integrated Processes:** lean, continuous improvement, design assist

Integrated Agreements

Multi-Party

One contract signed by Owner and each of the core team members

- ✓ Defines duties of each party to other
- ✓ Share risk and incentives
 - profit, contingency, bonus
 - Owners willing to pay for mistakes
- ✓ Efficient dispute resolution process
- ✓ Public Owners who cannot have single agreement or shared incentives can achieve similar benefits through separate contracts that define duties each owes to others and uses award fees instead of incentives

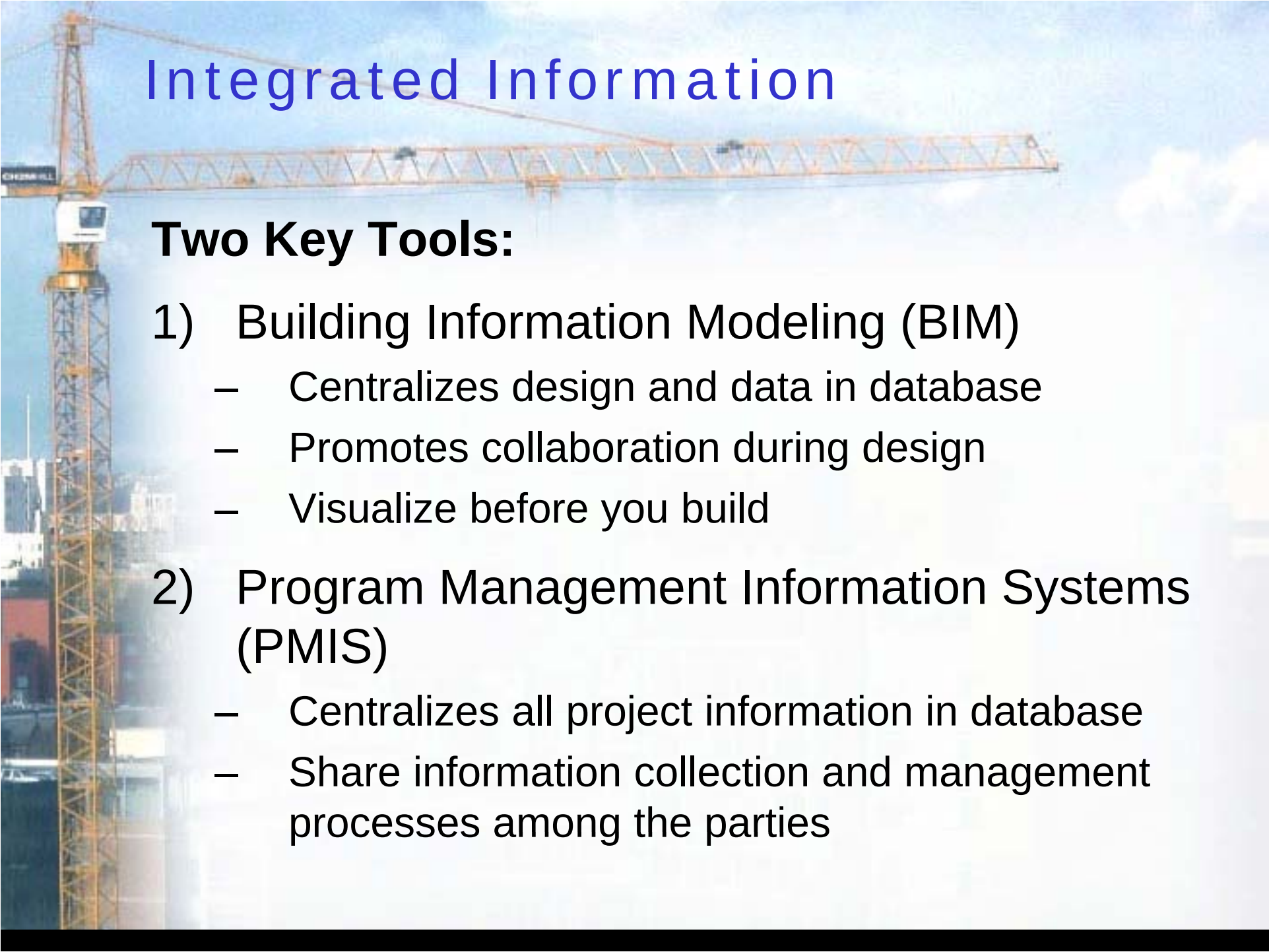


ConsensusDOCS 300 and AIA 195/196/197 are new IPD agreements



Integrated Leadership

- Transparency – full, open sharing of information
- Owner engagement – with experienced staff, or by hiring experienced PM
- Management Committees (Owner and core team members with significant stake in the outcome)
- Consensus decisions
- Collaborative selection procedures



Integrated Information

Two Key Tools:

- 1) Building Information Modeling (BIM)
 - Centralizes design and data in database
 - Promotes collaboration during design
 - Visualize before you build
- 2) Program Management Information Systems (PMIS)
 - Centralizes all project information in database
 - Share information collection and management processes among the parties

What Is BIM?

