DALHOUSIE UNIVERSITY
Department of Civil and Resource Engineering

Group 11
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NEW 2 OR 3 LANE HIGHWAY BRIDGE PROJECT

INTRODUCTION

The government of Nova Scotia is seeking to twin a section of highway to facilitate further development outside of the province's capital city. The alignment of the new length of twinned highway includes a 60-meter bridge over a river and a local trail, and the province is requesting design services for the new bridge for a 75-year design life. The bridge is to have two lanes with the potential to accommodate a third lane later in its design life

PROJECT SCOPE

The province requires a set of final bridge drawings to be issued for tender as well as Class B cost estimate submitted by the engineering design team.

DESIGN PROCESS

CONCEPT SELECTION
- Research Design Proposal
- Develop Preliminary Designs
- Prepare Formal Options Analysis Report

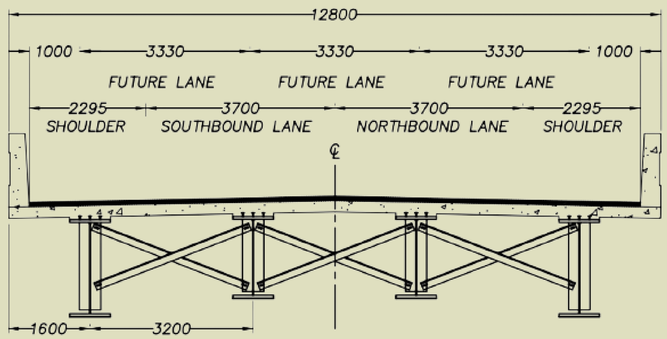
LOADING ANALYSIS
- Determine Different Loads
- Determine Loading Factors For Load Cases
- Identify Governing Load Cases

SUPERSTRUCTURE DESIGN
- Design Girder Elements for Construction Loading
- Design Bridge Deck for Composite Action
- Design Lateral Load Resisting System
- Design Bearing Stiffeners and Select Expansion Joints

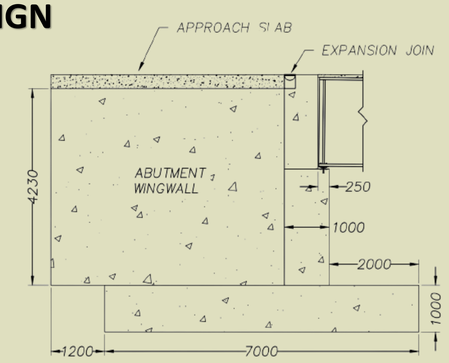
SUBSTRUCTURE DESIGN
- Design Bridge Abutments
- Design Footing
- Design Wingwalls
- Design Approach Slab

CONSTRUCTION WORK PACKAGE
- Draft Construction Drawings
- Class B Cost Estimate

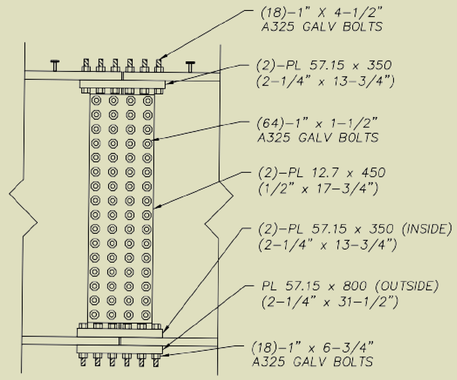
DETAILS OF DESIGN



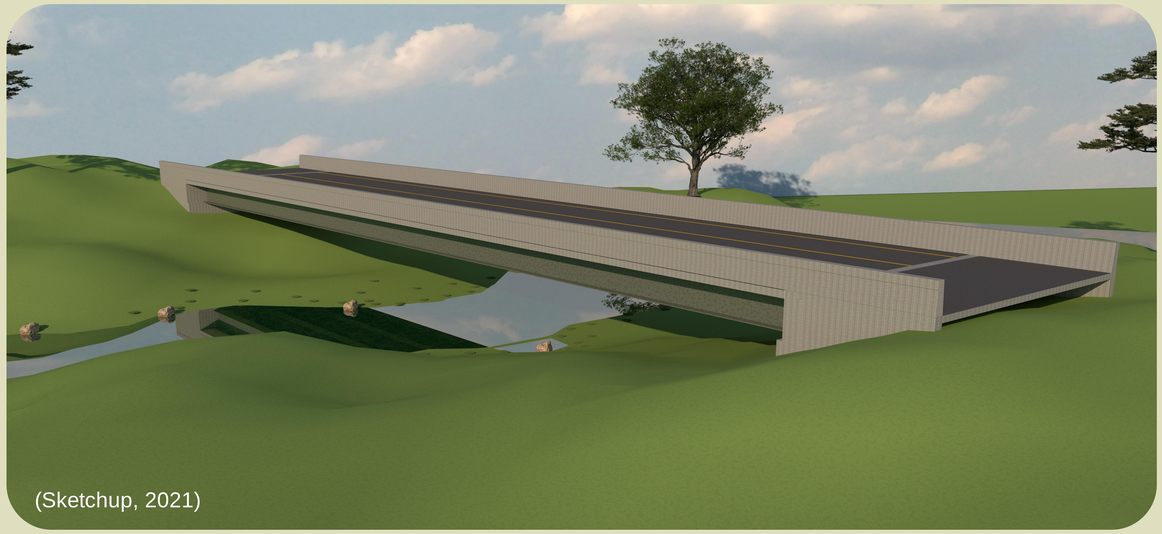
Bridge Cross-Section (AutoCAD, 2021)



