19192 Innovative Workshop Summary Update

24 January 2014

This document summarizes the submitted comments from the Innovative workshop held on October 25, 2013. The received comments are incorporated into the final document or have been added as an addendum to the final documents.

19192 Innovative Workshop Summary

October 25, 2013

Project Description

Project Name:	I-25/Arapahoe Interchange Reconstruction
Location:	Colorado
Estimated Budget:	$74 Million = $6 M Design + $68 M Construction
Estimated Project Delivery Period:	January 2014 - November 2017
Required Delivery Date:	December 2017
Source(s) of Project Funding:	Federal, Local Match; RAMP Public-Public Partnership
Project Corridor:	SH 88 from Greenwood Plaza South to Dayton St.
Major Features of Work:	Interchange Reconstruction and Bridge Replacement
Major Schedule Milestones:	TBD
Major Project Stakeholders:	Arapahoe County, City of Centennial, City of Greenwood Village, Denver South Transportation Management Association, Southeast Public Improvement Metropolitan District (SPIMD), CDOT, FHWA

Major Challenges

- Right of Way Acquisition in an urban corridor
- Major Utility corridor
- Permanent Stormwater Management
- Public By-in
- Construction Traffic Control and Phasing Concerns

Main Identified Sources of Risk

- Design changes resulting in possible Re-evaluation of approved FONSI less than 1 year old
- Jurisdiction issues ~ Walnut Hills Maintenance IGA, WQ maintenance IGA's, varying MS4
- ROW acquisition
- Walnut Hills Sound Walls ~ Design and Maintenance
- Local Agency Issues ~ Project involvement and time commitment requirements & communication
- Third Party (Utility)Delays during Construction
- Maintenance of Traffic/Work Zone Traffic Control

Safety Issues ~ Queuing on the off ramps backing up on to I-25 especially during construction activities .

Sustainable Design and Construction Requirements ~ The project will promote green technologies with a focus on implementing new technologies (if viable) for the construction of the bridge structure as well as reduce, reuse, recycle concepts for the entire project. The main focus is to enhance the environment through less traffic congestion and pollution. The use of ITS technology and the possible use of adaptive signal timing will be pursued from a sustainability perspective. Design and construction specifications will be developed in concert with the project.

19192 Innovative Contracting Workshop Summary

The purpose of this workshop was to learn about the different contracting methods and how they align with the proposed goals. To be able to recommend the most appropriate option, personnel experienced with Design-Build (DB) and Construction Manager/General Contractor (CM/GC) were brought in to assist with the methods evaluation. Matt Pacheco, experienced with DB, and Tamara Maurer, experience with CM/GC, discussed the merits and thought processes associated with their respective delivery methods.

Establishing the Goals

The workshop was broken up into groups to discuss the expectation for the project. After the exercise, the groups reconvened and discussed the goals. The results for the proposed goals and classification are as follows:

- ***Schedule:*** Accelerate delivery of overall project schedule and completed no later than Dec. 2017
- ***Technical Requirements:*** Project will maximize the operational (ITS integration for the corridor), capacity & safety improvements as stated in the FONSI within the identified budget.
- ***Public Interest:*** Minimize impacts to traveling public, stakeholders and environmental resources and maximize safety of workers and traveling public.
- ***Cost:*** Provide a high quality design and construction that maximizes service life, minimizes service cost and optimizes aesthetics.
- ***Team Building***: Facilitate a collaborative partnership with all of the members of the project team and stakeholders

Project Delivery Selection Matrix

Analyzing the factors and their interrelationships will help to determine the best delivery option. The Delivery Matrix is critical in helping to narrow down the delivery method by focusing on the opportunities and obstacles associated with each "factor" of the matrix. The checklist identified the Opportunities and Obstacles for the respective factors.

PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY			
	DBB	**DB**	**CM/GC**
Primary Evaluation Factors			
1. Delivery Schedule	+	+ +	+
2. Project Complexity & Innovation	+	+ +	+ +
3. Level of Design	+	+	+ +
4. Cost	+	+	+ +
5. Perform Initial Risk Assessment	-	+	+ +
Secondary Evaluation Factors			
6. Staff Experience/Availability (Owner)	+ +	+ +	+
7.Level of Oversight and Control	-	+	+ +
8. Competition and Contractor Experience	+	+	+

+ +	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

FACTOR #1: Delivery Schedule ~ The project was selected for RAMP. The deadline for RAMP project is December 2017.

1) Delivery Schedule Checklist

DESIGN-BID-BUILD		RATING
Opportunities	**Obstacles**	
☑ Schedule is more predictable and more manageable ❒ Milestones can be easier to define ❒ Projects can more easily be "shelved" ❒ Shortest procurement period ❒ Elements of design can be advanced prior to permitting, construction, etc. ❒ Time to communicate/discuss design with stakeholders	❒ Requires time to perform a linear design-bid-construction process ❒ Design and construction schedules can be unrealistic due to lack industry input ☑ Errors in design lead to change orders and schedule delays ☑ Low bid selection may lead to potential delays and other adverse outcomes.	+

DESIGN-BUILD		RATING
Opportunities	**Obstacles**	
❒ Potential to accelerate schedule through parallel design-build process ☑ Shifting schedule risk to DB team ☑ Encumbers construction funds more quickly ☑ Industry input into design and schedule ☑ Fewer chances for disputes between agency and design-builders ☑ More efficient procurement of long-lead items ☑ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☑ Allows innovation in resource loading and scheduling by DB team	☑ Request for proposal development and procurement can be intensive ☑ Undefined events or conditions found after procurement, but during design can impact schedule and cost ☑ Time required to define technical requirements and expectations through RFP development can be intensive ❒ Time required to gain acceptance of quality program ☑ Requires agency and stakeholder commitments to an expeditious review of design	+ +

CM/GC		RATING
Opportunities	**Obstacles**	
❒ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☑ More efficient procurement of long-lead items ☑ Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) ☑ Can provide a shorter procurement schedule than DB ☑ Team involvement for schedule optimization ☑ Continuous constructability review and VE ☑ Maintenance of Traffic improves with contractor inputs ☑ Contractor input for phasing, constructability and traffic control may reduce overall schedule	❒ Potential for not reaching GMP and substantially delaying schedule ❒ GMP negotiation can delay the schedule ☑ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to control schedule	+

Notes and Comments:

There isn't an apparent need to accelerate project delivery. All methods will produce the desired outcome in the time frame stipulated. Due to already having a design consultant secured CM/GC would be the better choice if time was a factor. **DB** allows for the **most schedule certainty** as the schedule is established fairly early in the process and does not allow for schedule growth compared to the other delivery methods.

FACTOR #2: Project Complexity & Innovation ~ Project complexity issues arise from coordinating major utility relocations with design, high traffic volumes at the interchange and maintaining satisfactory traffic operations during construction for the interchange as well as I-25.

2) Project Complexity & Innovation Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	
❒ CDOT can have more control of design of complex projects ❒ CDOT& consultant expertise can select innovation independently of contractor abilities ☑ Opportunities for value engineering studies during design, more time for design solutions ☑ Aids in consistency and maintainability ☑ Full control in selection of design expertise ❒ Complex design can be resolved and competitively bid	❒ ❒ Innovations can add cost or time and restrain contractor's benefits ☑ No contractor input to optimize costs ☑ Limited flexibility for integrated design and construction solutions (limited to constructability) ☑ Difficult to assess construction time and cost due to innovation	+

DESIGN-BUILD		RATING
Opportunities	Obstacles	
☑ Designer and contractor collaborate to optimize means and methods and enhance innovation ☑ Opportunity for innovation through draft RFP, best value and ATC processes ☑ Can use best-value procurement to select design-builder with best qualifications ❒ Constructability and VE inherent in process ☑ Early team integration ❒ Sole point of responsibility	❒ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ☑ Qualitative designs are difficult to define (example. aesthetics) ❒ Risk of time or cost constraints on designer inhibiting innovation ☑ Some design solutions might be too innovative or unacceptable ☑ Quality assurance for innovative processes are difficult to define in RFP	+ +

CM/GC		RATING
Opportunities	Obstacles	
☑ Highly innovative process through 3 party collaboration ☑ Allows for owner control of a designer/contractor process for developing innovative solutions ☑ Allows for an independent selection of the best qualified designer and best qualified contractor ☑ VE inherent in process and enhanced constructability ☑ Risk of innovation can be better defined and minimized and allocated ❒ Can take to market for bidding as contingency	❒ Process depends on designer/CM relationship ❒ No contractual relationship between designer/CM ☑ Innovations can add cost or time ☑ Scope additions can be difficult to manage ❒ Preconstruction services fees for contractor involvement ❒ Cost competitiveness – single source negotiated GMP	+ +

Notes and Comments:

Opportunity exists for innovation with design in DB and CM/GC. Complexities may be more easily resolved with a Designer / Contractor relationship that may be missed with DBB.

FACTOR #3: Level of Design ~ Conceptual design plans are roughly at 30%. Modified design plans could be delivered in 4-6 months if required. The current level of design does not preclude any delivery method.

3) Level of Design Checklist

DESIGN-BID-BUILD		
Opportunities	Obstacles	RATING
☑ 100% design by owner ☑ Agency has complete control over the design (can be beneficial when there is one specific solution for a project) ☑ Project/scope can be developed through design ☑ The scope of the project is well defined through complete plans and contract documents ☑ Well-known process to the industry	☑ Owner design errors can result in a higher number of change orders, claims, etc. ☑ Minimizes competitive innovation opportunities ☑ Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete	+

DESIGN-BUILD		
Opportunities	Obstacles	RATING
☑ Design advanced by the owner to level necessary to precisely define the contract requirements and properly allocate risk ☑ Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete) ☑ Contractor involvement in early design, which improves constructability and innovation ☑ Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility	☑ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ❒ If design is too far advanced it will limit the advantages of design-build ☑ Potential for lacking or missing scope definition if RFP not carefully developed ☑ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☑ Less agency control over the design ❒ Can create project less standardized designs across agency as a whole	+

CM/GC		
Opportunities	Obstacles	RATING
☑ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with owner, designer and contractor ☑ Contractor involvement in early design improves constructability ☑ CDOT controls design ☑ Design can be used for DBB if the price is not successfully negotiated. ☑ Design can be responsive to risk minimization	☑ Teaming and communicating concerning design can cause disputes ☑ Three party process can slow progression of design ❒ If design is too far advanced it will limit the advantages of CMGC or could require design backtracking	++

Notes and Comments:

RFP can solicit for modifications to the design that would improve the project technically or reduce construction costs. These factors may be utilized with DB and CM/GC but higher levels of control can be maintained with DBB and CM/GC.

FACTOR #4 Cost ~ Overall project cost will equate to a well-defined technical plan + Life Cycle cost +Maintainability.

