

MDT Quarterly Progress Report for July - Sept 2012

Project Title: **Determination of Material Properties and Deflection Behaviors for Contemporary Prestressed Beam Design**

Reporting Period: July 1, 2012 – September 30, 2012
First Quarter of State Fiscal Year 2013

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Background

The primary goal of this project is to provide guidance specific to Montana design and construction practices that will result in more efficient prestressed concrete bridge structures. In this regard, the project is focused on providing improved concrete material properties in conjunction with a better understanding of girder deflection behaviors.

Specific objectives consist of:

- 1) determining through tests and analyses appropriate values for the elastic and non-elastic properties of the typical concrete used in MDT prestress concrete bridge girders; and
- 2) measuring the deflections through time experienced by girders in an actual bridge structure, comparing these deflections to those estimated analytically, and suggesting appropriate modifications in the analysis process to produce better deflection predictions.

These objectives will be accomplished through the six tasks reported on below.

Task 0: Project Management

The research team met with the technical panel at the end of August to discuss the of Cretex's decision to delay installing onsite batch facilities at the Helena Plant for at least a year. The consensus of the group was that if the concrete being produced by Helena Sand and Gravel (HSG) for Cretex was sufficiently similar to that which Cretex would produce onsite, the project could move forward with the HSG concrete. Factors that could be important in this regard brought up during the discussion included basic mixture proportions, aggregate source and gradation, admixtures being used, compression strengths being realized and general consistency/quality of the delivered product. The decision was made to pursue a meeting with Cretex and HSG to learn more about the current and future concrete to be used by the Helena Plant, so that a final conclusion could be reached on whether to move ahead with sampling and testing the concrete yet this fall. When Mike Parady at Cretex was reached in mid-September, he indicated that they were about to cease operations for the season. Rather than rushing forward with this critical task, the decision was made to meet with Cretex and HSG during the off-season, with concrete sampling and testing to then be conducted in the spring, if deemed appropriate. With MDT's consent, a meeting will be pursued with Cretex and HSG on this matter in the December to February timeframe.

Note that it may be time to amend the project contract to reflect changes in project tasks and scheduling that have resulted from the delay in beginning the concrete sampling and testing effort. That being said, the schedule may be better known after the meeting with Cretex.

Task 1: Literature Review

The purpose of this task is to review the available research on, and the state-of-the-practice relative to determining the concrete material properties and deflection behaviors of prestressed concrete bridge girders. Work on this task includes directly contacting agencies that have been actively pursuing these issues.

During this reporting period work continued on this task. A draft of this review should be completed during the next reporting period.

Task 2: Material Properties Measurement

This task consists of laboratory work to establish elastic and non-elastic concrete property estimates that can be used in design. These estimates will be determined by measuring the properties of an appropriate sampling of the specific concrete mixture typically used in MDT prestressed beams. This work will be done using concrete from the Cretex West facility in Helena, MT.

As stated above, this work will proceed in the spring of 2013, pending further discussion with Cretex West and HSG regarding the current and future concrete to be used at the Helena Plant.

In preparation for the material testing effort, the frames required for creep testing were constructed.

Task 3: Measure Immediate and Long Term Girder Deflections

Deflection monitoring will be performed on one of MDT's phased bridge construction projects. Deflection measurements will be collected for a selection of the girders from a single bridge. Measurements will be made immediately after strand release, and then prior to transport, after erection (prior to deck placement), and after deck placement for both Phase 1 and Phase 2 of construction. It is anticipated that this work will be performed in state fiscal year 2013, following identification by MDT of an appropriate project for this purpose. Deflection measurement protocols will be prepared prior to beginning this work.

As part of the discussion of moving ahead in Task 2 and sampling and testing the concrete produced offsite, further discussion of specific bridge projects (and their timelines) that could be used for the this deflection monitoring work be useful for planning and scheduling purposes.

Task 4: Analysis of Results

The results of the research program will be thoroughly analyzed in this task. Analyses will be conducted as possible and appropriate to provide concrete material properties and measures of their variability, and measured and predicted girder deflections will be compared using relevant codes and potential computer model(s). Work on this task will begin as results are obtained.

Task 5: Final Report, 1/2-Day Workshop and Dissemination of Results

The research team will prepare a final report documenting the methodologies used, data collected, and complete findings of this investigation. The research team will also conduct a 1/2-day workshop at MDT in Helena on this study and the implications of the results on design and construction practices. The research team will document all aspects of the work performed as it is completed for inclusion in the final report and workshop, as appropriate.

Budget and Schedule

Expenditures on this project through September 30, 2012 are summarized in Table 1. If the decision is made to proceed and sample and test concrete from the local batch plant, this work is expected to start in the spring of 2013. The schedule below in Table 2 reflects this revised start date. This schedule also reflects the delay in completing the literature review.

Table 1: Summary of Expenditures

Budget Category	Budgeted Funds	Spent This		Total Spent	Total Remaining
		Period			
Salaries	\$49,180	\$1,977		\$4,524	\$44,656
Benefits	\$11,464	\$635		\$1,173	\$10,291
In-State Travel	\$2,666	\$0		\$107	\$2,559
Subcontracts	\$47,132	\$42		\$4,595	\$42,537
Contracted Svcs	\$0	\$0		\$600	-\$600
Supplies/Minor Eq/Main	\$0	\$0		\$0	\$0
Direct Costs	\$110,442	\$2,654		\$10,998	\$99,444
Indirect Costs	\$17,662	\$531		\$2,200	\$15,462
Total	\$128,104	\$3,185		\$13,198	\$114,906

Table 2: Schedule of Tasks

Task	2011		2012				2013				2014				2015
	Jul - Dec	Jan-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar
Project Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Literature Review	X	X	X												
Measure Matl Prop				X	X	X	X	X							
Girder Deflections					X	X	X	X	X						
Analysis of Results					X	X	X	X	X	X			X		
Report/Wkshp													X	X	

Table 3: Schedule of Deliverables

Task	2011		2012				2013				2014				2015
	Jul - Dec	Jan - Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar
Kickoff Meeting	X														
Technical Memo ^a		Task 1						Task 2 ^b	Task 3	Task 4					
Quarterly Report ^a	X	X	X	X	X	X	X	X	X	X					
Draft Final Report															X
Final Report															X
Half Day Workshop															X

^aTechnical memorandums and quarterly progress reports will be completed at the end of the month following completion of the appropriate task and/or quarter

^bShould unforeseen delays in girder casting occur, the research team can provide interim results from the previous three sampling periods to MDT.