Abutment Details (AutoCAD, 2021)

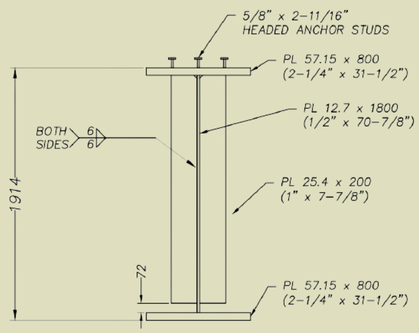


Exterior Splice Details (AutoCAD, 2021)

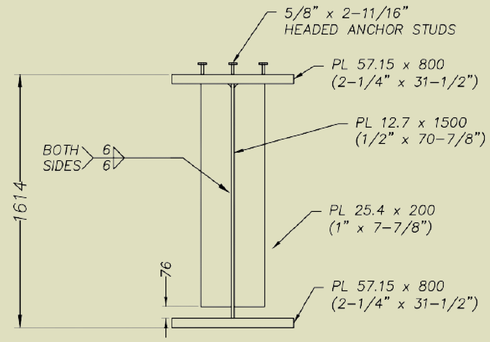


(Sketchup, 2021)

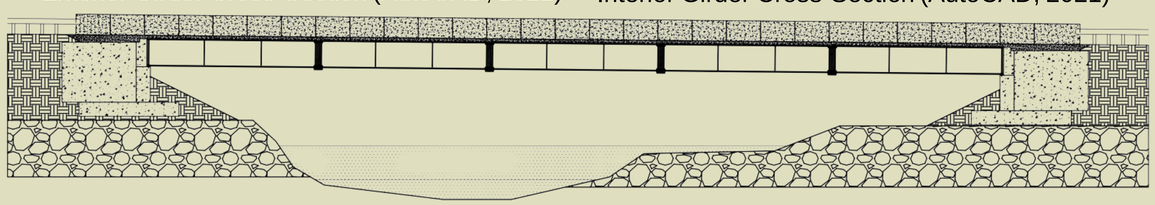
COST ESTIMATE	
Bridge Structure	$1,396,050
Earth Works	$80,436
Concrete Works	$331,843
Asphalt Works	$44,193
Subtotal	**$1,852,523**
Project Management	$228,995
Engineering Fees	$140,920
Mobilization / Demobilization	$176,150
Class B Estimate Contingency	$528,449
Total Budget Amount	**$2,927,036**



Exterior Girder Cross-Section (AutoCAD, 2021)



Interior Girder Cross-Section (AutoCAD, 2021)



Bridge Span Elevation View (AutoCAD, 2021)

CONCLUSIONS AND RECOMMENDATIONS

Group 11 has designed a 3-lane highway bridge in compliance with the CSA S6-14 standard. The slab-on-girder system spans 60-m and has a width of 12.8 m. The superstructure consists of four steel wide flange girders and is structurally composite with the 225-mm reinforced concrete deck. The lateral load resisting system is comprised of steel angles arranged in a cross pattern located every 7.5 m along the span. The substructure is a semi-retaining abutment system with wingwalls arranged in a U-pattern. A detailed quantity take-off was completed to support the development of Class B cost estimate which indicated an approximate $3 million construction cost.

REFERENCES

Canadian Standards Association. (2014). *Canadian highway bridge design code* (CAN/CSA Standard No. S6-14)

Canadian Standards Association. (2014). *Handbook of Steel Construction* (CAN/CSA Standard No. S16-14)

SketchUp. 2021 [Computer Software]. Trimble Inc. Sunnyvale, CA, USA.

Means Engineering. (2012). R.S. Means Cost Data. John Wiley & Sons.

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