4) Cost Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	-
☑ Competitive bidding provides a low cost construction to a fully defined scope of work ☑ Increase certainty about cost estimates ☑ Construction costs are contractually set before construction begins	☑ Cost accuracy is limited until design is completed ☑ Construction costs are not locked in until design is 100% complete. ☑ Cost reductions due to contractor innovation and constructability is difficult to obtain ☑ More potential of cost change orders due to owner design responsibility	

DESIGN-BUILD		RATING
Opportunities	Obstacles	+
☑ Contractor input into design should moderate cost ☑ Design-builder collaboration and ATCs can provide a cost-efficient response to project goals ☑ Costs are contractually set early in design process with design-build proposal ❒ Allows a variable scope bid to match a fixed budget ☑ Potential lower average cost growth ❒ Funding can be obligated in a very short timeframe	☑ Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project.	

CM/GC		RATING
Opportunities	Obstacles	+ +
☑ Owner/designer/contractor collaboration to reduce project risk can result in lowest project costs. ☑ Early contractor involvement can result in cost savings through VE and constructability ☑ Cost will be known earlier when compared to DBB ☑ Integrated design/construction process can provide a cost efficient strategies to project goals ☑ Can provide a cost efficient response to the project goals	❒ Non-competitive negotiated GMP introduces price risk ❒ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process. ❒ Paying for contractors involvement in the design phase may increase total cost	

Notes and Comments:

The defined technical plan as well as long-term, post construction cost of operations and maintenance can be affected by the chosen delivery method. DBB and CM/GC can be tailored to meet the goals of the project whereas DB may be more motivated to decrease the initial cost of the project and bring it down to the agreed upon amount regardless of possible increases in the future operation and maintenance costs of the facility. Also the additional criteria for innovation, maintainability and sustainability requirements will infer a cost increase. A qualified contractor/consultant will provide the “best value” by delivering a product that meets all of the team’s objectives.

5). RISK OPPORTUNITIES/OBSTACLES CHECKLIST (relative to each delivery method)

DESIGN-BID-BUILD		RATING
Opportunities	**Obstacles**	
☑ Risks managed separately through design, bid, build is expected easier ☑ Risk allocation is most widely understood/used ☑ Opportunity to avoid or mitigate risk through complete design ☑ Risks related to environmental, railroads, and third party involvement are best resolved prior to procurement ❒ Utilities and ROW best allocated to CDOT and mostly addressed prior to procurement to minimize potential for claim ❒ Project can be shelved while resolving risks	☑ Owner accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns ☑ Low-bid related risks ☑ Potential for misplaced risk through prescriptive specifications ☑ Innovative risk allocation is difficult to obtain ☑ Limited industry input in contract risk allocation ☑ Change order risks can be greater ☑ Contractor may avoid risks	+

DESIGN-BUILD		RATING
Opportunities	**Obstacles**	
☑ Performance specifications can allow for alternative risk allocations to the design builder ☑ Risk-reward structure can be better defined ☑ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☑ Opportunity for industry review of risk allocation (draft RFP, ATC processes) ☑ Avoid low-bid risk in procurement ☑ Contractor will help identify risks related to environmental, railroads, ROW, and utilities ☑ Designers and contractors can work toward innovative solutions to, or avoidance of, unknowns	☑ Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders) ☑ Limited time to resolve risks ☑ Additional risks allocated to designers for errors and omissions, claims for change orders ☑ Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract ☑ Risks associated with agreements when design is not completed ☑ Poorly defined risks are expensive ☑ Contractor may avoid risks or drive consultant to decrease cost at risk to quality	+

CM/GC		RATING
Opportunities	**Obstacles**	
☑ Contractor can have a better understanding of the unknown conditions as design progresses ☑ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☑ Opportunities to manage costs risks through CM/GC involvement ☑ Contractor will help identify and manage risk ☑ Agency still has considerable involvement with third parties to deal with risks ☑ Avoids low-bid risk in procurement ☑ More flexibility and innovation available to deal with unknowns early in design process	❒ Lack of motivation to manage small quantity costs ☑ Increase costs for non-proposal items ☑ Disagreement among Designer-Contractor-Owner can put the process at risk ☑ If GMP cannot be reached, additional low-bid risks appear ❒ Limited to risk capabilities of CM/GC ☑ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to negotiate/optimize risks ❒ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction	+ +

Notes and Comments:

DB and CM/GC offer the best opportunities to help mitigate risk concerns by securing a designer/contractor team to assess the problem at the design phase. Please refer to the project risk checklist for a comprehensive list of potential risks. CM/GC provides the least "Obstacle" pitfall compared to DB and DBB.

5B. GENERAL PROJECT RISK CHECKLIST (items to consider when assessing risk)

Environmental Risks	External Risks
☑ Delay in review of environmental documentation ☑ Challenge in appropriate environmental documentation ☑ Defined and non-defined hazardous waste ☑ Environmental regulation changes ❒ Environmental impact statement (EIS) required ❒ NEPA/ 404 Merger Process required ☑ Environmental analysis on new alignments required	☑ Stakeholders request late changes ☑ Influential stakeholders request additional needs to serve their own commercial purposes ☑ Local communities pose objections ☑ Community relations ☑ Conformance with regulations/guidelines/ design criteria ☑ Intergovernmental agreements and jurisdiction
Third-Party Risks	Geotechnical and Hazmat Risks
☑ Unforeseen delays due to utility owner and third-party ☑ Encounter unexpected utilities during construction ☑ Cost sharing with utilities not as planned ☑ Utility integration with project not as planned ☑ Third-party delays during construction ❒ Coordination with other projects ☑ Coordination with other government agencies	☑ Unexpected geotechnical issues ❒ Surveys late and/or in error ☑ Hazardous waste site analysis incomplete or in error ☑ Inadequate geotechnical investigations ☑ Adverse groundwater conditions ☑ Other general geotechnical risks
Right-of-Way/ Real Estate Risks	Design Risks
❒ Railroad involvement ☑ Objections to ROW appraisal take more time and/or money ❒ Excessive relocation or demolition ☑ Acquisition ROW problems ☑ Difficult or additional condemnation ☑ Accelerating pace of development in project corridor ☑ Additional ROW purchase due to alignment change	❒ Design is incomplete/ Design exceptions ☑ Scope definition is poor or incomplete ☑ Project purpose and need are poorly defined ☑ Communication breakdown with project team ❒ Pressure to delivery project on an accelerated schedule ☑ Constructability of design issues ☑ Project complexity (scope, schedule, objectives, cost, and deliverables are not clearly understood)
Organizational Risks	Construction Risks
☑ Inexperienced staff assigned ☑ Losing critical staff at crucial point of the project ☑ Functional units not available or overloaded ☑ No control over staff priorities ☑ Lack of coordination/ communication ☑ Local agency issues ☑ Internal red tape causes delay getting approvals, decisions ☑ Too many projects/ new priority project inserted into program	❒ Pressure to delivery project on an accelerated schedule. ☑ Inaccurate contract time estimates ☑ Construction QC/QA issues ☑ Unclear contract documents ☑ Problem with construction sequencing/ staging/ phasing ☑ Maintenance of Traffic/ Work Zone Traffic Control

FACTOR #5 Staff Experience ~ CDOT can provide counsel and experienced staffing for any method that is chosen.

6) Staff Experience/Availability Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	
☑ Agency, contractors and consultants have high level of experience with the traditional system ☑ Designers can be more interchangeable between projects	❒ Can require a high level of agency staffing of technical resources ❒ Staff's responsibilities are spread out over a longer design period ❒ Can require staff to have full breadth of technical expertise	+ +

DESIGN-BUILD		RATING
Opportunities	Obstacles	
☑ Less agency staff required due to the sole source nature of DB ❒ Opportunity to grow agency staff by learning a new process	❒ Limitation of availability of staff with skills, knowledge and personality to manage DB projects ☑ Existing staff may need additional training to address their changing roles ❒ Need to "mass" agency management and technical resources at critical points in process (i.e., RFP development, design reviews, etc.)	+ +

CM/GC		RATING
Opportunities	Obstacles	
❒ Agency can improve efficiencies by having more project managers on staff rather than specialized experts ☑ Smaller number of technical staff required through use of consultant designer	❒ Strong committed owner project management is important to success ☑ Limitation of availability of staff with skills, knowledge and personality to manage CMGC projects ☑ Existing staff may need additional training to address their changing roles ❒ Agency must learn how to negotiate GMP projects	+

Notes and Comments:

There is an innovative contracting unit that can provide guidance for the DB delivery methods. CM/GC is still relatively new to CDOT but assistance is available. CDOT has experienced practitioners in CM/GC and dedicated team members who have the time and capacity to be dedicated to the project.

7) Level of Oversight and Control Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	-
☑ Full owner control over a linear design and construction process ☑ Oversight roles are well understood ☑ Contract documents are typically completed in a single package before construction begins ☑ Multiple checking points through three linear phases: design-bid-build ☑ Maximum control over design	☑ Requires a high-level of oversight ☑ Increased likelihood of claims due to owner design responsibility ☑ Limited control over an integrated design/construction process	

DESIGN-BUILD		RATING
Opportunities	Obstacles	+
☑ A single entity responsibility during project design and construction ☑ Continuous execution of design and build ☑ Getting input from construction to enhance constructability and innovation ☑ Overall project planning and scheduling is established by one entity	☑ Can require high level of design oversight ❒ Can require high level of quality assurance oversight ❒ Limitation on staff with DB oversight experience ☑ Less owner control over design ☑ Control over design relies on proper development of technical requirements	

CM/GC		RATING
Opportunities	Obstacles	+ +
☑ Preconstruction services are provided by the construction manager ☑ Getting input from construction to enhance constructability and innovation ☑ Provides owner control over an integrated design/construction process	❒ Agency must have experienced staff to oversee the CM/GC ☑ Higher level of cost oversight required	

Notes and Comments:

DB requires prescriptive technical specifications and once awarded the agency loses control over the details of the final design. DB requires a quality management plan for design and construction activities. The Owner generally provides Assurance checks during the design and construction phasing. CM/GC allows the Owner to retain its role as the QC/QA for design and construction activities.

8) **Competition and Contractor Experience**

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	
☑ Promotes high level of competition in the marketplace ☑ Opens construction to all reasonably qualified bidders ☑ Transparency and fairness ☑ Reduced chance of corruption and collusion ☑ Contractors are familiar with DBB process	❒ Risks associated with selecting the low bid (the best contractor is not necessary selected) ☑ No contractor input into the process ☑ Limited ability to select contractor based on qualifications	+

DESIGN-BUILD		RATING
Opportunities	Obstacles	
☑ Allows for a balance of qualifications and cost in design-builder procurement ☑ Two-phase process can promote strong teaming to obtain "Best Value" ☑ Increased opportunity for innovation possibilities due to the diverse project team	☑ Need for DB qualifications can limit competition ☑ Lack of competition with past experience with the project delivery method ☑ Reliant on DB team selected for the project ☑ The gap between owner experience and contractor experience with delivery method can create conflict	+

CM/GC		RATING
Opportunities	Obstacles	
☑ Allows for qualifications based contractor procurement ☑ Agency has control over an independent selection of best qualified designer and contractor ☑ Contractor is part of the project team early on, creating a project "team" ☑ Increased opportunity for innovation due to the diversity of the project team	☑ Currently there is not a large pool of contractors with experience in CMGC, which will reduce the competition and availability ☑ Working with only one contractor to develop GMP can limit price competition ☑ Requires a strong project manager from the agency ☑ Teamwork and communication among the project team	+

Notes and Comments:

As part of the selection phase for both DB and CM/GC a competitive qualifications selection option may be included in the RFP. Also due to the size of the project many contractors will be eliminated from the procurement phase due to bonding issues and possibly the large number of RAMP projects released may affect the selection pool.