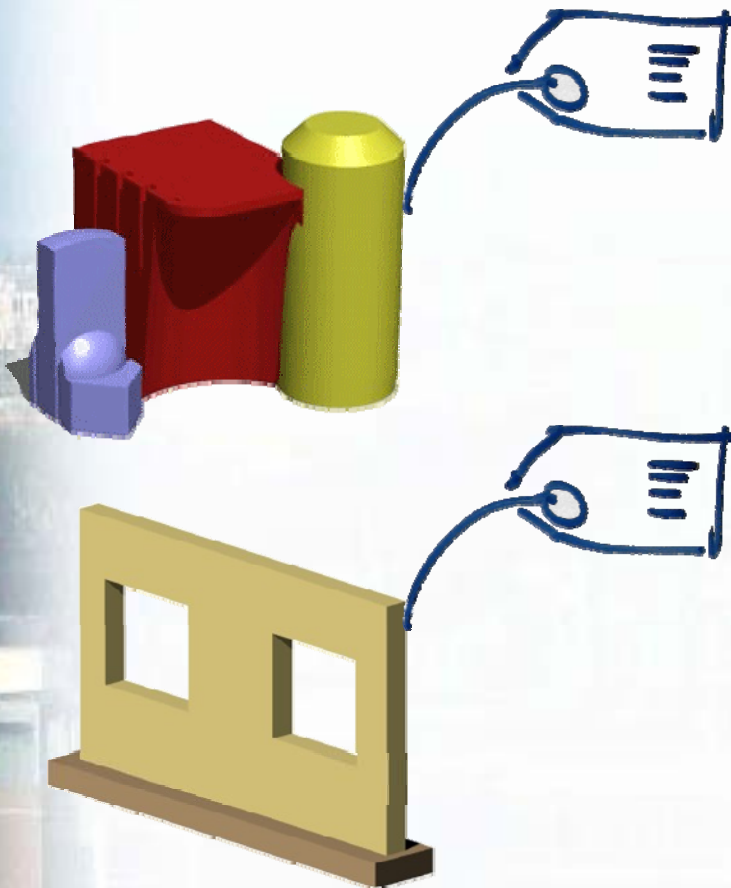
Geometry

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Data

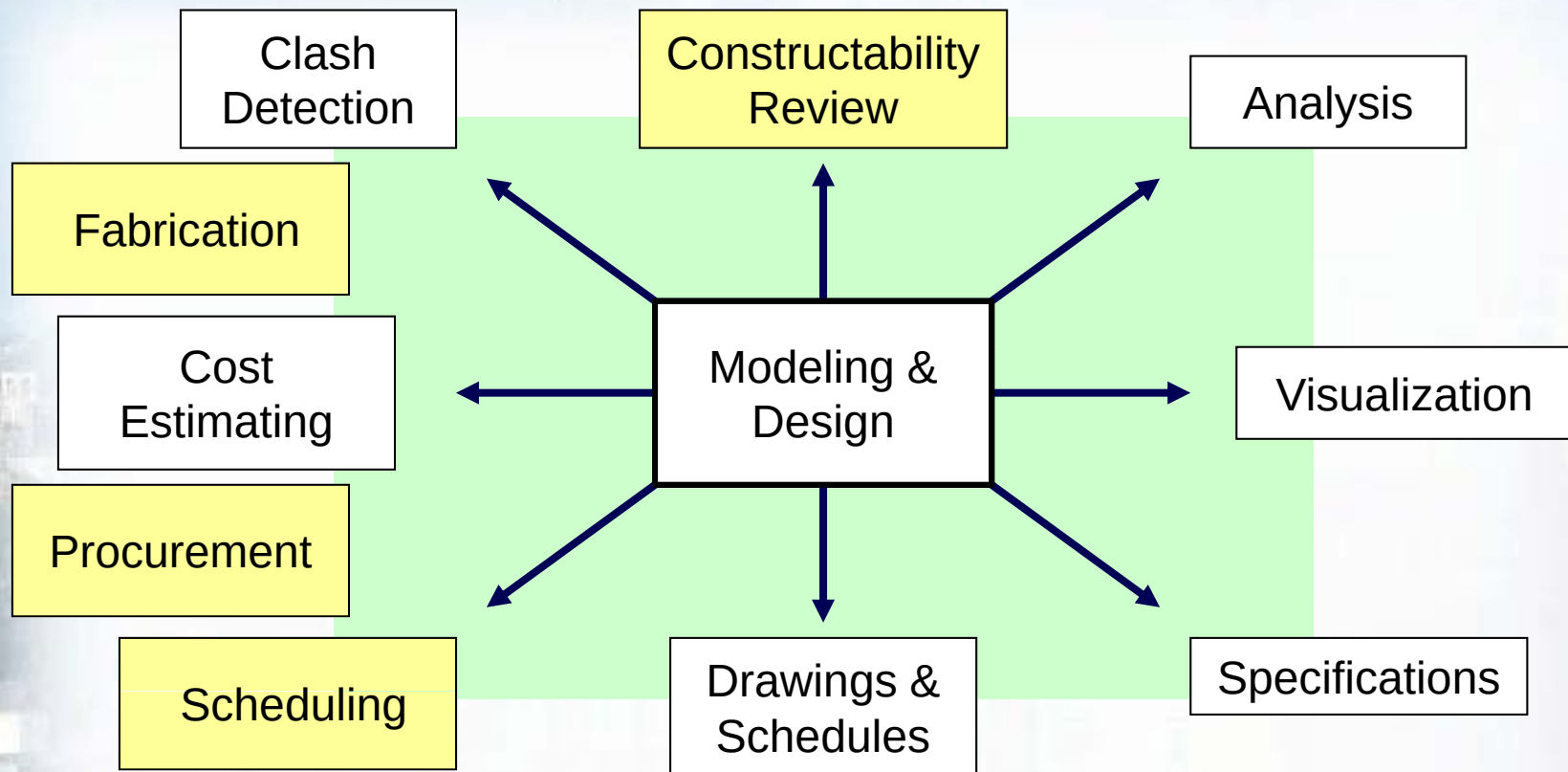
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BIM



