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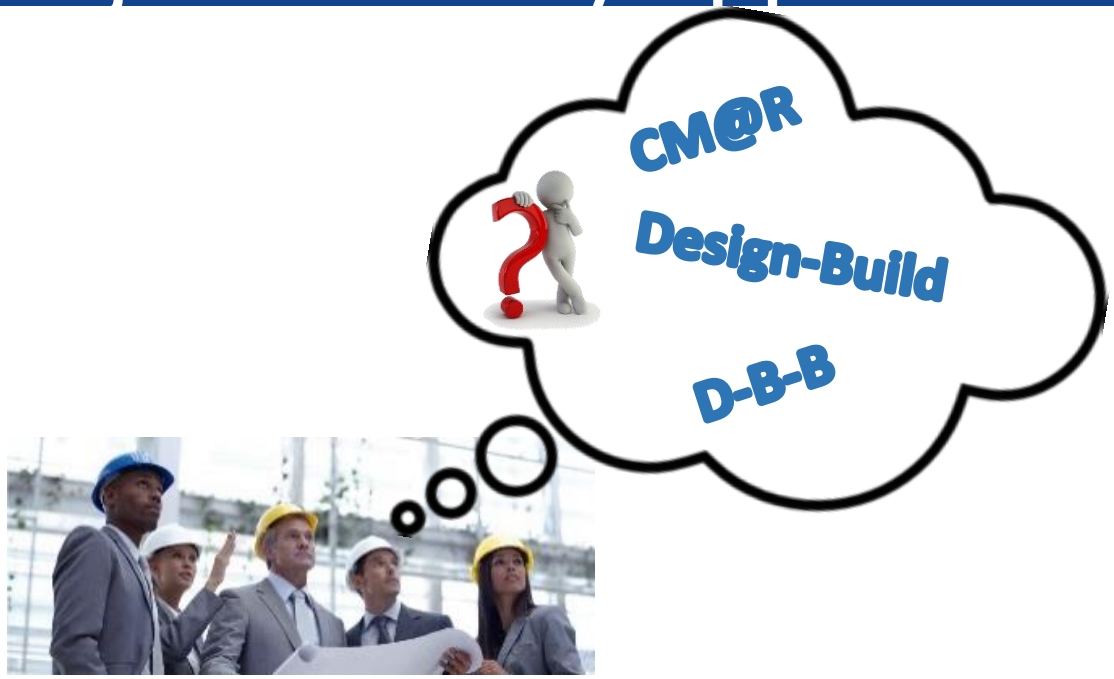
Project Delivery Selection Matrix
If the Project Delivery Approach Fits, Use It



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Project Delivery Selection Matrix Water and Wastewater Projects

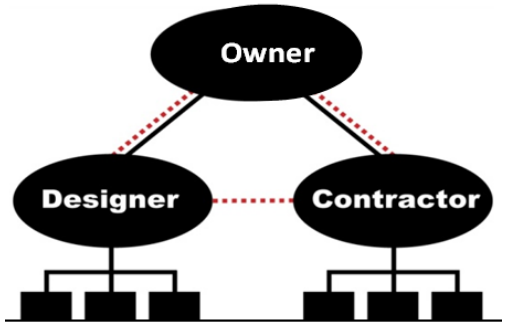
Design-Build Institute of America (DBIA)

Rocky Mountain Region (RMR) Water/Wastewater Committee
and

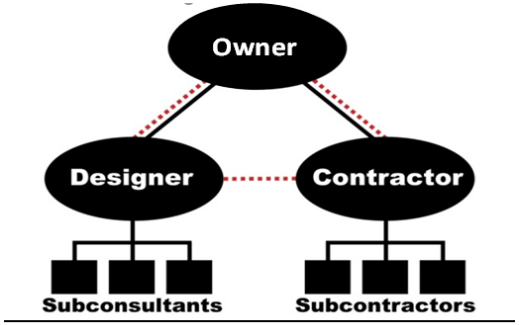
Construction Engineering and Management Program at the
University of Colorado Boulder