The Recommendation

It is recommended by CDOT that "The Coalition" move forward with CM/GC as the preferred Project Delivery Method.

CM/GC provides the best balance for this project. It will provide the opportunity for innovation while allowing the project team to maintain control of the project. The checklist of opportunities and obstacles reveal pertinent issues that could negatively impact the project if control isn't maintained during the course of the work.

CM/GC promotes collaboration between the Owners, Designers, and Contractors and will allow the Owners the control to review the design pertaining to aesthetics, service life and the technical requirements as the plans are developed. This collaboration will lead to efficiencies in design and construction resulting in a quality project. CM/GC is the embodiment of all the goals established during the workshop.

Project # STU 0252-429/19192
Innovative Design Workshop
I-25/Arapahoe Interchange Reconstruction

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Submitted Comments

STATE OF COLORADO

[redacted]

Re: Please Review--19192 Innovation Workshop Summary

Jeremy Hanak <jhanak@greenwoodvillage.com> Mon, Nov 18, 2013 at 10:49 AM

[redacted]

Telecia,

Thank you for all of your work on the project to date. The workshop on innovative delivery methods was a great learning experience and the knowledge CDOT was able to pass on is greatly appreciated.

Greenwood Village staff agrees with the overall summary and feels CM/GC will allow the project to proceed at a pace suitable for the complexity of the project, while allowing for continued innovation during design. Our specific comments are below.

- Should the estimated budget read $6 Million for design and $68 Million for ROW and Construction?
- The limits should be from Greenwood Plaza Blvd/Uinta Street to the end of the current Arapahoe Road/Dayton Street project.
- Greenwood Village will not support a design change that results in a re-evaluation of the FONSI. While we are open to design modifications in support of the recommended action alternative, a significant design change would have to demonstrate substantial improvements in operations and safety as well as cost for Greenwood Village to consider support.
- Please identify the difference in jurisdictional issues and local agency issues, as well as provide clarification on the issues. We agree that there may be local agency issues, but we feel that they need to be identified so that the project team will be able work through those issues from the beginning of the project.

Please feel free to contact John or I with any questions or additional comments you may have.

Thanks,

Jeremy Hanak, P.E., PTOE

[redacted]

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Project Delivery Selection Matrix Summary

Determine the factors that should be considered in the project delivery selection, discuss the opportunities and obstacles related to each factor, and document the discussion on the following pages. Then complete the summary below.

PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY			
	DBB	DB	CM/GC
Primary Evaluation Factors			
1. Delivery Schedule	–	+	+
2. Project Complexity & Innovation	–	+ +	–
3. Level of Design	–	+ +	+
4. Cost	–	+	+
5. Perform Initial Risk Assessment	–	+ +	+
Secondary Evaluation Factors			
6. Staff Experience/Availability (Owner)	+	+	–
7.Level of Oversight and Control	–	+	+
8. Competition and Contractor Experience	–	+	+ +
Total	-6	11	5

+ +	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

1) Delivery Schedule Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Schedule is more predictable and more manageable	☐ Requires time to perform a linear design-bid-construction process
☐ Milestones can be easier to define	☒ Design and construction schedules can be unrealistic due to lack industry input
☐ Projects can more easily be "shelved"	☒ Errors in design lead to change orders and schedule delays
☐ Shortest procurement period	☐ Low bid selection may lead to potential delays and other adverse outcomes.
☐ Elements of design can be advanced prior to permitting, construction, etc.	
☒ Time to communicate/discuss design with stakeholders	

DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Potential to accelerate schedule through parallel design-build process	☐ Request for proposal development and procurement can be intensive
☒ Shifting schedule risk to DB team	☒ Undefined events or conditions found after procurement, but during design can impact schedule and cost
☐ Encumbers construction funds more quickly	☐ Time required to define technical requirements and expectations through RFP development can be intensive
☒ Industry input into design and schedule	☐ Time required to gain acceptance of quality program
☐ Fewer chances for disputes between agency and design-builders	☐ Requires agency and stakeholder commitments to an expeditious review of design
☐ More efficient procurement of long-lead items	
☐ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design)	
☒ Allows innovation in resource loading and scheduling by DB team	

CM/GC	
Opportunities	**Obstacles**
☐ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design)	☒ Potential for not reaching GMP and substantially delaying schedule
☐ More efficient procurement of long-lead items	☐ GMP negotiation can delay the schedule
☒ Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork)	☐ Designer-contractor-agency disagreements can add delays
☐ Can provide a shorter procurement schedule than DB	☐ Strong agency management is required to control schedule
☒ Team involvement for schedule optimization	
☒ Continuous constructability review and VE	
☐ Maintenance of Traffic improves with contractor inputs	
☐ Contractor input for phasing, constructability and traffic control may reduce overall schedule	

2) Project Complexity & Innovation Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ CDOT can have more control of design of complex projects	☐
☒ CDOT& consultant expertise can select innovation independently of contractor abilities	☐ Innovations can add cost or time and restrain contractor's benefits
☒ Opportunities for value engineering studies during design, more time for design solutions	☒ No contractor input to optimize costs
☐ Aids in consistency and maintainability	☒ Limited flexibility for integrated design and construction solutions (limited to constructability)
☐ Full control in selection of design expertise	☒ Difficult to assess construction time and cost due to innovation
☐ Complex design can be resolved and competitively bid	

DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Designer and contractor collaborate to optimize means and methods and enhance innovation	☐ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do)
☒ Opportunity for innovation through draft RFP, best value and ATC processes	☐ Qualitative designs are difficult to define (example. aesthetics)
☒ Can use best-value procurement to select design-builder with best qualifications	☒ Risk of time or cost constraints on designer inhibiting innovation
☒ Constructability and VE inherent in process	☒ Some design solutions might be too innovative or unacceptable
☐ Early team integration	☐ Quality assurance for innovative processes are difficult to define in RFP
☐ Sole point of responsibility	

CM/GC	
Opportunities	**Obstacles**
☒ Highly innovative process through 3 party collaboration	☒ Process depends on designer/CM relationship
☐ Allows for owner control of a designer/contractor process for developing innovative solutions	☒ No contractual relationship between designer/CM
☒ Allows for an independent selection of the best qualified designer and best qualified contractor	☐ Innovations can add cost or time
☒ VE inherent in process and enhanced constructability	☒ Scope additions can be difficult to manage
☐ Risk of innovation can be better defined and minimized and allocated	☒ Preconstruction services fees for contractor involvement
☒ Can take to market for bidding as contingency	☒ Cost competitiveness -- single source negotiated GMP

3) Level of Design Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ 100% design by owner ☐ Agency has complete control over the design (can be beneficial when there is one specific solution for a project) ☐ Project/scope can be developed through design ☐ The scope of the project is well defined through complete plans and contract documents ☐ Well-known process to the industry	☐ Owner design errors can result in a higher number of change orders, claims, etc. ☐ Minimizes competitive innovation opportunities ☐ Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete

DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Design advanced by the owner to level necessary to precisely define the contract requirements and properly allocate risk ☐ Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete) ☐ Contractor involvement in early design, which improves constructability and innovation ☐ Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility	☐ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ☐ If design is too far advanced it will limit the advantages of design-build ☐ Potential for lacking or missing scope definition if RFP not carefully developed ☐ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☐ Less agency control over the design ☐ Can create project less standardized designs across agency as a whole

CM/GC	
Opportunities	**Obstacles**
☐ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with owner, designer and contractor ☐ Contractor involvement in early design improves constructability ☐ CDOT controls design ☐ Design can be used for DBB if the price is not successfully negotiated. ☐ Design can be responsive to risk minimization	☐ Teaming and communicating concerning design can cause disputes ☐ Three party process can slow progression of design ☐ If design is too far advanced it will limit the advantages of CMGC or could require design backtracking

4) Cost Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Competitive bidding provides a low cost construction to a fully defined scope of work	☐ Cost accuracy is limited until design is completed
☒ Increase certainty about cost estimates	☐ Construction costs are not locked in until design is 100% complete.
☐ Construction costs are contractually set before construction begins	☒ Cost reductions due to contractor innovation and constructability is difficult to obtain
	☒ More potential of cost change orders due to owner design responsibility

DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Contractor input into design should moderate cost	☒ Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project.
☒ Design-builder collaboration and ATCs can provide a cost-efficient response to project goals	
☐ Costs are contractually set early in design process with design-build proposal	
☐ Allows a variable scope bid to match a fixed budget	
☐ Potential lower average cost growth	
☐ Funding can be obligated in a very short timeframe	

CM/GC	
Opportunities	**Obstacles**
☒ Owner/designer/contractor collaboration to reduce project risk can result in lowest project costs.	☒ Non-competitive negotiated GMP introduces price risk
☒ Early contractor involvement can result in cost savings through VE and constructability	☒ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process.
☐ Cost will be known earlier when compared to DBB	☐ Paying for contractors involvement in the design phase may increase total cost
☐ Integrated design/construction process can provide a cost efficient strategies to project goals	
☒ Can provide a cost efficient response to the project goals	

5) Initial Risk Assessment

Three sets of risk assessment checklists are provided to assist in an initial risk assessment relative to the selection of the delivery method:

A. **Typical CDOT Transportation Project Risks**
B. **General Project Risks Checklist**
C. **Opportunities/Obstacles Checklist (relative to each delivery method)**

It is important to recognize that the initial risk assessment is to only ensure the selected delivery method can properly address the project risks. A more detailed level of risk assessment should be performed concurrently with the development of the procurement documents to ensure that project risks are properly allocated, managed, and minimized through the procurement and implementation of the project.

A. TYPICAL CDOT TRANSPORTATION PROJECT RISKS

Following is a list of project risks that are frequently encountered on CDOT transportation projects and a discussion on how the risks are resolved through the different delivery methods.

A.1: Site Conditions and Investigations How unknown site conditions are resolved. For additional information on site conditions, refer to 23 CFR 635.109(a) at the following link: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=91468e48c87a547c3497a5c19d640172&rgn=div5&view=text&node=23:1.0.1.7.23&idno=23#23:1.0.1.7.23.1.1.9)

DESIGN-BID-BUILD

Site condition risks are generally best identified and mitigated during the design process prior to procurement to minimize the potential for change orders and claims when the schedule allows.

