

Date: April 24, 2020
Project: I-69 Reconstruction
Submittal:



Re: CEE4905 Senior Design Spring 2020

LETTER OF TRANSMITTAL

To: Melanie Watkins, PhD, PE

Copy to: Pierce Treend, EIT

Attn: Work to date

1400 Townsend Drive
Houghton MI, 49931
Tel. 906.555.3201
Fax 906.962.2587

WE ARE SENDING YOU: Attached Under separate cover

via hand_the following items:

Description: As requested from CCBR, the Project Design Report with plan, estimate and construction schedule

- | | | |
|---|---|---|
| <input type="checkbox"/> For payment | <input type="checkbox"/> Approved as submitted | <input type="checkbox"/> Resubmit copies for approval |
| <input type="checkbox"/> For your use | <input type="checkbox"/> Approved as noted | <input type="checkbox"/> Submit copies for distribution |
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REMARKS:

- Design Report
- As Builts
- Plans
- Bridge Calculations
- Estimate and Construction Schedule

BY: Copper Country Bridge and Road

If enclosures are not as noted, kindly notify us at once.

Design Report

MDOT I-69 Lansing Bridge and Road Reconstruction



Copper Country Bridge & Road

Mary Kinney
Jack Martzke
Matt Nordlund
Stephen Rowley

Hurricane Engineering

Melanie Kueber Watkins, PhD, P.E.

Michigan Technological University
1400 Townsend Drive
Houghton, MI 49931



March 25, 2020

Dear MDOT Design Staff,

Enclosed is the Draft Report published by Copper Country Bridge and Road (CCBR) for the I-69 Lansing Reconstruction project. Per your request of January 20, 2020, a design of the I-69 mainline and turning roadways between Airport Road and the interchange with I-96 was necessary to improve safety and mobility in the corridor. The project scope includes the design of replacement bridges for structures S10, S11, and S17 of 19043. Maintenance improvements are specified for S16 and S19 of 19043. In addition, pavement designs of mainline I-69 and associated ramps were created. A Maintenance of Traffic plan was created to safely maintain traffic throughout the project site during the duration of construction. You will find the proposed bridge and road reconstruction design plans and details, as well as the Maintenance of Traffic plan in this report.

Copper Country Bridge and Road is dedicated to the design and construction of sustainable, economical, and safe infrastructure solutions. The completed designs represent hours of careful and dedicated work to ensure the creation of a sustainable, economical, and safe reconstruction plan for the I-69 Lansing Project.

Special thanks to Melanie Kueber Watkins, PhD, P.E. and Pierce Treend, E.I.T. for their guidance and feedback during the design process. Additional thanks to the faculty and staff of the Civil and Environmental Engineering Department at Michigan Technological University for their commitment to quality education and willingness to answer design questions.

If you have any questions or concerns do not hesitate to reach out to our engineering staff. Thank you for your time and we look forward to working together in the future.

Sincerely yours,

Mary Kinney, Jack Martzke, Matt Nordlund, and Stephen Rowley

Project Engineers
Copper Country Bridge and Road
Grover C Dillman Hall, Suite 109
1400 Townsend Dr
Houghton, MI 49931

Please note, this report, titled "CCBR Design Report," represents the efforts of undergraduate students in the Civil and Environmental Engineering Department at Michigan Technological University. While the students worked under the supervision and guidance of associated faculty members, the contents of this report should not be considered professional engineering.



1.0 Executive Summary

The MDOT I-69 Road and Bridge Reconstruction Project, sponsored by HNTB, is the section of I-69 from I-96 to Airport Road in Lansing, MI. This project consists of pavement removal and replacement, bridge removal, resurfacing and replacements, as well as, pavement markings, signing, and traffic control.

The reconstruction of the bridges consists of 3 structures, S10, S11, and S17. These bridges were recommended to be demolished and rebuilt using precast prestressed concrete. Site geometry and layout constraints influenced the sizing design of the prestressed girders. The design of bridge S10 of 19043 has two spans with both about 132 ft in length. S10 of 19043 is designed using new concrete girders which can reach spans of up to 140 ft. Bridges S11 and S17 of 19043 will have newly designed girders. Bridge S11 of 19043 has four spans of various lengths, with the largest span at 132.4 ft. Complete design details will follow in the report and are outlined in the plans.

Based on current conditions as found using Google satellite imagery, bridges S16 and S19 are in fair condition. The bridges were built in 1981 and do not contain any fracture critical elements like the connections in bridges S10, S11, and S17. The recommendation for S16 and S19 is a repainting of the steel superstructure. Per MDOT BDM 12.07.07 the paint color is light gray and is AMS-STD-595 paint color 16440.

Both S16 and S19 of 19043 are recommended for a new deck overlay. Based on satellite imagery, there was ponding of water on the deck and sections of pavement were cracking and spalling, which led to CCBR's recommendation of resurfacing the decks. A concrete overlay will be performed. The BDM recommends a deep overlay as a long term fix with a design life of 20-30 years (12.04.06).

The reconstruction of the roads consists of all existing pavement. Mainline I-69 will have two twelve foot travel lanes in each direction. Outside shoulders are 10 ft wide and interior shoulders are 8 ft wide. Per MDOT RDM Appendix 3A the required lane width for freeway roads is 12 ft. The required shoulder width is 10 ft for outside shoulders and 8 ft for median shoulders. On freeway ramps the right shoulder required to be 8 ft, while the left shoulder is 6 ft. Pavement design thickness is 10.5" thick without reinforcement. See final drawings, which are attached to the report, for detailed cross section plans. All MDOT codes and standards which applied to existing roadways will still be followed in accordance with AASHTO.

Within the construction influence area, of about 6 miles of I-69 mainline, four (4) stages of construction were developed, with two (2) pre-stage steps. These stages break down the construction process while also being able to maintain traffic, both ways, at all times. The pre-staging consists of implementing temporary signing, widening along outside shoulders, creating a median traffic crossover, and bringing in all barrels and concrete barriers. The stages

CCBR DESIGN REPORT



flip between westbound and eastbound one way traffic and call for some nightly highway shutdowns.

The I-69 Reconstruction project is expected to take 354 days. The project is scheduled to start on March 30th 2020 and work for the year will conclude on September 15th 2020 . The project will restart the following year on March 8th 2021 and work will be completed by August 4th 2021. The total project cost is \$133,977,764.