- In a collaborative effort, developed the Project Delivery Selection Matrix
- Goal – owners selecting the most suitable project delivery method for successful projects

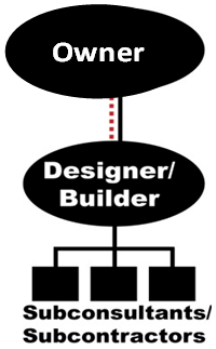
Most Common Project Delivery Methods



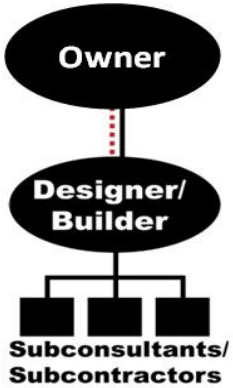
Design/Bid/Build
(D/B/B)



Construction Management-At-Risk
(CMAR)

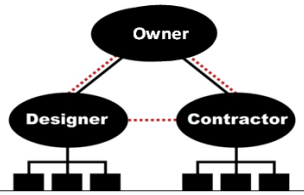
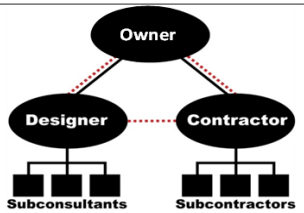
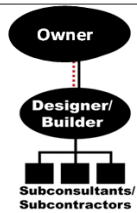
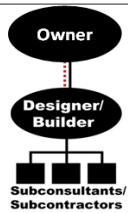


Progressive Design/Build
(D/B)



Prescriptive-Based Design/Build
(D/B)

ALTERNATIVE PROJECT DELIVERY METHODOLOGY – COMPARATIVE MATRIX

				
	Design/Bid/Build (D/B/B)	**Construction Management-At-Risk (CMAR)**	**Progressive Design/Build (D/B)**	**Prescriptive-Based Design/Build (D/B)**
ALTERNATE TERMINOLOGY	Competitive Bidding or Hard Bid	Construction Manager / General Contractor (CM/GC)	--	Lump Sum Design/Build, Engineer-Procure-Construct (EPC)
GENERAL DESCRIPTION	A project delivery method where the owner selects an engineer to design and develop construction documents, from which the owner solicits lump sum bids. Selection is based on the lowest responsive bid, and the contractor serves as a single point of responsibility for construction. The owner procurement rules allow some variations to the "traditional" design/bid/build project delivery method in order to increase level of "control" of certain project elements, if desired. Options include potential pre-qualification of contractors and/or specific suppliers, pre-selection and/or pre-purchase of selected equipment, or other non-standard variations. Selection is based on the lowest responsive bid and the contractor serves as a single point of responsibility for construction.	A project delivery method where the construction manager serves as the general contractor providing pre-construction and construction services, while the engineer completes design under a separate contract, with the intent of promoting enhanced collaboration between all parties during design development. Qualification-based selection (QBS) of the CMAR or CM/GC is typically done early in the design process. If no acceptable GMP is reached, the owner still maintains the option to bid out the construction work.	A project delivery method that uses a qualifications-based selection (QBS, often with a proposed fee structure) similar to CMAR or CM/GC, but combines separate design and construction procurements into one procurement and selection of a single-contract design/build entity. Once selected, design commences and a construction estimate is "progressively" developed in an open-book format until a price can be agreed upon between the design/builder and owner. If no acceptable GMP or Stipulated Price is reached, the owner still maintains the option to bid-out the construction work.	A project delivery method that typically uses a two-step procurement process, requiring short-listed design/builders to propose lump sum solutions based on the owner's specifications and project concept, usually using a design developed by others provided in the RFP. The selected design/builder works under a single contract and is required to deliver a facility that meets the owner's specifications at the proposed price.
PRICING STRUCTURE	Fixed Bid Price (Lump Sum)	Negotiated GMP	Negotiated GMP or Stipulated Price	Fixed Price (Lump Sum)
TOOLS / ELEMENTS				
Method – Legislative / Regulatory State of Colorado	ALLOWED	ALLOWED	ALLOWED	ALLOWED
Method – Selection Process				
Method – Qualifications-Based	NO	YES	YES	YES
Method – Price-Based	YES	POSSIBLE - BEST VALUE	POSSIBLE - BEST VALUE	YES
Method – Pre-Selection	POSSIBLE AS A VARIATION	POSSIBLE	POSSIBLE	POSSIBLE
Method – Pre-Purchase (by Owner)	POSSIBLE AS A VARIATION	POSSIBLE	POSSIBLE	POSSIBLE
Method – Pre-Purchase (by Contractor)	NO	POSSIBLE	POSSIBLE	POSSIBLE
Implementation – Pre-Qualification				
Implementation – General Contractors	POSSIBLE AS A VARIATION	RECOMMENDED FOR CMAR	RECOMMENDED FOR D/B TEAM-	RECOMMENDED FOR D/B TEAM
Implementation – Subcontractors	POSSIBLE FOR MAJOR	POSSIBLE	RECOMMENDED FOR MAJOR	RECOMMENDED FOR MAJOR
Implementation – Suppliers	POSSIBLE AS A VARIATION	RECOMMENDED FOR KEY EQUIPMENT	RECOMMENDED FOR KEY EQUIPMENT	POSSIBLE FOR KEY EQUIPMENT
Implementation – Multiple Contracts	POSSIBLE AS A VARIATION	NOT LIKELY	NOT LIKELY	NOT LIKELY
Implementation – Multiple Phases	NOT WELL SUITED	POSSIBLE	POSSIBLE	POSSIBLE
Implementation – Incentives	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE

——— Contractual Relationship ····· Working Relationship

The *Spearin* Doctrine

- Supreme Court – *U.S. v. Spearin* 1918
- Owner provides contractors with two specific implied warranties
  - The plans and specifications it furnishes are accurate
  - The plans and specifications are suitable for their intended purpose
- Additional time and money under the contract changes clause are the remedies

Project Delivery Method Selection

Project #	Description	Cost	PDM
1	Construct a 45 MGD Recycled Water Pump Station, yard piping, and valves.	$10 M	Montclair Recycled Water Pump Station 2006-2007 **CMAR**
2	A new 15 MGD water treatment plant, 3 booster stations, river diversion structure & 11 miles of underground raw water pipeline with lift station.	$2 M	Buckman Direct Diversion Water Treatment Plant 2011 **D-B**
3	Emergency coating repairs to 20 feet of exposed 54" and 40" waterlines and creek restoration with sheet-pile walls and imported rip rap & a 1,800’ trail.	$500 K	Rampart 54" and 40" Emergency Repair Project Aurora 2009 **D-B**

Project Delivery Method Selection

Existing Literature

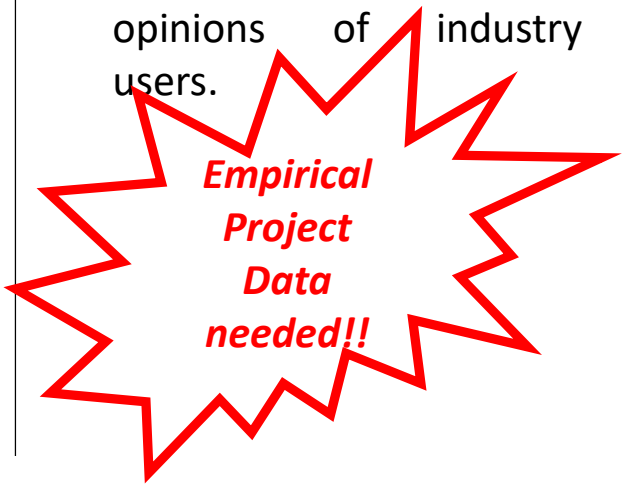
Bingham et al. (2016)
"Project Delivery Method Selection: Analysis of User Perceptions on Transportation Projects." Construction Research Congress 2016: pp. 2110-2118.