DESIGN-BUILD

Certain site condition responsibilities can be allocated to the design-builder provided they are well defined and associated third party approval processes are well defined. Caution should be used as unreasonable allocation of site condition risk will result in high contingencies during bidding. CDOT should perform site investigations in advance of procurement to define conditions and avoid duplication of effort by proposers. At a minimum CDOT should perform the following investigations:

1) Basic design surveys
2) Hazardous materials investigations to characterize the nature of soil and groundwater contamination
3) Geotechnical baseline report to allow design-builders to perform proposal design without extensive additional geotechnical investigations

CM/GC

CDOT, the designer, and the contractor can collectively assess site condition risks, identify the need to perform site investigations in order to reduce risks, and properly allocate risk prior to GMP.

A.2: Utilities

DESIGN-BID-BUILD

Utility risks are best allocated to CDOT, and mostly addressed prior to procurement to minimize potential for claims when the schedule allows.

B. GENERAL PROJECT RISK CHECKLIST (items to consider when assessing risk)

Environmental Risks

- ☐ Delay in review of environmental documentation
- ☐ Challenge in appropriate environmental documentation
- ☐ Defined and non-defined hazardous waste
- ☐ Environmental regulation changes
- ☐ Environmental impact statement (EIS) required
- ☐ NEPA/ 404 Merger Process required
- ☒ Environmental analysis on new alignments required

External Risks

- ☐ Stakeholders request late changes
- ☒ Influential stakeholders request additional needs to serve their own commercial purposes
- ☐ Local communities pose objections
- ☒ Community relations
- ☐ Conformance with regulations/guidelines/ design criteria
- ☒ Intergovernmental agreements and jurisdiction

Third-Party Risks

- ☒ Unforeseen delays due to utility owner and third-party
- ☒ Encounter unexpected utilities during construction
- ☐ Cost sharing with utilities not as planned
- ☐ Utility integration with project not as planned
- ☐ Third-party delays during construction
- ☐ Coordination with other projects
- ☒ Coordination with other government agencies

Geotechnical and Hazmat Risks

- ☐ Unexpected geotechnical issues
- ☐ Surveys late and/or in error
- ☐ Hazardous waste site analysis incomplete or in error
- ☐ Inadequate geotechnical investigations
- ☐ Adverse groundwater conditions
- ☐ Other general geotechnical risks

Right-of-Way/ Real Estate Risks

- ☐ Railroad involvement
- ☐ Objections to ROW appraisal take more time and/or money
- ☐ Excessive relocation or demolition
- ☒ Acquisition ROW problems
- ☐ Difficult or additional condemnation
- ☐ Accelerating pace of development in project corridor
- ☒ Additional ROW purchase due to alignment change

Design Risks

- ☐ Design is incomplete/ Design exceptions
- ☐ Scope definition is poor or incomplete
- ☒ Project purpose and need are poorly defined
- ☐ Communication breakdown with project team
- ☐ Pressure to delivery project on an accelerated schedule
- ☒ Constructability of design issues
- ☒ Project complexity (scope, schedule, objectives, cost, and deliverables are not clearly understood)

Organizational Risks

- ☐ Inexperienced staff assigned
- ☒ Losing critical staff at crucial point of the project
- ☐ Functional units not available or overloaded
- ☒ No control over staff priorities
- ☐ Lack of coordination/ communication
- ☒ Local agency issues
- ☐ Internal red tape causes delay getting approvals, decisions
- ☐ Too many projects/ new priority project inserted into program

Construction Risks

- ☐ Pressure to delivery project on an accelerated schedule.
- ☒ Inaccurate contract time estimates
- ☐ Construction QC/QA issues
- ☐ Unclear contract documents
- ☒ Problem with construction sequencing/ staging/ phasing
- ☒ Maintenance of Traffic/ Work Zone Traffic Control

C. RISK OPPORTUNITIES/OBSTACLES CHECKLIST (relative to each delivery method)

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Risks managed separately through design, bid, build is expected easier	☒ Owner accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns
☒ Risk allocation is most widely understood/used	☐ Low-bid related risks
☐ Opportunity to avoid or mitigate risk through complete design	☐ Potential for misplaced risk through prescriptive specifications
☐ Risks related to environmental, railroads, and third party involvement are best resolved prior to procurement	☐ Innovative risk allocation is difficult to obtain
☒ Utilities and ROW best allocated to CDOT and mostly addressed prior to procurement to minimize potential for claim	☒ Limited industry input in contract risk allocation
☐ Project can be shelved while resolving risks	☒ Change order risks can be greater
	☒ Contractor may avoid risks

DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Performance specifications can allow for alternative risk allocations to the design builder	☐ Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders)
☐ Risk-reward structure can be better defined	☐ Limited time to resolve risks
☒ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing)	☒ Additional risks allocated to designers for errors and omissions, claims for change orders
☒ Opportunity for industry review of risk allocation (draft RFP, ATC processes)	☐ Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract
☐ Avoid low-bid risk in procurement	☐ Risks associated with agreements when design is not completed
☒ Contractor will help identify risks related to environmental, railroads, ROW, and utilities	☒ Poorly defined risks are expensive
☒ Designers and contractors can work toward innovative solutions to, or avoidance of, unknowns	☒ Contractor may avoid risks or drive consultant to decrease cost at risk to quality

CM/GC	
Opportunities	**Obstacles**
☒ Contractor can have a better understanding of the unknown conditions as design progresses	☐ Lack of motivation to manage small quantity costs
☒ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing)	☐ Increase costs for non-proposal items
☒ Opportunities to manage costs risks through CM/GC involvement	☒ Disagreement among Designer-Contractor-Owner can put the process at risk
☒ Contractor will help identify and manage risk	☒ If GMP cannot be reached, additional low-bid risks appear
☐ Agency still has considerable involvement with third parties to deal with risks	☐ Limited to risk capabilities of CM/GC
☐ Avoids low-bid risk in procurement	☒ Designer-contractor-agency disagreements can add delays
☒ More flexibility and innovation available to deal with unknowns early in design process	☐ Strong agency management is required to negotiate/optimize risks
	☒ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction

6) Staff Experience/Availability Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☑ Agency, contractors and consultants have high level of experience with the traditional system	☑ Can require a high level of agency staffing of technical resources
☑ Designers can be more interchangeable between projects	☐ Staff's responsibilities are spread out over a longer design period
	☑ Can require staff to have full breadth of technical expertise

DESIGN-BUILD	
Opportunities	**Obstacles**
☑ Less agency staff required due to the sole source nature of DB	☑ Limitation of availability of staff with skills, knowledge and personality to manage DB projects
☐ Opportunity to grow agency staff by learning a new process	☑ Existing staff may need additional training to address their changing roles
	☐ Need to "mass" agency management and technical resources at critical points in process (i.e., RFP development, design reviews, etc.)

CM/GC	
Opportunities	**Obstacles**
☐ Agency can improve efficiencies by having more project managers on staff rather than specialized experts	☐ Strong committed owner project management is important to success
☑ Smaller number of technical staff required through use of consultant designer	☑ Limitation of availability of staff with skills, knowledge and personality to manage CMGC projects
	☑ Existing staff may need additional training to address their changing roles
	☑ Agency must learn how to negotiate GMP projects

7) Level of Oversight and Control Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Full owner control over a linear design and construction process	☐ Requires a high-level of oversight
☐ Oversight roles are well understood	☒ Increased likelihood of claims due to owner design responsibility
☐ Contract documents are typically completed in a single package before construction begins	☐ Limited control over an integrated design/construction process
☒ Multiple checking points through three linear phases: design-bid-build	
☐ Maximum control over design	

DESIGN-BUILD	
Opportunities	**Obstacles**
☐ A single entity responsibility during project design and construction	☐ Can require high level of design oversight
☐ Continuous execution of design and build	☐ Can require high level of quality assurance oversight
☒ Getting input from construction to enhance constructability and innovation	☒ Limitation on staff with DB oversight experience
☐ Overall project planning and scheduling is established by one entity	☐ Less owner control over design
	☐ Control over design relies on proper development of technical requirements

CM/GC	
Opportunities	**Obstacles**
☐ Preconstruction services are provided by the construction manager	☒ Agency must have experienced staff to oversee the CM/GC
☒ Getting input from construction to enhance constructability and innovation	☐ Higher level of cost oversight required
☐ Provides owner control over an integrated design/construction process	

8) Competition and Contractor Experience

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☒ Promotes high level of competition in the marketplace	☒ Risks associated with selecting the low bid (the best contractor is not necessary selected)
☐ Opens construction to all reasonably qualified bidders	☒ No contractor input into the process
☐ Transparency and fairness	☒ Limited ability to select contractor based on qualifications
☐ Reduced chance of corruption and collusion	
☒ Contractors are familiar with DBB process	

DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Allows for a balance of qualifications and cost in design-builder procurement	☐ Need for DB qualifications can limit competition
☒ Two-phase process can promote strong teaming to obtain "Best Value"	☒ Lack of competition with past experience with the project delivery method
☒ Increased opportunity for innovation possibilities due to the diverse project team	☐ Reliant on DB team selected for the project
	☒ The gap between owner experience and contractor experience with delivery method can create conflict

CM/GC	
Opportunities	**Obstacles**
☒ Allows for qualifications based contractor procurement	☒ Currently there is not a large pool of contractors with experience in CMGC, which will reduce the competition and availability
☐ Agency has control over an independent selection of best qualified designer and contractor	☒ Working with only one contractor to develop GMP can limit price competition
☒ Contractor is part of the project team early on, creating a project "team"	☐ Requires a strong project manager from the agency
☒ Increased opportunity for innovation due to the diversity of the project team	☐ Teamwork and communication among the project team

19192 Innovative Workshop Summary

October 25, 2013

Project Description

Project Name:	I-25/Arapahoe Interchange Reconstruction
Location:	Colorado
Estimated Budget:	$6 Million for Design; $74 Million for the Construction Contract
Estimated Project Delivery Period:	January 2014-November 2017
Required Delivery Date:	December 2017
Source(s) of Project Funding:	Federal, Local Match; RAMP Public Public Partnership
Project Corridor:	SH 88 from S. Uinta St. to Boston/Clinton
Major Features of Work:	Interchange Reconstruction and Bridge Replacement
Major Schedule Milestones:	TBD
Major Project Stakeholders:	Arapahoe County, City of Centennial, City of Greenwood Village, Southeast Business Partnership, CDOT, FHWA

Major Challenges

- Right of Way Acquisition in an urban corridor
- Major Utility corridor
- Permanent Stormwater Management
- Public By-in
- Construction Traffic and Phasing Concerns

Main Identified Sources of Risk

- Design changes resulting in possible Re-evaluation of approved FONSI less than 1 year old
- Intergovernmental agreements and jurisdictional issues
- ROW acquisition
- Local Agency Issues
- Third Party (Utility)Delays during Construction
- Maintenance of Traffic/Work Zone Traffic Control

Safety Issues ~ Queuing on the southbound off ramps backing upon to I-25

Sustainable Design and Construction Requirements ~ The project will promote green technologies with a focus on implementing new technologies (if viable) for the construction of the bridge structure as well as reduce, reuse, recycle concepts for the entire project. The main focus is to enhance the environment through less traffic congestion and pollution. Design and construction specifications will be developed in concert with the project.