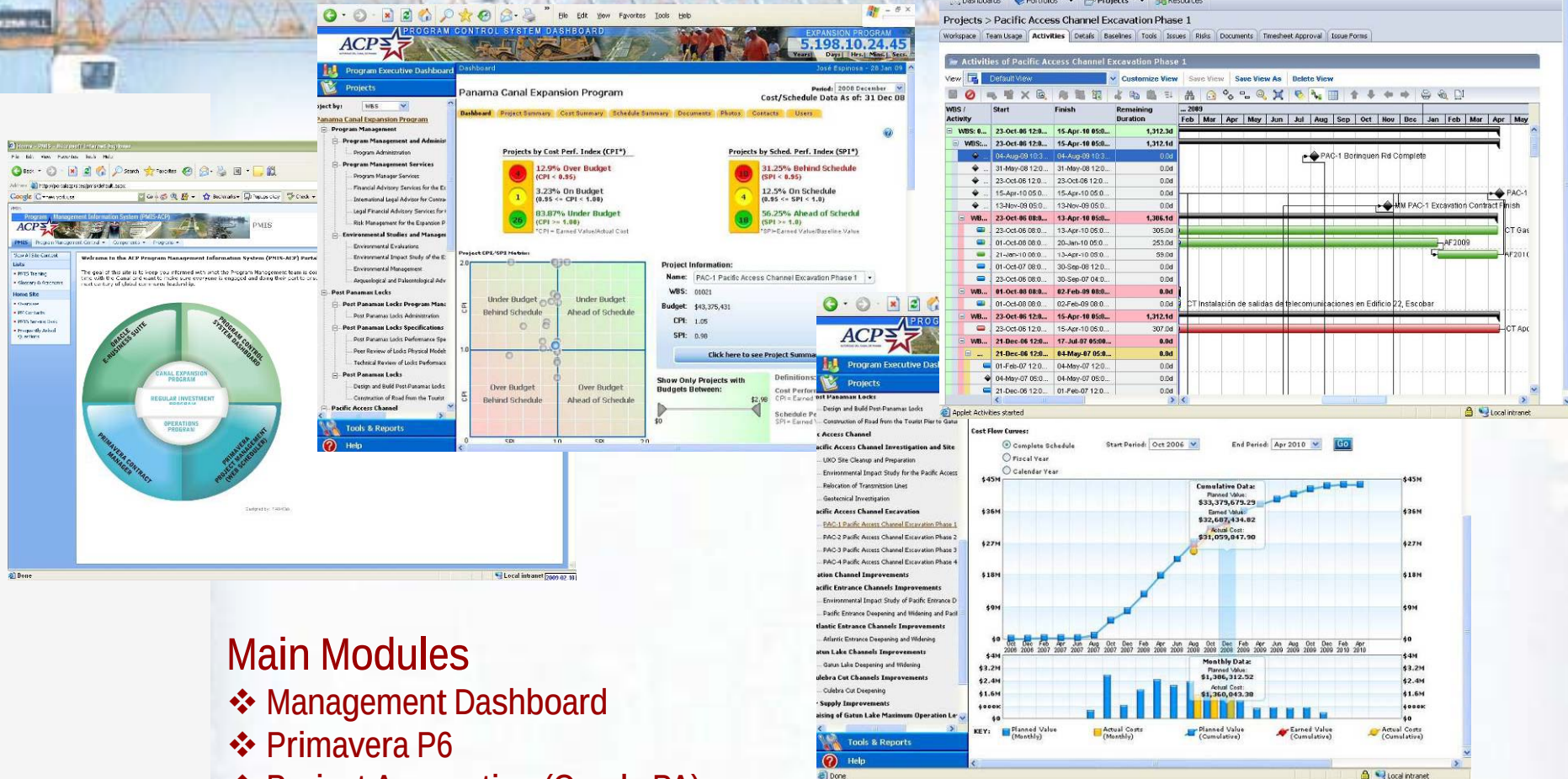
Property	Value	Query
ch_Construction_Status		
Construction Status:	Not Constructed / Poured / Installed	
Date Constructed:	2008-03-17	
ch_Mechanical-Condensing_Unit		
Equipment Number:	CU-12B	
Location:	Outdoors-ground	
Description:	Air-cooled condensing unit, dual compr...	
Service:	DHU-12, mag and corridor	
Design Elevation (Feet):	3540	
Nominal Capacity (Tons):	15.0	
Minimum EER:	11.1	
Design Ambient Temp (F):	100	
Minimum Ambient Operating Temp (F):	0	
Refrigerant Type:	R-22	
Sat Suction Temp Degree (F):	42	
Minimum Circuit Ampacity:	32.9	
Electrical - Voltage / Phase / Hertz	460/3/60	
Unit Weight (LBS):	800	
Remarks / Accessories:		
Material:		
BOD Manufacturer:	Trane	
BOD Model Number:	TTA180B	
CFD Quantity:		
CFD Horsepower Each:	1/2	
COMP Quantity:		
COMP Horsepower Each:		
COMP Cap Steps:		
ch_comments		
Comment ID:	2008-03-17_01	
Comment Submitted By:		
Comment:		
Comment Status:	No Comment	
Comment Resolved By:		
Resolution Date:	2008-03-17	

