

Winona Bridge Work Package #5 Bridge No. 5900 (Existing Bridge) Rehabilitation and Reconstruction Installment #4

Construction Manager General Contractor (CMGC) and Work Package #5 Cost Estimating
March 13, 2016

As regular readers of our Winona Bridge Work Package #5 updates know, the Winona Bridge project is the Minnesota Department of Transportation's first use of the CMGC (Construction Manager General Contractor) procurement methodology (see the CMGC infographic in Appendix A). We've discussed the two primary reasons for selecting CMGC:

1. To build the new bridge as fast as possible, and
2. To gain an early understanding of the existing bridge through-truss rehabilitation costs and risks.

But how is CMGC beneficial in these areas and how does it work? Let's go behind the scenes to address these questions.

Basically, within CMGC, MnDOT hires a contracting team to work with us during the design phase to better understand costs, construction schedules, construction risks, and to prepare a more "contractor friendly" set of design plans and specifications (*contract documents*). That same contracting team, in this case Ames Construction, is the only contractor bidding the work or work packages. They are competing against one or more independent estimates to ensure MnDOT is receiving a fair market value from the CMGC contractor's bid.



Work Package #5: MnDOT, Final Design and Ames team meeting to discuss through-truss risks

The construction of the new bridge and through-truss rehabilitation work fit the criteria regarding potential benefits of using the CMGC procurement methodology in several areas, including¹:

- When there are aggressive scheduling constraints.
- When there is Construction work that is high risk.
- When the Design and/or Construction work are highly complex.
- When there is Construction work that requires complex staging.
- When early knowledge of costs is necessary.
- When the ability to bid early work packages is necessary.

When the current Project Management team was assigned to the project in May 2013, the letting date of the project was March of 2015, but the overall project was behind schedule and the delivery of the right-of-way parcels was viewed as the cause of the delay. The project was planned to be one overall single bid package (contract) using our traditional design-bid-build methodology. If the project had met this March 2015 letting and the low bidding contractor awarded the project, which may have been highly unlikely, the new bridge would have been opened to traffic by the end of 2017 or later, a full one calendar year later than the current path.

The Winona Bridge team needed to simultaneously work quickly on the new bridge and build the CMGC program from the ground up as MnDOT did not have any internal CMGC processes or procedures when CMGC was selected for the Winona Bridge project.



New Bridge No. 85851 progress

¹NCHRP Project 10-85 A Guidebook for use of Construction Manager /General Contractor (CMGC) Contracting for Highway Projects (Page 4).

Goal #1 – Open the New Bridge as Fast as Possible

Our team knew the only way to accelerate the construction of the new bridge was to break the construction into separate work packages (contracts) and schedule the right-of-way delivery so it was not delaying the overall project. We accomplished this by breaking up the new bridge construction into four (4) work packages and starting construction on the new bridge as follows:

- Work Package #1 – Procurement of river pier piling. Anticipated 12-14 weeks to get the new piling to the project site. Letting Date: May 1, 2014.
- Work Package #2 – Temporary contractor access facilities. Letting Date: May 15, 2014.
- Work Package #3 – Construct non-land piers for new bridge. This removed the land piers from the contract as right-of-way was needed for them. Letting Date: July 30, 2014.
- Work Package #4 – Complete new bridge, including necessary roadway work. Letting Date: February 18, 2015.



Start of New Bridge construction in July 2014 – Latsch Island tree clearing

Work Packages #1 and #2 were fully funded with state funds to streamline the review and approval processing. The right-of-way acquisitions were needed for Work Package #4 and this approach gave approximately one full calendar year for the property owners to consider the offers from MnDOT before we needed possession of the properties. This was important to

Winona leaders to maximize the timeline and potential for re-development within the community.

While these four (4) work packages may have been able to be delivered using our traditional design-bid-build or the design-build procurement methodologies, coordination would have been very challenging. Additionally, it's important to note that while using the CMGC approach is partially to thank for our ability to stay on schedule to open the new bridge by the end of 2016, it also taken extraordinary efforts from Ames Construction and the project team.