19192 Innovative Contracting Workshop Summary

The purpose of this workshop was to learn about the different contracting methods and how they align with the proposed goals. To be able to recommend the most appropriate option, personnel experienced with Design-Build (DB) and Construction Manager/General Contractor (CM/GC) were brought in to assist with the methods evaluation. Matt Pacheco, experienced with DB, and Tamara Maurer, experience with CM/GC, discussed the merits and thought processes associated with their respective delivery methods.

Establishing the Goals

The workshop was broken up into groups to discuss the expectation for the project. After the exercise, the groups reconvened and discussed the goals. The results for the proposed goals and classification are as follows:

- ***Schedule:*** Accelerate delivery of overall project schedule and complete by Dec. 2017
- ***Technical Requirements:*** Project will maximize the operational (ITS integration for the corridor), capacity & safety improvements as stated in the FONSI within the identified budget.
- ***Public Interest:*** Minimize impacts to traveling public, stakeholders and environmental resources and maximize safety of workers and traveling public.
- ***Cost:*** Provide a high quality design and construction that maximizes service life, minimizes service cost and optimizes aesthetics.
- ***Team Building***: Facilitate a collaborative partnership with all of the members of the project team and stakeholders

Project Delivery Selection Matrix

Analyzing the factors and their interrelationships will help to determine the best delivery option. The Delivery Matrix is critical in helping to narrow down the delivery method by focusing on the opportunities and obstacles associated with each "factor" of the matrix. The checklist identified the Opportunities and Obstacles for the respective factors.

PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY			
	DBB	**DB**	**CM/GC**
Primary Evaluation Factors			
1. Delivery Schedule	+	+ +	+
2. Project Complexity & Innovation	+	+ +	+ +
3. Level of Design	+	+	+ +
4. Cost	-	+	+ +
5. Perform Initial Risk Assessment	-	+	+ +
Secondary Evaluation Factors			
6. Staff Experience/Availability (Owner)	+ +	+ +	+
7.Level of Oversight and Control	-	+	+ +
8. Competition and Contractor Experience	+	+	+ +

+ +	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

FACTOR #1: Delivery Schedule ~ The project was selected for RAMP. The deadline for RAMP project is December 2017.

1) Delivery Schedule Checklist

DESIGN-BID-BUILD		RATING
Opportunities	**Obstacles**	
☑ Schedule is more predictable and more manageable ❒ Milestones can be easier to define ❒ Projects can more easily be "shelved" ❒ Shortest procurement period ❒ Elements of design can be advanced prior to permitting, construction, etc. ❒ Time to communicate/discuss design with stakeholders	❒ Requires time to perform a linear design-bid-construction process ❒ Design and construction schedules can be unrealistic due to lack industry input ☑ Errors in design lead to change orders and schedule delays Low bid selection may lead to potential delays and other adverse outcomes.	+

DESIGN-BUILD		RATING
Opportunities	**Obstacles**	
❒ Potential to accelerate schedule through parallel design-build process ☑ Shifting schedule risk to DB team ☑ Encumbers construction funds more quickly ☑ Industry input into design and schedule ☑ Fewer chances for disputes between agency and design-builders ☑ More efficient procurement of long-lead items ☑ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☑ Allows innovation in resource loading and scheduling by DB team	Request for proposal development and procurement can be intensive ☑ Undefined events or conditions found after procurement, but during design can impact schedule and cost ☑ Time required to define technical requirements and expectations through RFP development can be intensive ❒ Time required to gain acceptance of quality program ☑ Requires agency and stakeholder commitments to an expeditious review of design	+ +

CM/GC		RATING
Opportunities	**Obstacles**	
❒ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☑ More efficient procurement of long-lead items ☑ Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) ☑ Can provide a shorter procurement schedule than DB ☑ Team involvement for schedule optimization ☑ Continuous constructability review and VE ☑ Maintenance of Traffic improves with contractor inputs ☑ Contractor input for phasing, constructability and traffic control may reduce overall schedule	❒ Potential for not reaching GMP and substantially delaying schedule ❒ GMP negotiation can delay the schedule ☑ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to control schedule	+

Notes and Comments:

There isn't an apparent need to accelerate project delivery. All methods will produce the desired outcome in the time frame stipulated. Due to already having a consultant secured CM/GC would be the better choice if time was a factor. **DB** allows for the **most schedule certainty** as the schedule is established fairly early in the process and does not allow for schedule growth compared to the other delivery methods.

FACTOR #2: Project Complexity & Innovation ~ Project complexity issues arise from coordinating major utility relocations with design, high traffic volumes at the interchange and maintaining satisfactory traffic operations during construction for the interchange as well as I-25.

2) Project Complexity & Innovation Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	+
❒ CDOT can have more control of design of complex projects ❒ CDOT& consultant expertise can select innovation independently of contractor abilities ☑ Opportunities for value engineering studies during design, more time for design solutions ☑ Aids in consistency and maintainability ☑ Full control in selection of design expertise ❒ Complex design can be resolved and competitively bid	❒ ❒ Innovations can add cost or time and restrain contractor's benefits ☑ No contractor input to optimize costs ☑ Limited flexibility for integrated design and construction solutions (limited to constructability) ☑ Difficult to assess construction time and cost due to innovation	

DESIGN-BUILD		RATING
Opportunities	Obstacles	+ +
☑ Designer and contractor collaborate to optimize means and methods and enhance innovation ☑ Opportunity for innovation through draft RFP, best value and ATC processes ☑ Can use best-value procurement to select design-builder with best qualifications ❒ Constructability and VE inherent in process ☑ Early team integration ❒ Sole point of responsibility	❒ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) Qualitative designs are difficult to define (example. aesthetics) ❒ Risk of time or cost constraints on designer inhibiting innovation ☑ Some design solutions might be too innovative or unacceptable ☑ Quality assurance for innovative processes are difficult to define in RFP	

CM/GC		RATING
Opportunities	Obstacles	+ +
☑ Highly innovative process through 3 party collaboration ☑ Allows for owner control of a designer/contractor process for developing innovative solutions ☑ Allows for an independent selection of the best qualified designer and best qualified contractor ☑ VE inherent in process and enhanced constructability ☑ Risk of innovation can be better defined and minimized and allocated ❒ Can take to market for bidding as contingency	❒ Process depends on designer/CM relationship ❒ No contractual relationship between designer/CM ☑ Innovations can add cost or time ☑ Scope additions can be difficult to manage ❒ Preconstruction services fees for contractor involvement ❒ Cost competitiveness – single source negotiated GMP	

Notes and Comments:

Opportunity exists for innovation with design in DB and CM/GC. Complexities may be easily resolved with a Designer / Contractor relationship that may be missed with DBB.

FACTOR #3: Level of Design ~ Conceptual design plans are at 30%. Modified design plans could be delivered in 4-6 months if required. The current level of design does not preclude any delivery method.

3) Level of Design Checklist

DESIGN-BID-BUILD		RATING
Opportunities	**Obstacles**	
☑ 100% design by owner ☑ Agency has complete control over the design (can be beneficial when there is one specific solution for a project) ☑ Project/scope can be developed through design ☑ The scope of the project is well defined through complete plans and contract documents ☑ Well-known process to the industry	☑ Owner design errors can result in a higher number of change orders, claims, etc. ☑ Minimizes competitive innovation opportunities ☑ Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete	+

DESIGN-BUILD		RATING
Opportunities	**Obstacles**	
☑ Design advanced by the owner to level necessary to precisely define the contract requirements and properly allocate risk ☑ Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete) ☑ Contractor involvement in early design, which improves constructability and innovation ☑ Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility	☑ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ❒ If design is too far advanced it will limit the advantages of design-build ☑ Potential for lacking or missing scope definition if RFP not carefully developed ☑ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☑ Less agency control over the design ❒ Can create project less standardized designs across agency as a whole	+

CM/GC		RATING
Opportunities	**Obstacles**	
☑ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with owner, designer and contractor ☑ Contractor involvement in early design improves constructability ☑ CDOT controls design ☑ Design can be used for DBB if the price is not successfully negotiated. ☑ Design can be responsive to risk minimization	Teaming and communicating concerning design can cause disputes ☑ Three party process can slow progression of design ❒ If design is too far advanced it will limit the advantages of CMGC or could require design backtracking	+ +

Notes and Comments:

RFP can solicit for modifications to the design that ~~would~~ improve the project technically or reduce construction costs may be utilized with DB and CM/GC but higher levels of control can be maintained with DBB and CM/GC.

FACTOR #4 Cost ~ Overall project cost will equate to a well-defined technical plan + Life Cycle cost +Maintainability.

4) Cost Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	-
☑ Competitive bidding provides a low cost construction to a fully defined scope of work ☑ Increase certainty about cost estimates ☑ Construction costs are contractually set before construction begins	☑ Cost accuracy is limited until design is completed ☑ Construction costs are not locked in until design is 100% complete. ☑ Cost reductions due to contractor innovation and constructability is difficult to obtain ☑ More potential of cost change orders due to owner design responsibility	

DESIGN-BUILD		RATING
Opportunities	Obstacles	+
☑ Contractor input into design should moderate cost ☑ Design-builder collaboration and ATCs can provide a cost-efficient response to project goals ☑ Costs are contractually set early in design process with design-build proposal ❒ Allows a variable scope bid to match a fixed budget ☑ Potential lower average cost growth ❒ Funding can be obligated in a very short timeframe	☑ Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project.	

CM/GC		RATING
Opportunities	Obstacles	+ +
☑ Owner/designer/contractor collaboration to reduce project risk can result in lowest project costs. ☑ Early contractor involvement can result in cost savings through VE and constructability ☑ Cost will be known earlier when compared to DBB ☑ Integrated design/construction process can provide a cost efficient strategies to project goals ☑ Can provide a cost efficient response to the project goals	❒ Non-competitive negotiated GMP introduces price risk ❒ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process. ❒ Paying for contractors involvement in the design phase may increase total cost	

Notes and Comments:

The defined technical plan as well as long-term, post construction cost of operations and maintenance can be affected by the chosen delivery method. DBB and CM/GC can be tailored to meet the goals of the project whereas DB may be more motivated to decrease the initial cost of the project and bring it down to the agreed upon amount regardless of possible increases in the future operation and maintenance costs of the facility. Also the additional criteria for innovation, maintainability and sustainability requirements will infer a cost increase. A qualified contractor/consultant will provide the “best value” by delivering a product that meets all of the team’s objectives.