Multiple Uses and Benefits of BIM



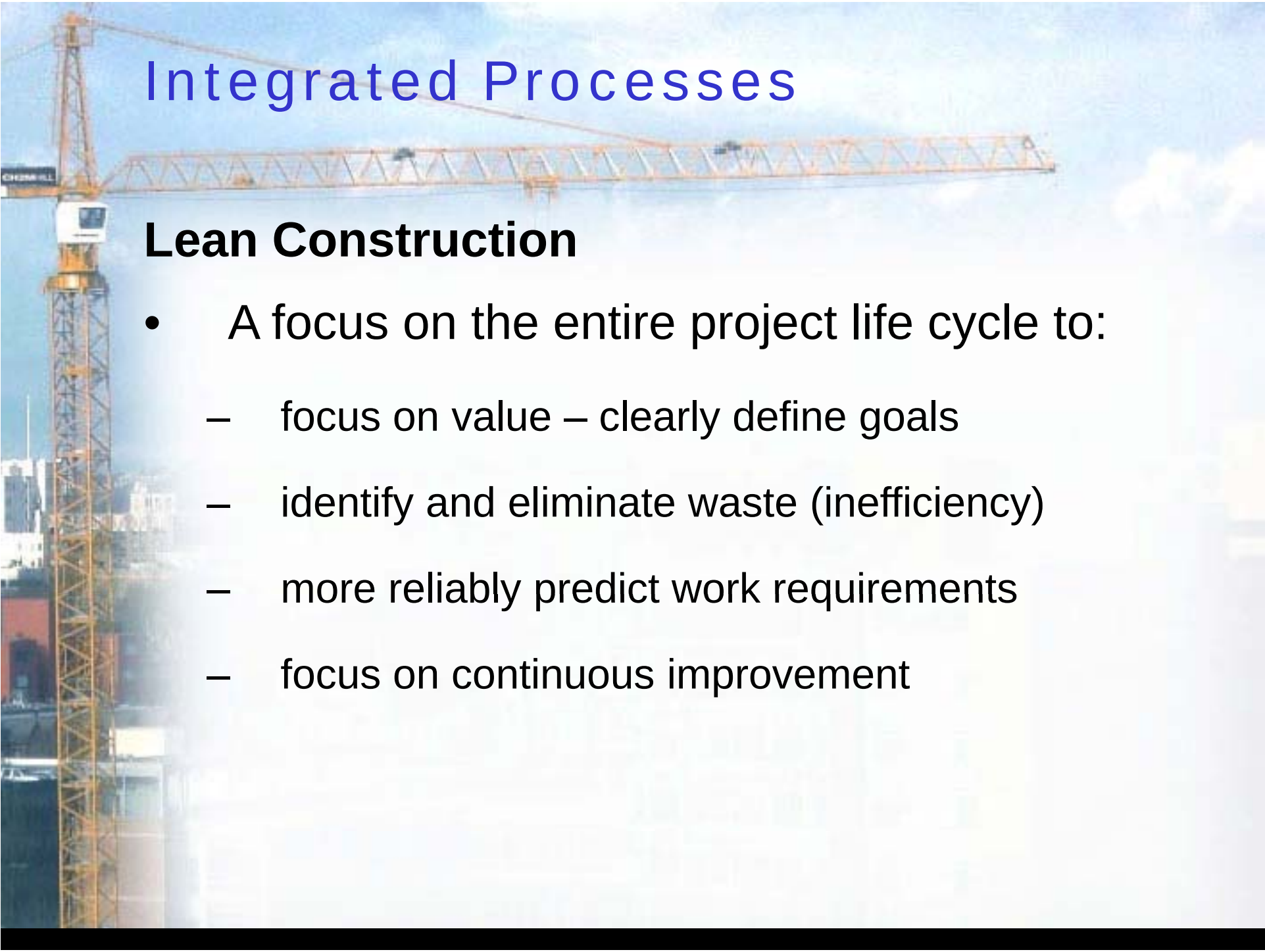
In addition to all this, the model and all its data can be used for some other construction-specific activities, including fabrication, construction scheduling and work packaging, constructability review, and procurement

Program Management Information System



Main Modules

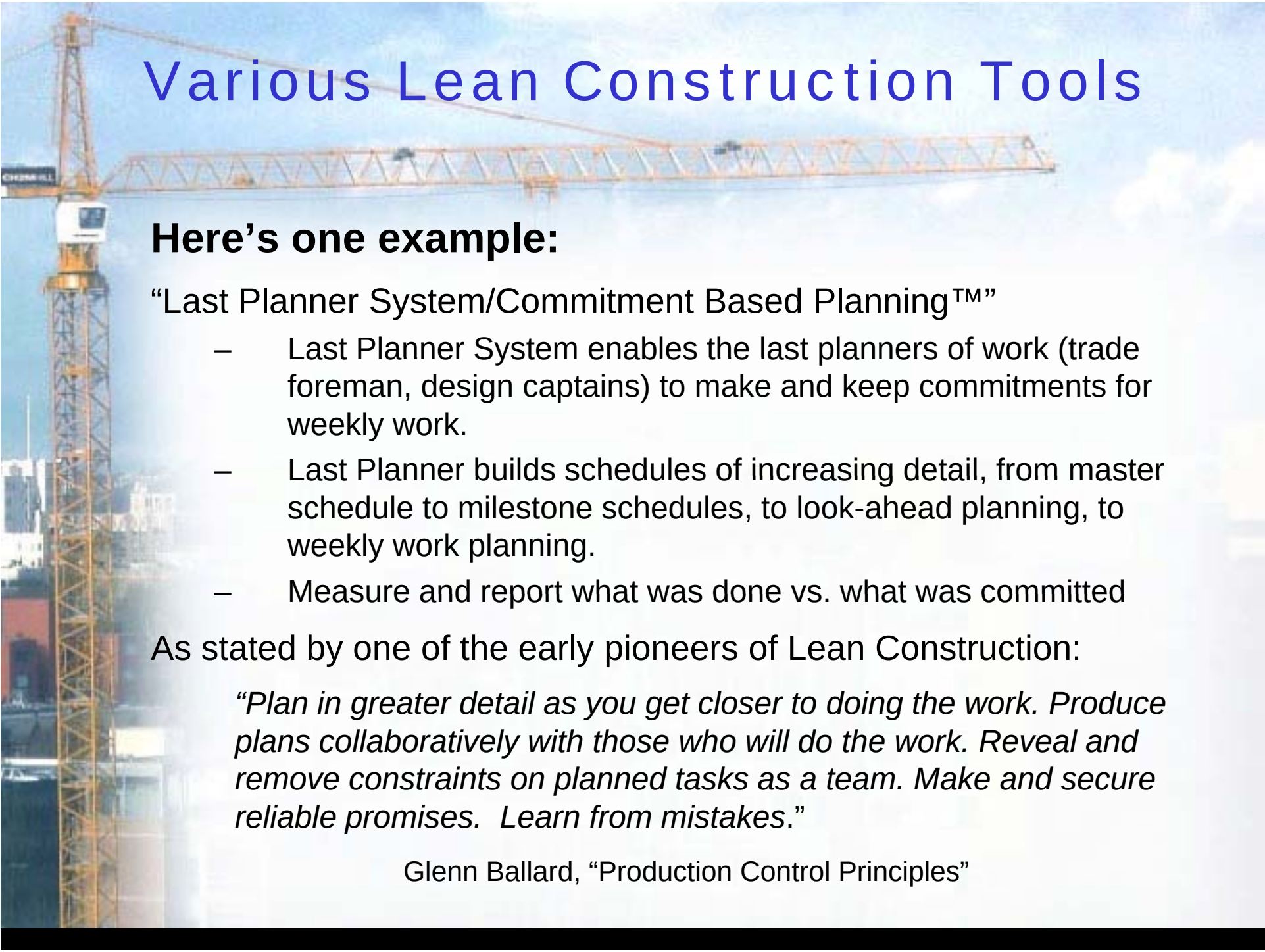
- ❖ Management Dashboard
- ❖ Primavera P6
- ❖ Project Accounting (Oracle PA)
- ❖ Primavera Contract Manager (Document Control)
- ❖ Risk Analysis (Primavera Pert Master and At-Risk)
- ❖ Cost Estimates (Heavy Bid and Timberline Estimating)