Bridge No. 85851 – scheduled to be opened in fall 2016

Goal #2 – Understand Existing Bridge Through-Truss Costs and Risks Earlier

The second primary reason for utilizing the CMGC procurement methodology was based on concerns from the project management team regarding the rehabilitation and reconstruction of the through-truss of the existing bridge. As was previously mentioned, projects with similar scopes of work had historically cost considerably more than planned. The rehabilitation of the through-truss within a historical context was viewed as a significant challenge, if not the biggest challenge on the project.



Bridge No. 5900 – Through-Truss

Specifically, with the through-truss, we have been able to explore the challenges and risks with the Ames Construction team with numerous field reviews and mock-up trials. In fact, our team has created a complete node mock-up and mock-ups of the intricate steel plating work that is proposed.



Bridge No. 5900 field steel plate strengthening mock-ups



Bridge No. 5900 field steel plate strengthening and complete node mock-ups

These efforts resulted in several important enhancements in the scope of work to make things more efficient for the contractor and reduce costs and risks. These enhancements included:

- Length of Bottom Chord Steel plating and splicing. The Final Design included 75-foot steel splice plates that would be difficult for the Ames team to handle in the field. Based on feedback from the CMGC team, splices will now be allowed in these plates, saving an approximate \$100,000 in costs.
- Paint System specifications. Based on the complex staging for the through-truss work, after abrasive blasting, the prime paint coat will be on the bridge for an extended period of time. The risk is the extent of prime coat preparation to continue painting operations in later phases of the project. Revisions to the MnDOT standard painting specifications

accommodated this complex staging and saved an approximate \$300,000 in costs.

- CMGC team feedback resulted in not having to replace existing bridge piers #21 and #23 in the river, as well as the north abutment. The cost savings for this is approximately \$1.25 million.
- CMGC team feedback led to the use of MnDOT owned glu-laminated deck panels for the through-truss rehabilitation. The cost savings for this is approximately \$300,000.
- The CMGC team found a way to build the Latsch Island deck truss approach spans without river equipment (barges) onsite. The cost savings for this is approximately \$1 million.
- As a means to try and reduce cost growth on the through-truss during construction, the *Final Design* team reviewed the recommended strengthening work at each node of the through-truss and provided the CMGC team with criteria on maximum section loss of steel before the Engineer of Record needs to be contacted. This ensures the field team is as efficient as possible in making the important decisions as the work progresses.

Even though the estimated construction costs are projected to be \$20 million over budget, so far during the cost estimating phases on Work Package #5, the CMGC team has reduced the costs between \$4-\$5 million on this work package and approximately \$10 million over all the work packages. So let's now explore how the cost estimating process works.

The CMGC Cost Estimating Process:

The cost estimating process in CMGC is vastly different from traditional design-bid-build. A small team of MnDOT staff is able to meet with the contractor and see all their estimated costs, including direct labor, materials and equipment rates, and all indirects. The contractor is expected to "open their books" to the owner.

Besides the contractor's estimating team for Ames Construction on the project, MnDOT has employed an Independent Cost Estimator (ICE), Armeni Consulting Services, and an Owner's Design Estimate consultant, Stanley Consulting. Both of the estimating consultants, working on behalf of MnDOT, report to the MnDOT Estimating Office and not to the Winona Bridge Project Management team. Each consultant was selected based on their experience and expertise in estimating projects similar to the Winona Bridge project.

All estimators have the ability to ask the CMGC contractor or the *Final Design* team clarification questions to ensure a comprehensive understanding of the scope of work and intent of the contract. Quantities, productivity rates, plans and special provisions and all contract requirements are discussed. *What if* scenarios can be and were considered from a cost perspective.



Winona Bridge Estimating Team during a field site visit.