5). RISK OPPORTUNITIES/OBSTACLES CHECKLIST (relative to each delivery method)

DESIGN-BID-BUILD		RATING
Opportunities	**Obstacles**	
☑ Risks managed separately through design, bid, build is expected easier ☑ Risk allocation is most widely understood/used ☑ Opportunity to avoid or mitigate risk through complete design ☑ Risks related to environmental, railroads, and third party involvement are best resolved prior to procurement ❒ Utilities and ROW best allocated to CDOT and mostly addressed prior to procurement to minimize potential for claim ❒ Project can be shelved while resolving risks	☑ Owner accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns ☑ Low-bid related risks ☑ Potential for misplaced risk through prescriptive specifications ☑ Innovative risk allocation is difficult to obtain ☑ Limited industry input in contract risk allocation ☑ Change order risks can be greater ☑ Contractor may avoid risks	-

DESIGN-BUILD		RATING
Opportunities	**Obstacles**	
☑ Performance specifications can allow for alternative risk allocations to the design builder ☑ Risk-reward structure can be better defined ☑ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☑ Opportunity for industry review of risk allocation (draft RFP, ATC processes) ☑ Avoid low-bid risk in procurement ☑ Contractor will help identify risks related to environmental, railroads, ROW, and utilities ☑ Designers and contractors can work toward innovative solutions to, or avoidance of, unknowns	☑ Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders) ☑ Limited time to resolve risks ☑ Additional risks allocated to designers for errors and omissions, claims for change orders ☑ Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract ☑ Risks associated with agreements when design is not completed ☑ Poorly defined risks are expensive ☑ Contractor may avoid risks or drive consultant to decrease cost at risk to quality	+

CM/GC		RATING
Opportunities	**Obstacles**	
☑ Contractor can have a better understanding of the unknown conditions as design progresses ☑ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☑ Opportunities to manage costs risks through CM/GC involvement ☑ Contractor will help identify and manage risk ☑ Agency still has considerable involvement with third parties to deal with risks ☑ Avoids low-bid risk in procurement ☑ More flexibility and innovation available to deal with unknowns early in design process	❒ Lack of motivation to manage small quantity costs ☑ Increase costs for non-proposal items ☑ Disagreement among Designer-Contractor-Owner can put the process at risk ☑ If GMP cannot be reached, additional low-bid risks appear ❒ Limited to risk capabilities of CM/GC ☑ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to negotiate/optimize risks ❒ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction	++

Notes and Comments:

DB and CM/GC offer the best opportunities to help mitigate risk concerns by securing a designer/contractor team to assess the problem at the design phase. Please refer to the project risk checklist for a comprehensive list of potential risks. CM/GC provides the least "Obstacle" pitfall compared to DB and DBB.

5B. GENERAL PROJECT RISK CHECKLIST (items to consider when assessing risk)

Environmental Risks	External Risks
☑ Delay in review of environmental documentation ☑ Challenge in appropriate environmental documentation ☑ Defined and non-defined hazardous waste ☑ Environmental regulation changes ❒ Environmental impact statement (EIS) required ❒ NEPA/ 404 Merger Process required ☑ Environmental analysis on new alignments required	☑ Stakeholders request late changes ☑ Influential stakeholders request additional needs to serve their own commercial purposes ☑ Local communities pose objections ☑ Community relations ☑ Conformance with regulations/guidelines/ design criteria ☑ Intergovernmental agreements and jurisdiction
Third-Party Risks	Geotechnical and Hazmat Risks
☑ Unforeseen delays due to utility owner and third-party ☑ Encounter unexpected utilities during construction ☑ Cost sharing with utilities not as planned ☑ Utility integration with project not as planned ☑ Third-party delays during construction ❒ Coordination with other projects ☑ Coordination with other government agencies	☑ Unexpected geotechnical issues ❒ Surveys late and/or in error ☑ Hazardous waste site analysis incomplete or in error ☑ Inadequate geotechnical investigations ☑ Adverse groundwater conditions ☑ Other general geotechnical risks
Right-of-Way/ Real Estate Risks	Design Risks
❒ Railroad involvement ☑ Objections to ROW appraisal take more time and/or money ❒ Excessive relocation or demolition ☑ Acquisition ROW problems ☑ Difficult or additional condemnation ☑ Accelerating pace of development in project corridor ☑ Additional ROW purchase due to alignment change	❒ Design is incomplete/ Design exceptions ☑ Scope definition is poor or incomplete ☑ Project purpose and need are poorly defined ☑ Communication breakdown with project team ❒ Pressure to delivery project on an accelerated schedule ☑ Constructability of design issues ☑ Project complexity (scope, schedule, objectives, cost, and deliverables are not clearly understood)
Organizational Risks	Construction Risks
☑ Inexperienced staff assigned ☑ Losing critical staff at crucial point of the project ☑ Functional units not available or overloaded ☑ No control over staff priorities ☑ Lack of coordination/ communication ☑ Local agency issues ☑ Internal red tape causes delay getting approvals, decisions ☑ Too many projects/ new priority project inserted into program	❒ Pressure to delivery project on an accelerated schedule. ☑ Inaccurate contract time estimates ☑ Construction QC/QA issues ☑ Unclear contract documents ☑ Problem with construction sequencing/ staging/ phasing ☑ Maintenance of Traffic/ Work Zone Traffic Control

FACTOR #5 Staff Experience ~ CDOT can provide counsel and experienced staffing for any method that is chosen.

6) Staff Experience/Availability Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	
☑ Agency, contractors and consultants have high level of experience with the traditional system ☑ Designers can be more interchangeable between projects	❒ Can require a high level of agency staffing of technical resources ❒ Staff's responsibilities are spread out over a longer design period ❒ Can require staff to have full breadth of technical expertise	+ +

DESIGN-BUILD		RATING
Opportunities	Obstacles	
☑ Less agency staff required due to the sole source nature of DB ❒ Opportunity to grow agency staff by learning a new process	❒ Limitation of availability of staff with skills, knowledge and personality to manage DB projects ☑ Existing staff may need additional training to address their changing roles ❒ Need to "mass" agency management and technical resources at critical points in process (i.e., RFP development, design reviews, etc.)	+ +

CM/GC		RATING
Opportunities	Obstacles	
❒ Agency can improve efficiencies by having more project managers on staff rather than specialized experts ☑ Smaller number of technical staff required through use of consultant designer	❒ Strong committed owner project management is important to success ☑ Limitation of availability of staff with skills, knowledge and personality to manage CMGC projects ☑ Existing staff may need additional training to address their changing roles ❒ Agency must learn how to negotiate GMP projects	+

Notes and Comments:

There is an innovative contracting unit that can provide guidance for the DB delivery methods. CM/GC is still relatively to CDOT new but assistance is available.

7) Level of Oversight and Control Checklist

DESIGN-BID-BUILD		RATING
Opportunities	**Obstacles**	-
☑ Full owner control over a linear design and construction process ☑ Oversight roles are well understood ☑ Contract documents are typically completed in a single package before construction begins ☑ Multiple checking points through three linear phases: design-bid-build ☑ Maximum control over design	☑ Requires a high-level of oversight ☑ Increased likelihood of claims due to owner design responsibility ☑ Limited control over an integrated design/construction process	

DESIGN-BUILD		RATING
Opportunities	**Obstacles**	+
☑ A single entity responsibility during project design and construction ☑ Continuous execution of design and build ☑ Getting input from construction to enhance constructability and innovation ☑ Overall project planning and scheduling is established by one entity	❐ Can require high level of design oversight ❐ Can require high level of quality assurance oversight ❐ Limitation on staff with DB oversight experience ☑ Less owner control over design ☑ Control over design relies on proper development of technical requirements	

CM/GC		RATING
Opportunities	**Obstacles**	+ +
☑ Preconstruction services are provided by the construction manager ☑ Getting input from construction to enhance constructability and innovation ☑ Provides owner control over an integrated design/construction process	Agency must have experienced staff to oversee the CM/GC Higher level of cost oversight required	

Notes and Comments:

DB requires prescriptive technical specifications and once awarded the agency loses control over the details of the final design. DB requires a quality management plan for design and construction activities. The Owner generally provides Assurance checks during the design and construction phasing. CM/GC allows the Owner to retain its role as the QC/QA for design and construction activities.

8) **Competition and Contractor Experience**

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	
☑ Promotes high level of competition in the marketplace ☑ Opens construction to all reasonably qualified bidders ☑ Transparency and fairness ☑ Reduced chance of corruption and collusion ☑ Contractors are familiar with DBB process	❒ Risks associated with selecting the low bid (the best contractor is not necessary selected) ☑ No contractor input into the process ☑ Limited ability to select contractor based on qualifications	+

DESIGN-BUILD		RATING
Opportunities	Obstacles	
☑ Allows for a balance of qualifications and cost in design-builder procurement ☑ Two-phase process can promote strong teaming to obtain "Best Value" ☑ Increased opportunity for innovation possibilities due to the diverse project team	☑ Need for DB qualifications can limit competition ☑ Lack of competition with past experience with the project delivery method ☑ Reliant on DB team selected for the project ☑ The gap between owner experience and contractor experience with delivery method can create conflict	+

CM/GC		RATING
Opportunities	Obstacles	
☑ Allows for qualifications based contractor procurement ☑ Agency has control over an independent selection of best qualified designer and contractor ☑ Contractor is part of the project team early on, creating a project "team" ☑ Increased opportunity for innovation due to the diversity of the project team	☑ Currently there is not a large pool of contractors with experience in CMGC, which will reduce the competition and availability ☑ Working with only one contractor to develop GMP can limit price competition ❒ Requires a strong project manager from the agency Teamwork and communication among the project team	+ +

Notes and Comments:

As part of the selection phase for both DB and CM/GC a competitive qualifications selection option may be included in the RFP. Also due to the size of the project many contractors will be eliminated from the procurement phase due to bonding issues and possibly the large number of RAMP projects released may affect the selection pool.

The Recommendation

It is recommended by CDOT that "The Coalition" move forward with CM/GC as the preferred Project Delivery Method.

CM/GC provides the best balance for this project. It will provide the opportunity for innovation while allowing the project team to maintain control of the project. The checklist of opportunities and obstacles reveal pertinent issues that could negatively impact the project if control isn't maintained during the course of the work.

CM/GC promotes collaboration between the Owners, Designers, and Contractors and will allow the Owners the control to review the design pertaining to aesthetics, service life and the technical requirements as the plans are developed. This collaboration will lead to efficiencies in design and construction resulting in a quality project. CM/GC is the embodiment of all the goals established during the workshop.