Integrated Processes

Lean Construction

- A focus on the entire project life cycle to:
 - focus on value – clearly define goals
 - identify and eliminate waste (inefficiency)
 - more reliably predict work requirements
 - focus on continuous improvement



Various Lean Construction Tools

Here's one example:

“Last Planner System/Commitment Based Planning™”

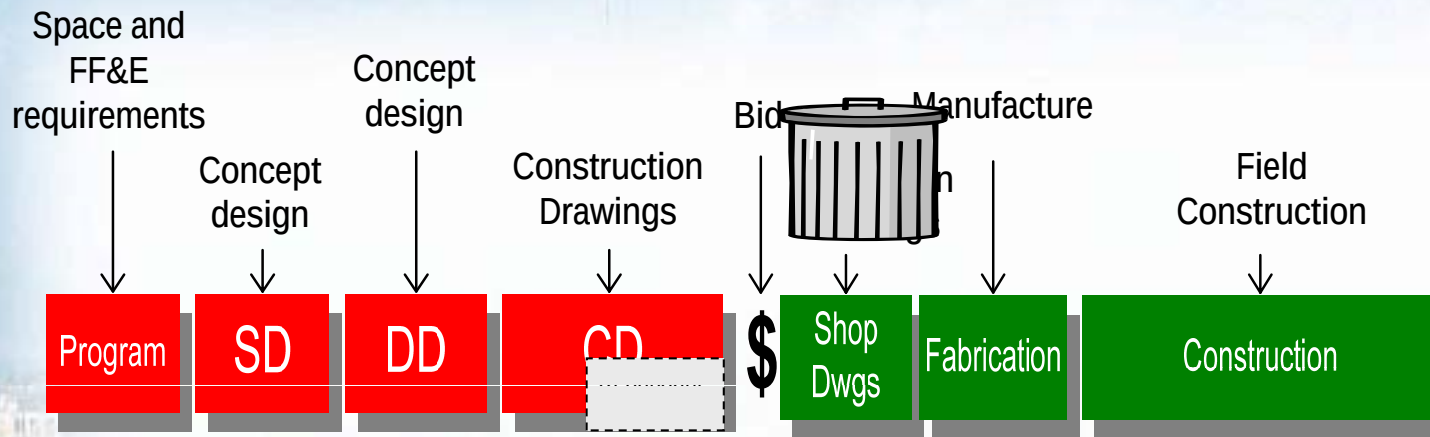
- Last Planner System enables the last planners of work (trade foreman, design captains) to make and keep commitments for weekly work.
- Last Planner builds schedules of increasing detail, from master schedule to milestone schedules, to look-ahead planning, to weekly work planning.
- Measure and report what was done vs. what was committed

As stated by one of the early pioneers of Lean Construction:

