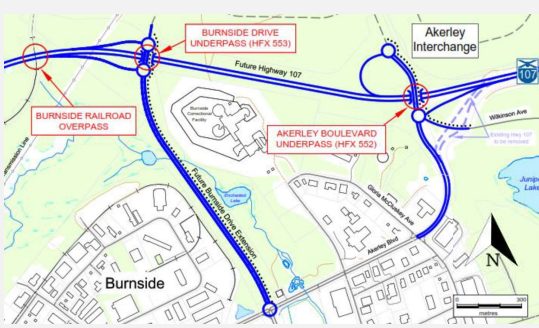


# BRIDGE DESIGN FOR BURNSIDE DRIVE UNDERPASS

## INTRODUCTION

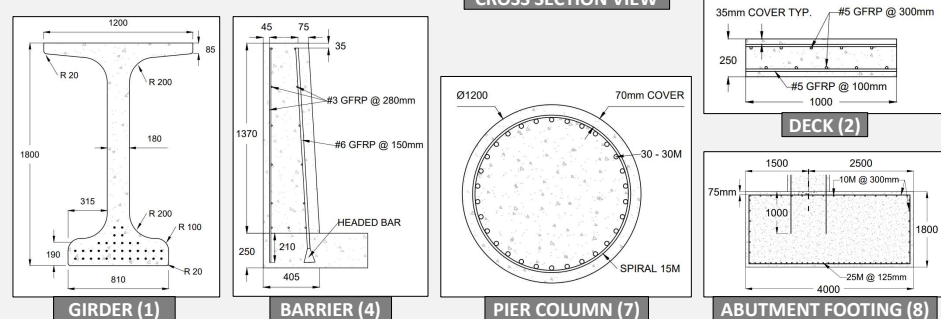
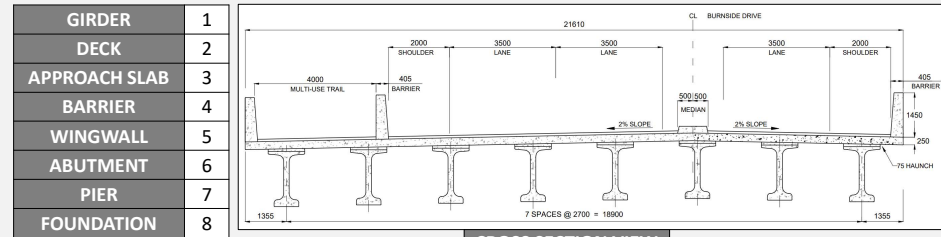
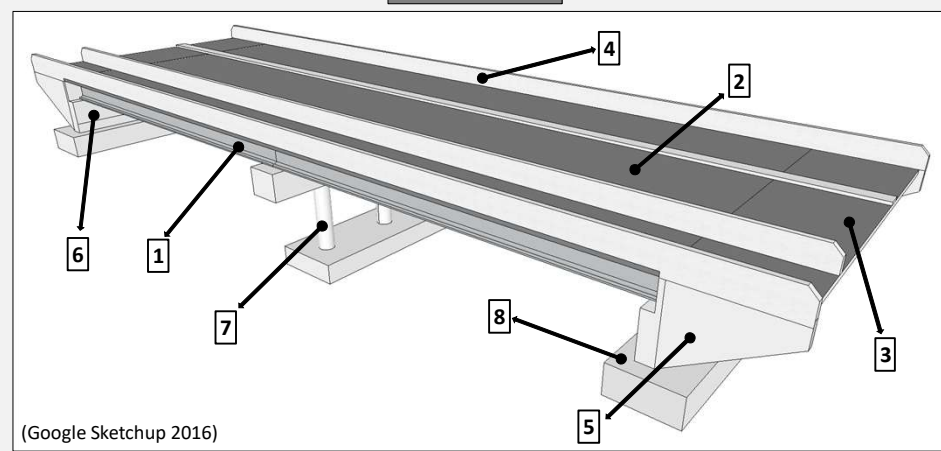
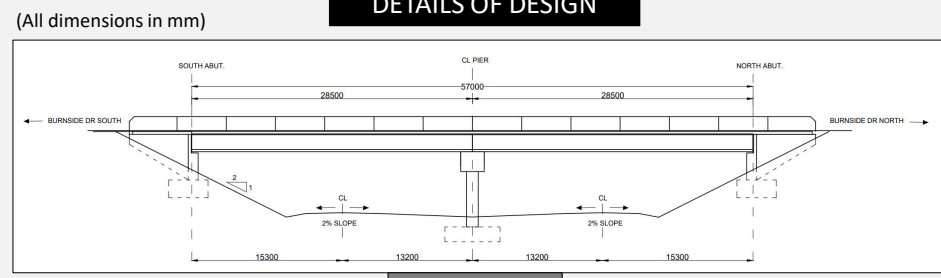
Burnside Drive Underpass is part of the Highway 107 expansion project for the Government of Nova Scotia located in Burnside, NS. The client, Nova Scotia Department of Public Works (NSDPW), requested a girder-type bridge configuration and that concrete and steel girder options be evaluated. The location is considered a greenfield site and will not need to accommodate traffic during construction. The scope of work is to provide engineering services for the design of the new bridge.