On the Winona Bridge project, preliminary cost estimates have typically been performed at the 30%, 60% and 90% *Final Design* level, in advance of the bidding phase. This means that after the designs were 30% complete for example, they were provided to the estimators to price and estimate the cost. After the cost estimate pricing is received from the estimating teams, a variance report is developed and shared with the team to assist with efforts to reconcile any significant pricing differences. The contractor's pricing, along with the Owner's Design Engineers' pricing was included with only the variance to the ICE pricing.

During the bidding phase, the goal is to have the CMGC contractor's pricing be within 10% of the Independent Cost Estimator (ICE) and have it validated by the Owner's Estimate prior to award. All work packages on the Winona Bridge Project so far have been within 10% of the ICE.

MnDOT's first CMGC variance report is shown in Appendix A.

These efforts provide much earlier insight into the actual cost for the construction contract and allow the team to look at items that may be driving up the cost due to risk or complexity. Innovative ideas and other potential cost cutting ideas are generated as well.

So, for the Winona Bridge work package #5, these efforts have allowed MnDOT to:

- Have a much earlier understanding of the Work Package #5 costs for rehabilitation and reconstruction of the existing bridge.
- Have a much higher confidence level in knowing where the actual bid pricing will be at in terms of cost.
- Potentially reduce cost growth after letting on Work Package #5 as all the contractors' means and methods have been discussed and incorporated into the plans and specifications.

Appendix A
CMGC Infographic
MnDOT's First Variance Report



The 2013 – 2019 Winona Bridge project is MnDOT's first CMGC project

BENEFITS OF THE CONSTRUCTION MANAGER/GENERAL CONTRACTOR (CMGC) DELIVERY METHOD

WHAT IS CMGC?

In the **CMGC** process the project owner hires a contractor to provide feedback during the design phase before the start of construction. It's an alternative contracting method to Design-Bid-Build or Design-Build.



DESIGNER

CONTRACTOR

The CMGC method is also called "**CONSTRUCTION MANAGER AT RISK**" (CMR).

CMGC is relatively new to the transportation industry.

2014: THE WINONA BRIDGE PROJECT WAS MNDOT'S 1ST CMGC PROJECT.

CMGC is one of **THE FEDERAL HIGHWAY ADMINISTRATION'S EVERY DAY COUNTS** (EDC) initiatives being furthered as an accelerated project delivery method.

THE EDC INITIATIVE is designed to identify and deploy innovation aimed at reducing the time it takes to deliver highway projects, enhance safety, and protect the environment.



2 PHASES

HOW DOES IT WORK?

THE CMGC PROCESS IS BROKEN DOWN INTO 2 CONTRACT PHASES:

In the **1ST** contract phase, **THE DESIGN PHASE**, the contractor works with the designer and the project owner to identify risks, provide cost projections, and refine the project schedule. Then, the contractor and project owner negotiate on the price for the construction contract. If all parties are in agreement with costs, then the **2ND** contract phase, **THE CONSTRUCTION PHASE**, is kicked off and construction begins.

WHY CMGC INSTEAD OF A TRADITIONAL DELIVERY METHOD?

CMGC HELPS SAVE TIME IN 4 PRIMARY AREAS:

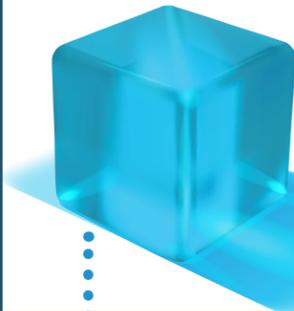
Can begin the project earlier

Design takes less time

Construction takes less time

Overlapping design and construction reduces project time

INDEPENDENT COST ESTIMATOR (ICE)