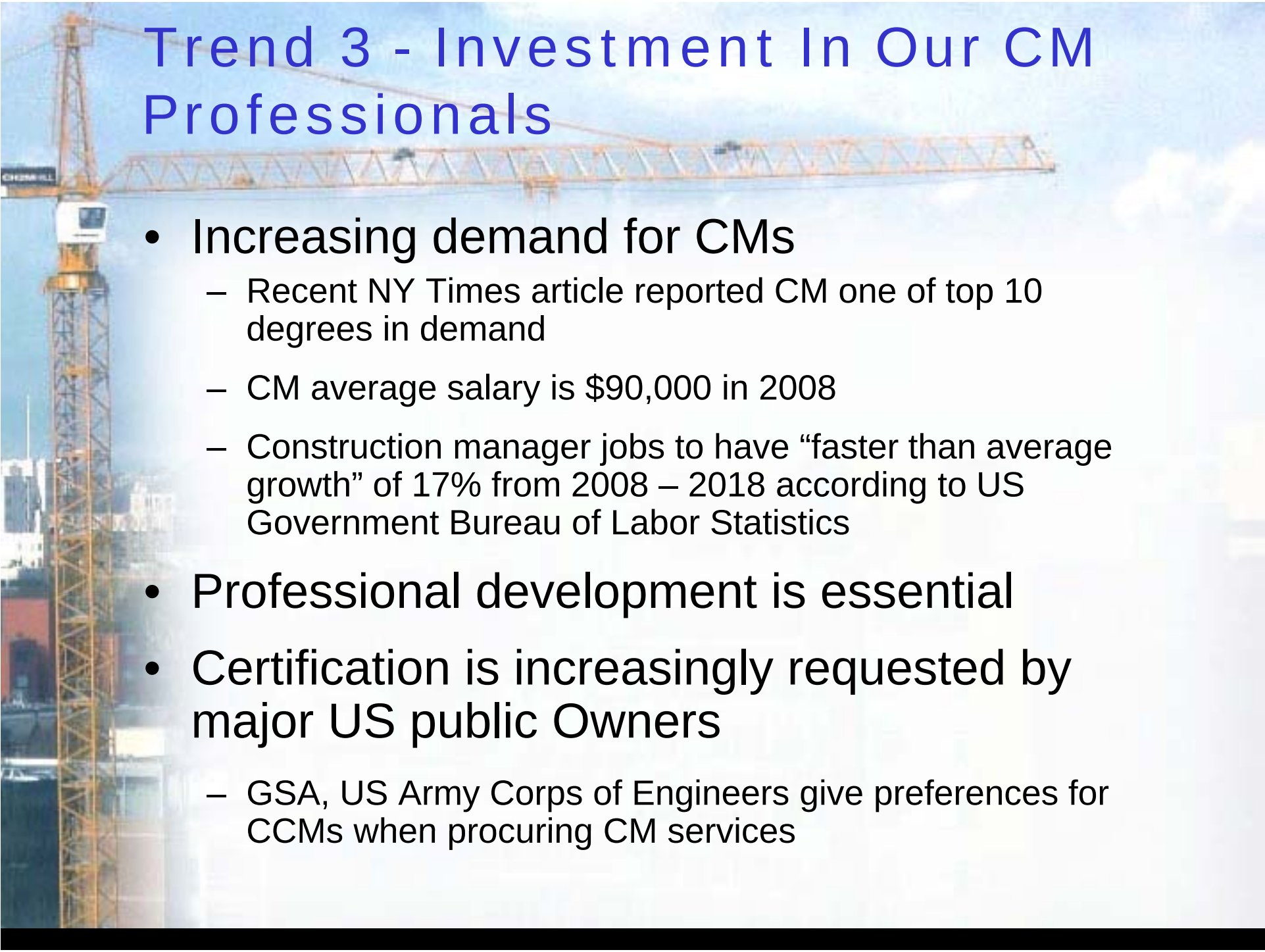
“Plan in greater detail as you get closer to doing the work. Produce plans collaboratively with those who will do the work. Reveal and remove constraints on planned tasks as a team. Make and secure reliable promises. Learn from mistakes.”

Glenn Ballard, “Production Control Principles”

Design Assist



- Detailed knowledge of design, cost, and technology resides with the fabricators, manufacturers, and subcontractors
- In traditional design-bid-build, some of the detailed construction drawing design is wasted and replaced by shop drawings
- So, the sooner they are involved in design decision-making, the better the design and predictability of cost and schedule can be



Trend 3 - Investment In Our CM Professionals

- Increasing demand for CMs
 - Recent NY Times article reported CM one of top 10 degrees in demand
 - CM average salary is \$90,000 in 2008
 - Construction manager jobs to have “faster than average growth” of 17% from 2008 – 2018 according to US Government Bureau of Labor Statistics
- Professional development is essential
- Certification is increasingly requested by major US public Owners
 - GSA, US Army Corps of Engineers give preferences for CCMs when procuring CM services