Project # STU 0252-429/19192
Innovative Design Workshop
I-25/Arapahoe Interchange Reconstruction

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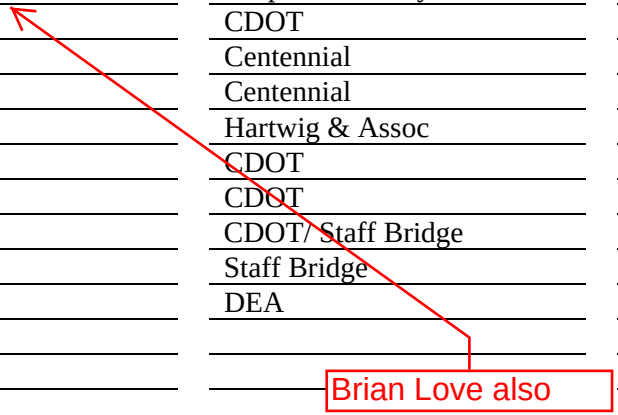

DEPARTMENT OF TRANSPORTATION

Project # STU 0252-429/19192
Innovative Design Workshop
I-25/Arapahoe Interchange Reconstruction

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19192 Innovative Workshop Summary

October 25, 2013

Project Description

Project Name:	I-25/Arapahoe Interchange Reconstruction
Location:	Colorado
Estimated Budget:	$6 Million for Design; $74 Million for the Construction Contract
Estimated Project Delivery Period:	January 2014-November 2017
Required Delivery Date:	December 2017
Source(s) of Project Funding:	Federal, Local Match; RAMP Public-Public Partnership
Project Corridor:	SH 88 from S. Uinta St. to Boston/Clinton
Major Features of Work:	Interchange Reconstruction and Bridge Replacement
Major Schedule Milestones:	TBD
Major Project Stakeholders:	Arapahoe County, City of Centennial, City of Greenwood Village, Southeast Business Partnership, CDOT, FHWA

Major Challenges

- Right of Way Acquisition in an urban corridor
- Major Utility corridor
- Permanent Stormwater Management
- Public By-in
- Construction Traffic and Phasing Concerns

Main Identified Sources of Risk

- Design changes resulting in possible Re-evaluation of approved FONSI less than 1 year old
- Intergovernmental agreements and jurisdictional issues
- ROW acquisition
- Local Agency Issues
- Third Party (Utility)Delays during Construction
- Maintenance of Traffic/Work Zone Traffic Control

Safety Issues ~ Queuing on the southbound off ramps backing upon to I-25

Sustainable Design and Construction Requirements ~ The project will promote green technologies with a focus on implementing new technologies (if viable) for the construction of the bridge structure as well as reduce, reuse, recycle concepts for the entire project. The main focus is to enhance the environment through less traffic congestion and pollution. Design and construction specifications will be developed in concert with the project.

19192 Innovative Contracting Workshop Summary

The purpose of this workshop was to learn about the different contracting methods and how they align with the proposed goals. To be able to recommend the most appropriate option, personnel experienced with Design-Build (DB) and Construction Manager/General Contractor (CM/GC) were brought in to assist with the methods evaluation. Matt Pacheco, experienced with DB, and Tamara Maurer, experience with CM/GC, discussed the merits and thought processes associated with their respective delivery methods.

Establishing the Goals

The workshop was broken up into groups to discuss the expectation for the project. After the exercise, the groups reconvened and discussed the goals. The results for the proposed goals and classification are as follows:

- ***Schedule:*** Accelerate delivery of overall project schedule and complete by Dec. 2017
- ***Technical Requirements:*** Project will maximize the operational (ITS integration for the corridor), capacity & safety improvements as stated in the FONSI within the identified budget.
- ***Public Interest:*** Minimize impacts to traveling public, stakeholders and environmental resources and maximize safety of workers and traveling public.
- ***Cost:*** Provide a high quality design and construction that maximizes service life, minimizes service cost and optimizes aesthetics.
- ***Team Building***: Facilitate a collaborative partnership with all of the members of the project team and stakeholders

Project Delivery Selection Matrix

Analyzing the factors and their interrelationships will help to determine the best delivery option. The Delivery Matrix is critical in helping to narrow down the delivery method by focusing on the opportunities and obstacles associated with each "factor" of the matrix. The checklist identified the Opportunities and Obstacles for the respective factors.

PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY			
	DBB	**DB**	**CM/GC**
Primary Evaluation Factors			
1. Delivery Schedule	+	+ +	+
2. Project Complexity & Innovation	+	+ +	+ +
3. Level of Design	+	+	+ +
4. Cost	-	+	+ +
5. Perform Initial Risk Assessment	-	+	+ +
Secondary Evaluation Factors			
6. Staff Experience/Availability (Owner)	+ +	+ +	+
7.Level of Oversight and Control	-	+	+ +
8. Competition and Contractor Experience	+	+	+ +

+ +	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

FACTOR #1: Delivery Schedule ~ The project was selected for RAMP. The deadline for RAMP project is December 2017.

1) Delivery Schedule Checklist

DESIGN-BID-BUILD		RATING
Opportunities	**Obstacles**	
☑ Schedule is more predictable and more manageable ❒ Milestones can be easier to define ❒ Projects can more easily be "shelved" ❒ Shortest procurement period ❒ Elements of design can be advanced prior to permitting, construction, etc. ❒ Time to communicate/discuss design with stakeholders	❒ Requires time to perform a linear design-bid-construction process ❒ Design and construction schedules can be unrealistic due to lack industry input ☑ Errors in design lead to change orders and schedule delays ❒ Low bid selection may lead to potential delays and other adverse outcomes.	+

DESIGN-BUILD		RATING
Opportunities	**Obstacles**	
❒ Potential to accelerate schedule through parallel design-build process ☑ Shifting schedule risk to DB team ☑ Encumbers construction funds more quickly ☑ Industry input into design and schedule ☑ Fewer chances for disputes between agency and design-builders ☑ More efficient procurement of long-lead items ☑ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☑ Allows innovation in resource loading and scheduling by DB team	❒ Request for proposal development and procurement can be intensive ☑ Undefined events or conditions found after procurement, but during design can impact schedule and cost ☑ Time required to define technical requirements and expectations through RFP development can be intensive ❒ Time required to gain acceptance of quality program ☑ Requires agency and stakeholder commitments to an expeditious review of design	+ +

CM/GC		RATING
Opportunities	**Obstacles**	
❒ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☑ More efficient procurement of long-lead items ☑ Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) ☑ Can provide a shorter procurement schedule than DB ☑ Team involvement for schedule optimization ☑ Continuous constructability review and VE ☑ Maintenance of Traffic improves with contractor inputs ☑ Contractor input for phasing, constructability and traffic control may reduce overall schedule	❒ Potential for not reaching GMP and substantially delaying schedule ❒ GMP negotiation can delay the schedule ☑ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to control schedule	+

Notes and Comments:

There isn't an apparent need to accelerate project delivery. All methods will produce the desired outcome in the time frame stipulated. Due to already having a consultant secured CM/GC would be the better choice if time was a factor. **DB** allows for the **most schedule certainty** as the schedule is established fairly early in the process and does not allow for schedule growth compared to the other delivery methods.

FACTOR #2: Project Complexity & Innovation ~ Project complexity issues arise from coordinating major utility relocations with design, high traffic volumes at the interchange and maintaining satisfactory traffic operations during construction for the interchange as well as I-25.

2) Project Complexity & Innovation Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	
❒ CDOT can have more control of design of complex projects ❒ CDOT& consultant expertise can select innovation independently of contractor abilities ☑ Opportunities for value engineering studies during design, more time for design solutions ☑ Aids in consistency and maintainability ☑ Full control in selection of design expertise ❒ Complex design can be resolved and competitively bid	❒ ❒ Innovations can add cost or time and restrain contractor's benefits ☑ No contractor input to optimize costs ☑ Limited flexibility for integrated design and construction solutions (limited to constructability) ☑ Difficult to assess construction time and cost due to innovation	+

DESIGN-BUILD		RATING
Opportunities	Obstacles	
☑ Designer and contractor collaborate to optimize means and methods and enhance innovation ☑ Opportunity for innovation through draft RFP, best value and ATC processes ☑ Can use best-value procurement to select design-builder with best qualifications ❒ Constructability and VE inherent in process ☑ Early team integration ❒ Sole point of responsibility	❒ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ❒ Qualitative designs are difficult to define (example. aesthetics) ❒ Risk of time or cost constraints on designer inhibiting innovation ☑ Some design solutions might be too innovative or unacceptable ☑ Quality assurance for innovative processes are difficult to define in RFP	+ +

CM/GC		RATING
Opportunities	Obstacles	
☑ Highly innovative process through 3 party collaboration ☑ Allows for owner control of a designer/contractor process for developing innovative solutions ☑ Allows for an independent selection of the best qualified designer and best qualified contractor ☑ VE inherent in process and enhanced constructability ☑ Risk of innovation can be better defined and minimized and allocated ❒ Can take to market for bidding as contingency	❒ Process depends on designer/CM relationship ❒ No contractual relationship between designer/CM ☑ Innovations can add cost or time ☑ Scope additions can be difficult to manage ❒ Preconstruction services fees for contractor involvement ❒ Cost competitiveness – single source negotiated GMP	+ +

Notes and Comments:

Opportunity exists for innovation with design in DB and CM/GC. Complexities may be easily resolved with a Designer / Contractor relationship that may be missed with DBB.

FACTOR #3: Level of Design ~ Conceptual design plans are at 30%. Modified design plans could be delivered in 4-6 months if required. The current level of design does not preclude any delivery method.

3) Level of Design Checklist

DESIGN-BID-BUILD		
Opportunities	Obstacles	RATING
☑ 100% design by owner ☑ Agency has complete control over the design (can be beneficial when there is one specific solution for a project) ☑ Project/scope can be developed through design ☑ The scope of the project is well defined through complete plans and contract documents ☑ Well-known process to the industry	☑ Owner design errors can result in a higher number of change orders, claims, etc. ☑ Minimizes competitive innovation opportunities ☑ Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete	+

DESIGN-BUILD		
Opportunities	Obstacles	RATING
☑ Design advanced by the owner to level necessary to precisely define the contract requirements and properly allocate risk ☑ Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete) ☑ Contractor involvement in early design, which improves constructability and innovation ☑ Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility	☑ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ❒ If design is too far advanced it will limit the advantages of design-build ☑ Potential for lacking or missing scope definition if RFP not carefully developed ☑ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☑ Less agency control over the design ❒ Can create project less standardized designs across agency as a whole	+

CM/GC		
Opportunities	Obstacles	RATING
☑ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with owner, designer and contractor ☑ Contractor involvement in early design improves constructability ☑ CDOT controls design ☑ Design can be used for DBB if the price is not successfully negotiated. ☑ Design can be responsive to risk minimization	❒ Teaming and communicating concerning design can cause disputes ☑ Three party process can slow progression of design ❒ If design is too far advanced it will limit the advantages of CMGC or could require design backtracking	++

Notes and Comments:

RFP can solicit for modifications to the design that ~~would~~ improve the project technically or reduce construction costs may be utilized with DB and CM/GC but higher levels of control can be maintained with DBB and CM/GC.

FACTOR #4 Cost ~ Overall project cost will equate to a well-defined technical plan + Life Cycle cost +Maintainability.

4) Cost Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	-
☑ Competitive bidding provides a low cost construction to a fully defined scope of work ☑ Increase certainty about cost estimates ☑ Construction costs are contractually set before construction begins	☑ Cost accuracy is limited until design is completed ☑ Construction costs are not locked in until design is 100% complete. ☑ Cost reductions due to contractor innovation and constructability is difficult to obtain ☑ More potential of cost change orders due to owner design responsibility	

DESIGN-BUILD		RATING
Opportunities	Obstacles	+
☑ Contractor input into design should moderate cost ☑ Design-builder collaboration and ATCs can provide a cost-efficient response to project goals ☑ Costs are contractually set early in design process with design-build proposal ❒ Allows a variable scope bid to match a fixed budget ☑ Potential lower average cost growth ❒ Funding can be obligated in a very short timeframe	☑ Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project.	