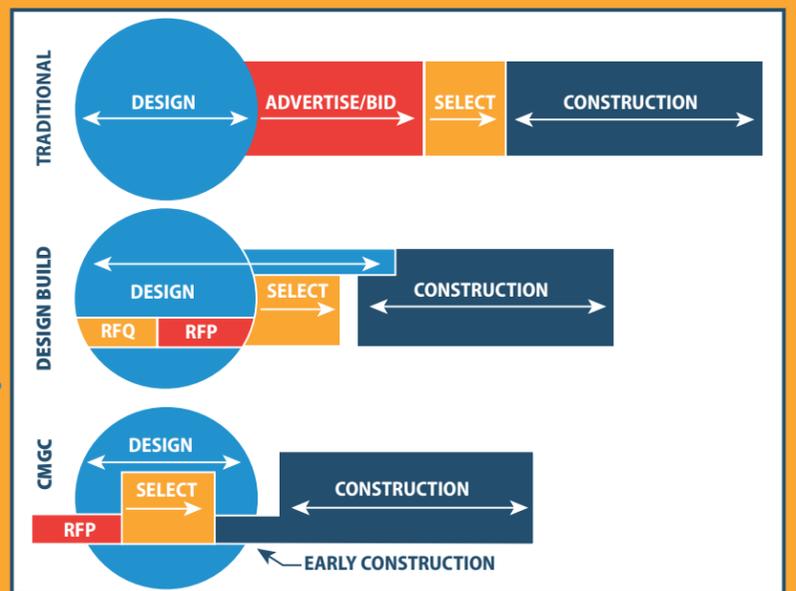


In the CMGC bid process, an **INDEPENDENT COST ESTIMATOR (ICE)** separately estimates the costs for different parts of the construction, to compare with the bid the CMGC submits. The CMGC's bid must be within 10% of the independent cost estimator in order to be accepted.

BENEFITS

WHAT ARE THE BENEFITS OF CMGC?

- FOSTERS INNOVATION
 - ALLOWS FLEXIBILITY
 - IMPROVES COST CONTROL AND COST CERTAINTY
 - FEWER CHANGE ORDERS AND OVERRUNS
 - HIGHER DESIGN QUALITY
 - REDUCES RISK
 - OPTIMIZES SCHEDULES
 - ENHANCES COLLABORATION
 - UPFRONT VALUE ENGINEERING
 - IMPROVES CONSTRUCTABILITY
- (The design only includes features that can be built.)



CMGC IMPACTS ON THE WINONA BRIDGE PROJECT

- REDUCED THE COMPLEXITY OF DEALING WITH MULTIPLE CONTRACTORS
- AIDED IN WINONA COMMUNITY INVOLVEMENT
- MAKES RENOVATION OF THE ADJACENT HISTORIC BRIDGE MORE PREDICTABLE
- ALLOWED EARLIER ENGAGEMENT OF THE HISTORICAL TEAM
- REDUCED RISKS

AMES CONSTRUCTION IS THE WINONA BRIDGE CMGC CONTRACTOR

Also the **GENERAL CONTRACTOR** on the nearby Dresbach Interchange project (shown). **OUTSTANDING SAFETY RECORD.** History of **QUALITY BRIDGE PROJECTS, ON-TIME DELIVERY, AND PROFESSIONALISM.**



Ames Construction, Inc.®

Building a Better Mississippi River Crossing



Cost Comparison Analysis
 S.P. 8503-46, Work Package 1 (Pile Procurement)
 Submission Date: April 9, 2014
 Estimate No. 1

Item No.	Description	Unit	Qty	Contractor Bid W/O OH & Profit	Owner's Estimate	Contractor/I CE	Contractor/ Owner
2104.601	Haul Structural Steel	Lump Sum	1	\$150,000.00	\$150,000.00	Within 10%	100%
2452.507	CIP Concrete Piling Delivered	LF	8762	\$1,999,926.50	\$1,999,751.26	Within 10%	100%
	Subtotal W/O Fixed Markup %			2,149,926.50	2,149,751.26	Within 10%	100%
	Total with Fixed Markup %			\$2,407,917.68	\$2,407,721.41	Within 10%	100%