Alternative Contracting Process – SEP 14
Construction Manager General Contractor (CM/GC)
2011 Annual Report

1. Introduction

The Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) have developed a Special Experimental Project Number 14 (SEP-14) work plan for the use of the Construction Manager General Contractor (CM/GC) technique on transportation projects.

As part of this work plan, CDOT is required to submit an annual report to FHWA Colorado Division each year summarizing the CM/GC activities of that particular calendar year. This report is for calendar year 2011 where CDOT saw the completion of one CM/GC project, the I-70 Eisenhower Tunnel switchgear project. It is worth mentioning that CDOT has also started procuring 3 other CM/GC projects in late 2011, where the RFP's have been released. CDOT will fully report on these projects in the 2012 Annual CM/GC Report, as these projects have just started.

2. Criteria

Initially, CDOT and FHWA identified thirteen criteria for evaluating the applicability of the CM/GC process in order to analyze the benefits provided by the CM/GC process as it relates to these criteria:

a) Project Complexity
b) Opportunity for Innovation
c) Delivery Schedule
d) Level of Design
e) Project Unknowns
f) Staff Experience/Availability
g) Level of Oversight
h) Risk Allocation
i) Competition and Availability
j) Resource Availability
k) Team Experience
l) Third Party Involvement
m) Regulations and Clearances

However, these factors were based on an original version of the risk-based project delivery selection matrix created by members of the Innovative Contracting Advisory Committee (ICAC). To improve the original matrix and make it more understandable, efficient, less redundant, and easier to use, the latest version of the matrix reduces these criteria from 13 factors to 8 factors.

In brief, all of the same factors and considerations are considered in the new matrix, but in a more efficient manner. Below is a summary of the changes:

Opportunity for Innovation and Project Complexity were similar and were combined (the manner that the project delivery methods address both those factors is the same).

Project Unknowns is inherent in both the risk assessment and Level of Design.

Staff Experience/Availability, Competition and Availability, Resource Availability, and Team Experience were somewhat unclear in the distinction between them and they had redundant factors. To improve the understanding and efficiency of the process they were coalesced into two factors: Staff Experience/Availability (Owner) and Competition and Contractor Experience.

Third Party Involvement and Regulations and Clearances are both very important aspects of the Risk Assessment and are thoroughly covered in that section. They were redundant considerations in the original matrix.

The new 8 factors are:

a) Delivery Schedule
b) Project Complexity and Innovation
c) Level of Design
d) Initial Project Risk
e) Cost
f) Staff Experience/Availability (Owner)
g) Level of Oversight and Control
h) Competition and Contractor Experience

3. Summary of Projects

Project One: IM 703-248 17148 (I-70 Eisenhower Johnson Memorial Tunnel 2400v Switchgear Project):

- This was CDOT's first CM/GC project.
- Original project risk was high because of the unknown risk of electrical field conditions, actual wire lengths, and owner experience with electrical projects.
- Original Delivery Schedule:18 months
  - 6 Months Preconstruction Phase
  - 6 months Procurement
  - 6 Months Construction Phase
- Final Delivery Schedule:13 months
  - Preconstruction Phase: November 2010 to August 2011
  - LLTP (Long Lead Time Procurement) Phase: April 2011 to October 2011
  - Construction Phase: August 2011 to December 2011
- 28% overall schedule savings or 5 months.

4. Budget Analysis

- Design Budget:
  - Original Design Budget Estimate: $650,000
    - Final Design, Construction Support, and no CM/GC Services
  - Final Design Expenditures: $474,100
    - Final Design, Construction Support, and CM/GC Services
  - Design Savings: 27% over original estimate.
- Construction Budget:
  - Original Budget: $2,775,000
  - Scope Added to Budget (new estimate): $3,527,857
  - Final Expenditures: $3, 308,857
    - Savings: 6% under final budget.