CMAA Responding - CMAA's Professional Development

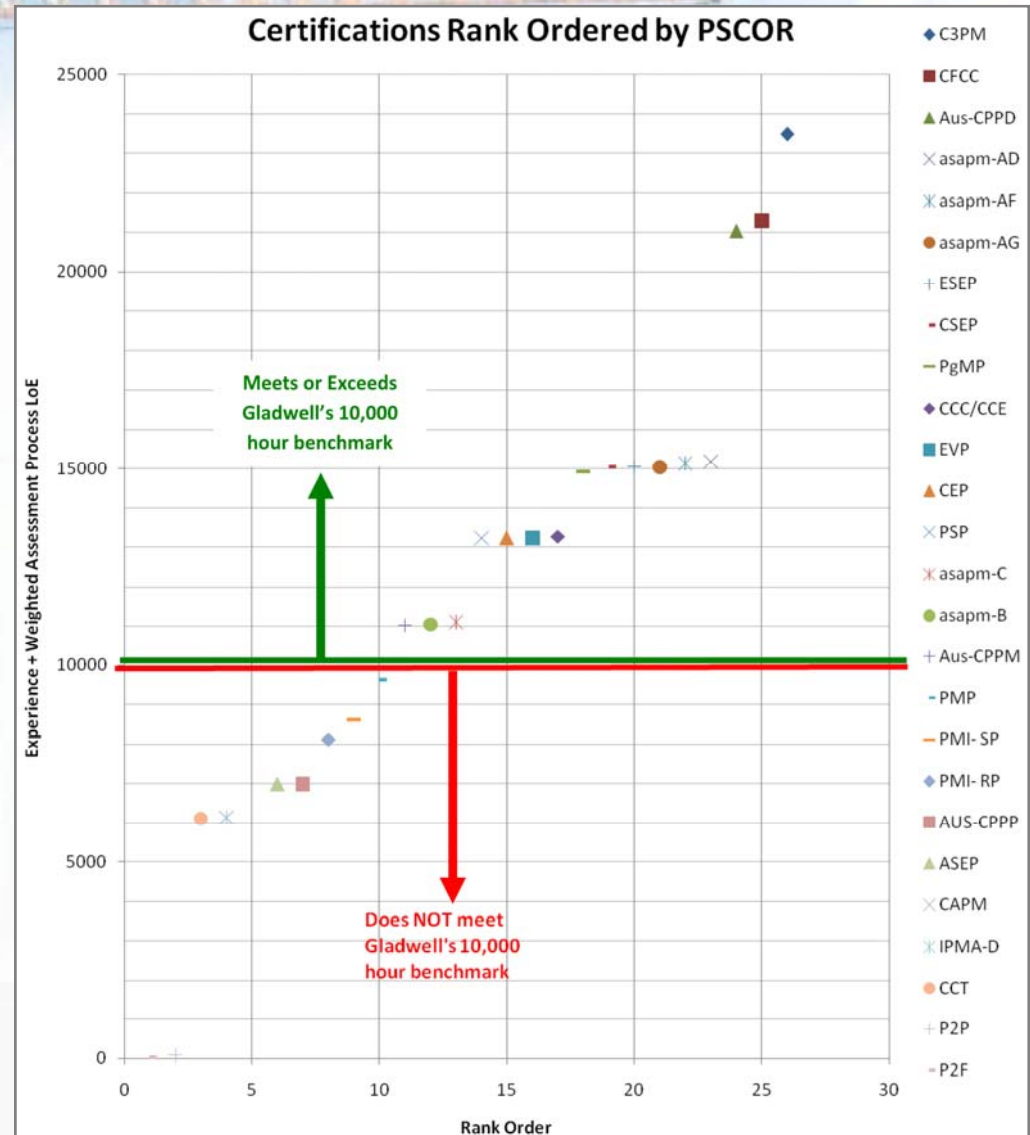
How CMAA Supports Your Full Career Path

[illegible]

Need More Consistent Project Management Certifications

- Many competing certifications within US and international
- Qualifications and standards vary widely
- Difficult for Owners to know which are better
- Need for more consistency

Table courtesy of Dr. Paul Giammalvo from unpublished paper: "Project Management Certifications Compared - A Preliminary Analysis"