CM/GC		RATING
Opportunities	Obstacles	+ +
☑ Owner/designer/contractor collaboration to reduce project risk can result in lowest project costs. ☑ Early contractor involvement can result in cost savings through VE and constructability ☑ Cost will be known earlier when compared to DBB ☑ Integrated design/construction process can provide a cost efficient strategies to project goals ☑ Can provide a cost efficient response to the project goals	❒ Non-competitive negotiated GMP introduces price risk ❒ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process. ❒ Paying for contractors involvement in the design phase may increase total cost	

Notes and Comments:

The defined technical plan as well as long-term, post construction cost of operations and maintenance can be affected by the chosen delivery method. DBB and CM/GC can be tailored to meet the goals of the project whereas DB may be more motivated to decrease the initial cost of the project and bring it down to the agreed upon amount regardless of possible increases in the future operation and maintenance costs of the facility. Also the additional criteria for innovation, maintainability and sustainability requirements will infer a cost increase. A qualified contractor/consultant will provide the “best value” by delivering a product that meets all of the team’s objectives.

5). RISK OPPORTUNITIES/OBSTACLES CHECKLIST (relative to each delivery method)

DESIGN-BID-BUILD		RATING
Opportunities	**Obstacles**	
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DESIGN-BUILD		RATING
Opportunities	**Obstacles**	
☑ Performance specifications can allow for alternative risk allocations to the design builder ☑ Risk-reward structure can be better defined ☑ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☑ Opportunity for industry review of risk allocation (draft RFP, ATC processes) ☑ Avoid low-bid risk in procurement ☑ Contractor will help identify risks related to environmental, railroads, ROW, and utilities ☑ Designers and contractors can work toward innovative solutions to, or avoidance of, unknowns	☑ Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders) ☑ Limited time to resolve risks ☑ Additional risks allocated to designers for errors and omissions, claims for change orders ☑ Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract ☑ Risks associated with agreements when design is not completed ☑ Poorly defined risks are expensive ☑ Contractor may avoid risks or drive consultant to decrease cost at risk to quality	+

CM/GC		RATING
Opportunities	**Obstacles**	
☑ Contractor can have a better understanding of the unknown conditions as design progresses ☑ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☑ Opportunities to manage costs risks through CM/GC involvement ☑ Contractor will help identify and manage risk ☑ Agency still has considerable involvement with third parties to deal with risks ☑ Avoids low-bid risk in procurement ☑ More flexibility and innovation available to deal with unknowns early in design process	❒ Lack of motivation to manage small quantity costs ☑ Increase costs for non-proposal items ☑ Disagreement among Designer-Contractor-Owner can put the process at risk ☑ If GMP cannot be reached, additional low-bid risks appear ❒ Limited to risk capabilities of CM/GC ☑ Designer-contractor-agency disagreements can add delays ❒ Strong agency management is required to negotiate/optimize risks ❒ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction	++

Notes and Comments:

DB and CM/GC offer the best opportunities to help mitigate risk concerns by securing a designer/contractor team to assess the problem at the design phase. Please refer to the project risk checklist for a comprehensive list of potential risks. CM/GC provides the least "Obstacle" pitfall compared to DB and DBB.

5B. GENERAL PROJECT RISK CHECKLIST (items to consider when assessing risk)

Environmental Risks	External Risks
☑ Delay in review of environmental documentation ☑ Challenge in appropriate environmental documentation ☑ Defined and non-defined hazardous waste ☑ Environmental regulation changes ❒ Environmental impact statement (EIS) required ❒ NEPA/ 404 Merger Process required ☑ Environmental analysis on new alignments required	☑ Stakeholders request late changes ☑ Influential stakeholders request additional needs to serve their own commercial purposes ☑ Local communities pose objections ☑ Community relations ☑ Conformance with regulations/guidelines/ design criteria ☑ Intergovernmental agreements and jurisdiction
Third-Party Risks	Geotechnical and Hazmat Risks
☑ Unforeseen delays due to utility owner and third-party ☑ Encounter unexpected utilities during construction ❒ Cost sharing with utilities not as planned ☑ Utility integration with project not as planned ☑ Third-party delays during construction ❒ Coordination with other projects ☑ Coordination with other government agencies	☑ Unexpected geotechnical issues ❒ Surveys late and/or in error ☑ Hazardous waste site analysis incomplete or in error ☑ Inadequate geotechnical investigations ☑ Adverse groundwater conditions ☑ Other general geotechnical risks
Right-of-Way/ Real Estate Risks	Design Risks
❒ Railroad involvement ☑ Objections to ROW appraisal take more time and/or money ❒ Excessive relocation or demolition ☑ Acquisition ROW problems ☑ Difficult or additional condemnation ☑ Accelerating pace of development in project corridor ☑ Additional ROW purchase due to alignment change	❒ Design is incomplete/ Design exceptions ☑ Scope definition is poor or incomplete ☑ Project purpose and need are poorly defined ☑ Communication breakdown with project team ❒ Pressure to delivery project on an accelerated schedule ☑ Constructability of design issues ☑ Project complexity (scope, schedule, objectives, cost, and deliverables are not clearly understood)
Organizational Risks	Construction Risks
☑ Inexperienced staff assigned ☑ Losing critical staff at crucial point of the project ☑ Functional units not available or overloaded ☑ No control over staff priorities ☑ Lack of coordination/ communication ☑ Local agency issues ☑ Internal red tape causes delay getting approvals, decisions ☑ Too many projects/ new priority project inserted into program	❒ Pressure to delivery project on an accelerated schedule. ☑ Inaccurate contract time estimates ☑ Construction QC/QA issues ☑ Unclear contract documents ☑ Problem with construction sequencing/ staging/ phasing ☑ Maintenance of Traffic/ Work Zone Traffic Control

FACTOR #5 Staff Experience ~ CDOT can provide counsel and experienced staffing for any method that is chosen.

6) Staff Experience/Availability Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	
☑ Agency, contractors and consultants have high level of experience with the traditional system ☑ Designers can be more interchangeable between projects	❒ Can require a high level of agency staffing of technical resources ❒ Staff's responsibilities are spread out over a longer design period ❒ Can require staff to have full breadth of technical expertise	+ +

DESIGN-BUILD		RATING
Opportunities	Obstacles	
☑ Less agency staff required due to the sole source nature of DB ❒ Opportunity to grow agency staff by learning a new process	❒ Limitation of availability of staff with skills, knowledge and personality to manage DB projects ☑ Existing staff may need additional training to address their changing roles ❒ Need to "mass" agency management and technical resources at critical points in process (i.e., RFP development, design reviews, etc.)	+ +

CM/GC		RATING
Opportunities	Obstacles	
❒ Agency can improve efficiencies by having more project managers on staff rather than specialized experts ☑ Smaller number of technical staff required through use of consultant designer	❒ Strong committed owner project management is important to success ☑ Limitation of availability of staff with skills, knowledge and personality to manage CMGC projects ☑ Existing staff may need additional training to address their changing roles ❒ Agency must learn how to negotiate GMP projects	+

Notes and Comments:

There is an innovative contracting unit that can provide guidance for the DB delivery methods. CM/GC is still relatively to CDOT new but assistance is available.

7) Level of Oversight and Control Checklist

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	-
☑ Full owner control over a linear design and construction process ☑ Oversight roles are well understood ☑ Contract documents are typically completed in a single package before construction begins ☑ Multiple checking points through three linear phases: design-bid-build ☑ Maximum control over design	☑ Requires a high-level of oversight ☑ Increased likelihood of claims due to owner design responsibility ☑ Limited control over an integrated design/construction process	

DESIGN-BUILD		RATING
Opportunities	Obstacles	+
☑ A single entity responsibility during project design and construction ☑ Continuous execution of design and build ☑ Getting input from construction to enhance constructability and innovation ☑ Overall project planning and scheduling is established by one entity	❒ Can require high level of design oversight ❒ Can require high level of quality assurance oversight ❒ Limitation on staff with DB oversight experience ☑ Less owner control over design ☑ Control over design relies on proper development of technical requirements	

CM/GC		RATING
Opportunities	Obstacles	+ +
☑ Preconstruction services are provided by the construction manager ☑ Getting input from construction to enhance constructability and innovation ☑ Provides owner control over an integrated design/construction process	❒ Agency must have experienced staff to oversee the CM/GC ❒ Higher level of cost oversight required	

Notes and Comments:

DB requires prescriptive technical specifications and once awarded the agency loses control over the details of the final design. DB requires a quality management plan for design and construction activities. The Owner generally provides Assurance checks during the design and construction phasing. CM/GC allows the Owner to retain its role as the QC/QA for design and construction activities.

8) **Competition and Contractor Experience**

DESIGN-BID-BUILD		RATING
Opportunities	Obstacles	
☑ Promotes high level of competition in the marketplace ☑ Opens construction to all reasonably qualified bidders ☑ Transparency and fairness ☑ Reduced chance of corruption and collusion ☑ Contractors are familiar with DBB process	❒ Risks associated with selecting the low bid (the best contractor is not necessary selected) ☑ No contractor input into the process ☑ Limited ability to select contractor based on qualifications	+

DESIGN-BUILD		RATING
Opportunities	Obstacles	
☑ Allows for a balance of qualifications and cost in design-builder procurement ☑ Two-phase process can promote strong teaming to obtain "Best Value" ☑ Increased opportunity for innovation possibilities due to the diverse project team	☑ Need for DB qualifications can limit competition ☑ Lack of competition with past experience with the project delivery method ☑ Reliant on DB team selected for the project ☑ The gap between owner experience and contractor experience with delivery method can create conflict	+

CM/GC		RATING
Opportunities	Obstacles	
☑ Allows for qualifications based contractor procurement ☑ Agency has control over an independent selection of best qualified designer and contractor ☑ Contractor is part of the project team early on, creating a project "team" ☑ Increased opportunity for innovation due to the diversity of the project team	☑ Currently there is not a large pool of contractors with experience in CMGC, which will reduce the competition and availability ☑ Working with only one contractor to develop GMP can limit price competition ❒ Requires a strong project manager from the agency ❒ Teamwork and communication among the project team	+ +

Notes and Comments:

As part of the selection phase for both DB and CM/GC a competitive qualifications selection option may be included in the RFP. Also due to the size of the project many contractors will be eliminated from the procurement phase due to bonding issues and possibly the large number of RAMP projects released may affect the selection pool.

The Recommendation

It is recommended by CDOT that "The Coalition" move forward with CM/GC as the preferred Project Delivery Method.

CM/GC provides the best balance for this project. It will provide the opportunity for innovation while allowing the project team to maintain control of the project. The checklist of opportunities and obstacles reveal pertinent issues that could negatively impact the project if control isn't maintained during the course of the work.

CM/GC promotes collaboration between the Owners, Designers, and Contractors and will allow the Owners the control to review the design pertaining to aesthetics, service life and the technical requirements as the plans are developed. This collaboration will lead to efficiencies in design and construction resulting in a quality project. CM/GC is the embodiment of all the goals established during the workshop.

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I-25/Arapahoe Interchange Reconstruction

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