5. Change Orders

None reported for calendar year 2011. There were no unplanned change orders during the construction phase of the 2400v Switchgear project. 16% of the contingency force account was utilized for a field change adding emergency override for fire protection for future suppression system planning.

6. Lessons Learned

- Preconstruction Lessons Learned.
  - Document everything that is addressed or resolved during preconstruction.
  - Be sure of every decision and double check all technical details.
  - Enforce the contract with the contractor as closely as possible.
  - Enforce written reviews and redlined drawing submittals. Have tracked changes logged for all
  - Ensure that the CM/GC services construction manager will be the same during construction.
  - Ensure that construction foreman and supervisors are quickly transitioned into the project so that they understand what they will be building during construction.
  - Create process for vendor selection that includes best value instead of low bid.
  - Ensure that project manager and construction manager for CM/GC firm understands and knows their contractual requirements.
  - Require contractor and consultant to submit monthly DBE drawdown and progress reports.
  - Use of thorough site visits reduced quantity unknowns.
  - Bigger budget electrical projects have limited competition in design consultant and contractor fields.
  - Electrical contractors should be vetted for government experience and CM/GC experience.

- Construction Lessons Learned.
  - Need to move "define new pay items" (Construction Fee, General Conditions, and Risk Pool) to Project Special Provisions.
  - Contractor teamed with CDOT to pressure and work with vendors to resolve problems on the team's behalf. Contractor accepted vendor liquidated damages as negotiated during preconstruction phase.

7. Innovations

- Installed new conduit to mitigate wire and cable coming apart instead of pulling cable through old full conduits.
- Replaced all cabinet switchgear in original footprint instead of requiring new locations, additional cost, and additional materials.
- Installed new type of cable trays for low voltage.
- Early procurement of switchgear led to schedule savings.
- Vendor job showings enabled the team to make good design and procurement decisions.
- Replacement of old mechanical relays with Programmable Logic Controls enabled cleaner, reduced, and dependable wiring.

8. Analysis of Performance Measures

a) Delivery Schedule
   a. CDOT completed this project 28% (5 months) faster than the original estimated schedule.

b) Project Complexity and Innovation
   a. Original project risk was high because of the unknown risk of electrical field conditions, actual wire lengths, and owner experience with electrical projects.
   b. Project is very complex electrically especially with 35 year old equipment and cabling.
   c. Prior projects have had significant value engineering processes, very low bids requiring justification, field change orders, and only small parts of design plans were used.

c) Level of Design
   a. Level of design at time of CM/GC procurement was 15%.

d) Initial Project Risk
   a. Original project risk was high because of the unknown risk of electrical field conditions, actual wire lengths, and owner experience with electrical projects.
   b. Discovered project risks were much higher than anticipated and risks were mitigated during the preconstruction phase.

e) Cost
   a. Final expenditures were 6% under final project budget.

f) Staff Experience/Availability (Owner)
   a. This was CDOT's first CM/GC project that had many of the characteristics of a CM/GC roadway project including long lead time procurement, required two GMP proposals for acceptance, and required strong active project management from the owner.

g) Level of Oversight and Control
   a. CDOT had requirements in the EJMT that oversight and control be maintained at all times due to safety and operations.
   b. CDOT had to make quick educated design decisions to keep the design moving on schedule.

h) Competition and Contractor Experience
   a. There are only a few design firms and electrical contractors that can do 2400V work because it is a specialized field.
   b. There were only four vendors that could supply the switchgears.
   c. CM/GC experience is limited but both proposers had vertical CMAR experience.

9. Conclusion

This document details the process that CDOT and FHWA have used for implementing the CM/GC project delivery method under SEP-14. It is expected that this evaluation will enhance our understanding of the CM/GC strengths, weaknesses, and suitability of this project delivery method. In 2011, only one project was completed using CM/GC, and the procurement of three other projects has just started. CDOT is well on its way to procure eight projects between 2011 and 2014 as described in the CDOT/FHWA SEP-14 Programmatic Agreement.