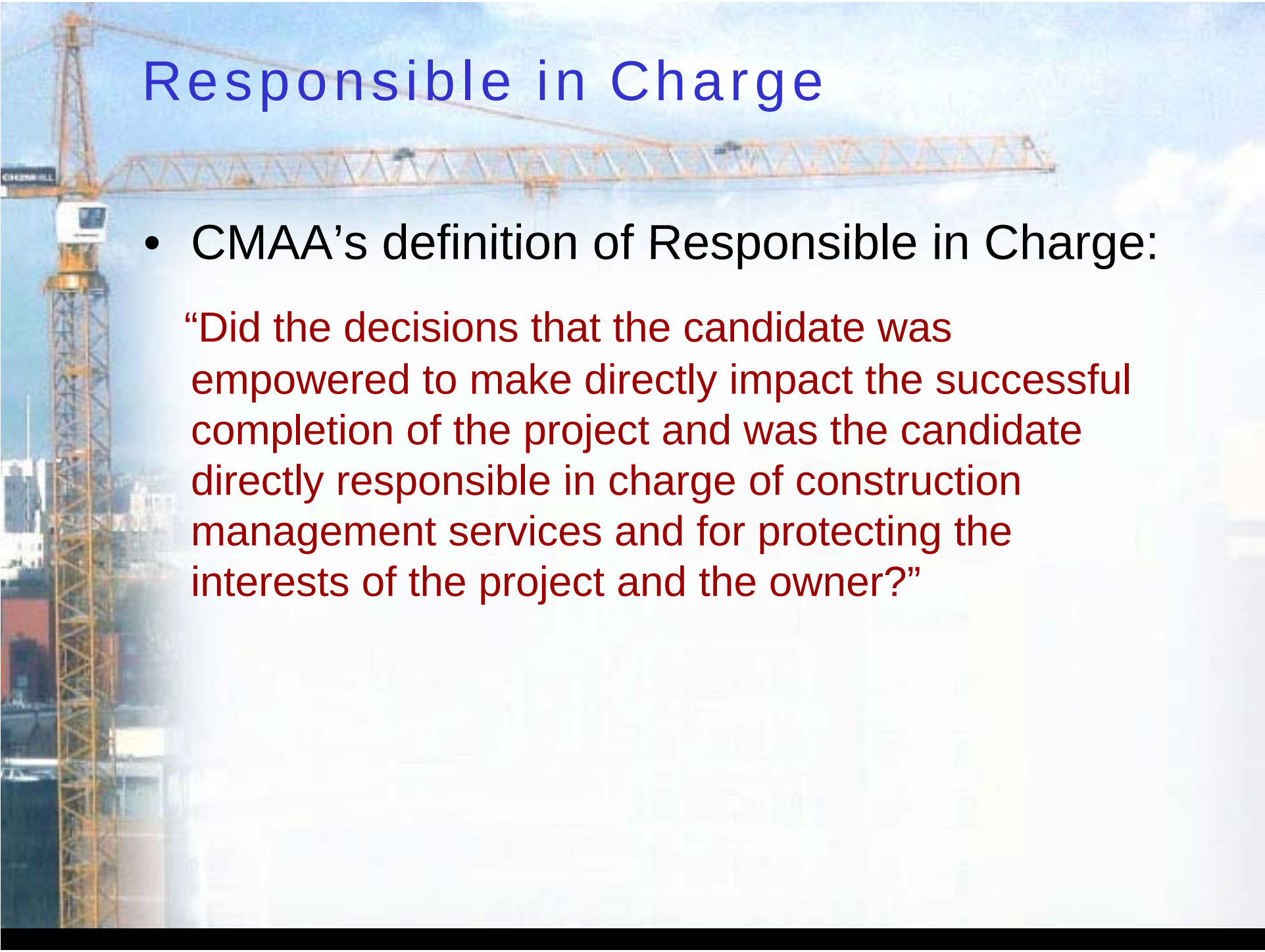


CMAA's CCM Qualification – Only Certification Specific to CM

PHASE:	Pre-design	Design	Procurement	Construction	Post-construction
<u>FUNCTION/ROLE</u>					
Project Management	[X]	[X]	—	[X]	—
Cost Management	—	[X]	[X]	[X]	—
Time Management	—	[X]	—	[X]	—
Quality Management	—	[X]	—	[X]	[X]
Contract Administration	—	—	[X]	[X]	[X]
Safety Management	—	—	—	[X]	—

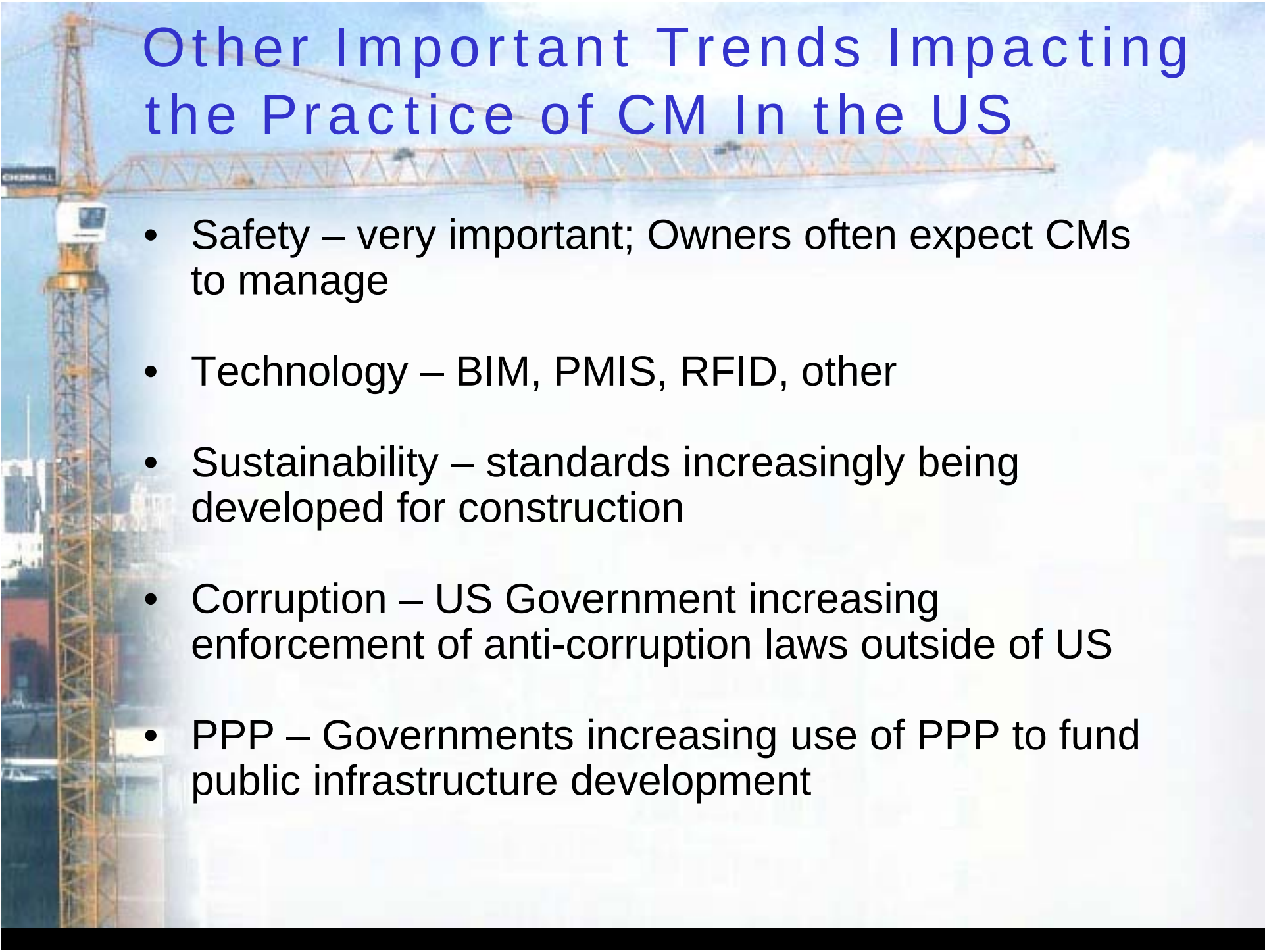
X – CCM requires 48 months total of “Responsible In Charge Experience” in at least these areas, plus examination.

CCM was the first personnel certification program in the construction industry to be accredited by the American National Standards Institute under the provisions of ISO 17024, the international standard for personnel certification programs.



Responsible in Charge

- CMAA's definition of Responsible in Charge:
“Did the decisions that the candidate was empowered to make directly impact the successful completion of the project and was the candidate directly responsible in charge of construction management services and for protecting the interests of the project and the owner?”



Other Important Trends Impacting the Practice of CM In the US

- Safety – very important; Owners often expect CMs to manage
- Technology – BIM, PMIS, RFID, other
- Sustainability – standards increasingly being developed for construction
- Corruption – US Government increasing enforcement of anti-corruption laws outside of US
- PPP – Governments increasing use of PPP to fund public infrastructure development

Questions?



Thank you!