Farnsworth et al. (2015)
"Effects of CM/GC Project Delivery on Managing Process Risk in Transportation Construction." J. Constr. Eng. Manage., Volume 142, Issue 3.

McGraw Hill Construction (2014)
"Project Delivery Systems: How They Impact Efficiency and Profitability in the Buildings Sector."
SmartMarket Report.

Shrestha et al. (2014)
"Alternative Project Delivery Methods for Water and Wastewater Projects: The Satisfaction Level of Owners."
Construction Research Congress 2014: pp. 1733-1742.

- Results are not specific to particular construction sector/type.
- Based on perceptions and opinions of industry users.



Project Delivery Selection Matrix (PDSM)

Need for Project Delivery Selection Tool:

- To provide for a risk-based, objective project delivery selection approach
- To eliminate arbitrary decisions regarding project delivery methods
- To provide support and justification of the decision
- To use ratepayer funds efficiently

Project Delivery Selection Matrix (PDSM)

How the PDSM Works

Develop project description checklist and project goals.

Evaluate criteria and associated sub-criteria:

1. Level of Control
   - O&M considerations
   - Sustainability
   - Level of owner control
   - Project quality
   - Owner resources

Project Delivery Selection Matrix (PDSM)

How the PDSM Works

Evaluate criteria and associated sub-criteria:

2. Schedule
   - Implementation schedule
   - Construction & operation flexibility

3. Cost
   - Cost competitiveness
   - Cash flow, cost certainty,
   - Market & industry variability

Project Delivery Selection Matrix (PDSM)

How the PDSM Works

Evaluate criteria and associated sub-criteria:

4. Risk allocation
   - Project size & complexity
   - Impact on public
   - Legislative & legal
   - Risk allocation
   - Regulatory compliance
   - ROW & environmental permitting control

Project Delivery Selection Matrix (PDSM)

How the PDSM Works

Evaluation is enhanced by the PDSM appendices:

- Project Description Checklist
- Project Goals Worksheet
- Project Constraints Worksheet
- Opportunity/Obstacle Checklists
- Initial Risk Assessment Guidance

Project Delivery Selection Matrix (PDSM)

Example PDSM Summary

✕ : Fatal flaw	NA : Not applicable	- : Least appropriate	+ : Appropriate	+ + : Most appropriate

Summary Matrix				
	DBB	CMAR	Progressive DB	Prescriptive DB
Level of Design				
O&M Considerations	+	+	+	+
Sustainability	+	+	+ +	+ +
Level of Owner Control	+ +	+ +	-	+
Project Quality	-	+	+ +	+ +
Owner Resources (Staffing)	-	-	+ +	+
Implementation Schedule	-	-	+	+ +
Construction & Operational Flexibility	-	+	+ +	+ +
Cost Competitiveness	+ +	+ +	+	+
Cash Flow	+	+	+	+
Cost Certainty	+	+	+	+ +

Project Delivery Selection Matrix (PDSM)