## DESIGN PROCESS

STEP 1: OPTIONS ANALYSIS
<ul style="list-style-type: none"> <li>Steel Plate Girder Option</li> <li>NEBT Concrete Girder Option</li> </ul>
STEP 2: LOAD ANALYSIS
<ul style="list-style-type: none"> <li>Construction Loading</li> <li>Dead Load</li> <li>CL-625 Live Load (CSA S6-19)</li> </ul>
STEP 3: SUPERSTRUCTURE DESIGN
<ul style="list-style-type: none"> <li>Prestressed NEBT1800 concrete girder design</li> <li>Design of approach slabs and deck using simplified method of analysis for live load with GFRP (CSA S6-19)</li> <li>Design of barriers for Test Level 4 (TL-4) with GFRP</li> </ul>
STEP 4: SUBSTRUCTURE DESIGN
<ul style="list-style-type: none"> <li>Design of bridge piers considering wind load</li> <li>Wingwalls, abutments, and foundation design using soil parameters from geotechnical report</li> </ul>
STEP 5: DESIGN PACKAGE
<ul style="list-style-type: none"> <li>Class 'A' Cost Estimate</li> <li>Bridge Engineering Drawing Package</li> </ul>

## DETAILS OF DESIGN



## CLASS 'A' COST ESTIMATE

EARTHWORKS	\$653,000.00
SUPERSTRUCTURE	\$2,094,000.00
SUBSTRUCTURE	\$889,000.00
LIFE CYCLE	\$52,000.00
CONTINGENCY	\$655,000.00
<b>TOTAL</b>	<b>\$4,343,000.00</b>

## CONCLUSIONS AND RECOMMENDATIONS

The final design consists of a two-span continuous bridge supported by 8-NEBT1800 concrete girders per span. The total bridge span is 57 m with a width of 21.61 m, and the structure is supported on shallow foundations. The final cost for the bridge construction is \$4,343,000.00.

## OTHER CONSIDERATIONS

- Concrete option reduced lifecycle costs and environmental impact through elimination of coatings
- GFRP in superstructure elements is non-corrosive and thus prolongs lifespan of bridge and improves sustainability
- Contingency in cost estimate to account for delays in construction, change in material and resource costs over the life of the project, inflation, etc.



## REFERENCES

Canadian Standards Association. 2019. CSA S6-19: Canadian Highway Bridge Design Code. CSA Group, 178 Rexdale Boulevard, Toronto, Ontario, Canada.

Precast Prestressed Concrete Institute. 2014. Bridge Design Manual: Third Edition, Second Release, August 2014. Printed in the USA. MNL-133-14.

ISIS Canada Research Network. 2007. Reinforcing Concrete Structures with Fibre Reinforced Polymers. Design Manual No. 3. A Canadian Network of Centres of Excellence, Manitoba, Canada. ISBN 0-9689006-6-6.