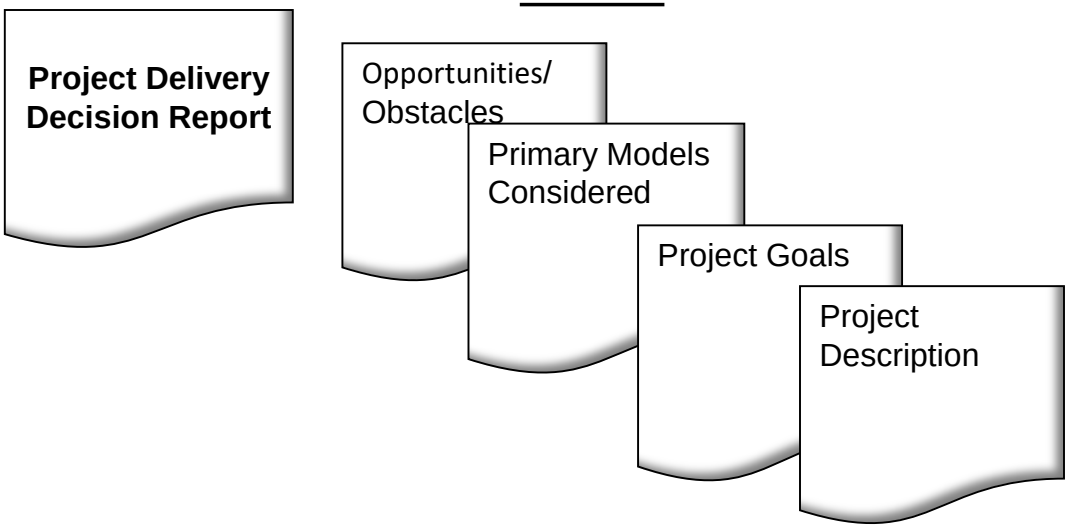
Example PDSM Summary

✕: Fatal flaw	NA : Not applicable	- : Least appropriate	+ : Appropriate	+ + : Most appropriate

Summary Matrix

	DBB	CMAR	Progressive DB	Prescriptive DB
Final Project Delivery Selection	+	+	+ +	+ +

Result



Project Delivery Selection Matrix (PDSM)

Benefits of using the PDSM

- Provides defensible project delivery method decision
- Promotes a better understanding of project goals, risks and opportunities
- Educates team members on alternative delivery methods
- Promotes organizational learning for owners, designers, and builders

Project Delivery Selection Matrix (PDSM)

Website

- Water/Wastewater Project Delivery Selection Matrix (PDSM)
  https://www.colorado.edu/waterpdsm/

- Abridged PDSM
  https://www.colorado.edu/waterpdsm/abridged-pdsm-0

- Facilitated PDSM
  https://www.colorado.edu/waterpdsm/facilitated-pdsm

Project Delivery Selection Matrix (PDSM)

Project Profiles

https://www.colorado.edu/waterpdsm/project-profiles

- East Cherry Creek Valley Water & Sanitation District ($28M - CM @ Risk)
- Nelson-Flanders Water Treatment Plant ($41M - D-B)

Resources

Design-Build Institute of America

www.dbia.org

The Municipal Water and Wastewater Design-Build Handbook

Water Design-Build Council

www.waterdesignbuild.com

Project Delivery Selection Matrix (PDSM)

Contacts

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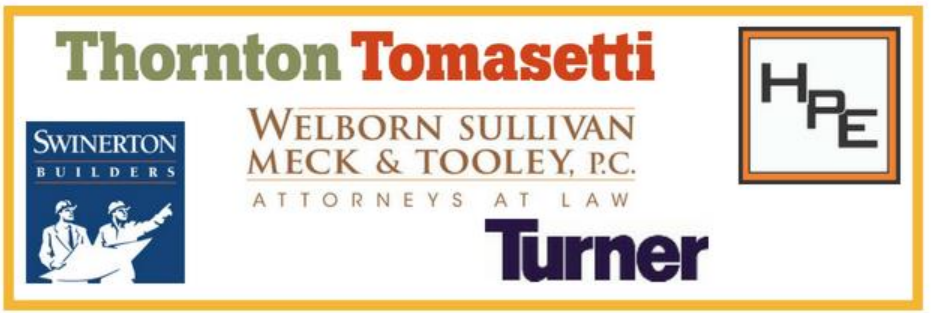

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Q & A