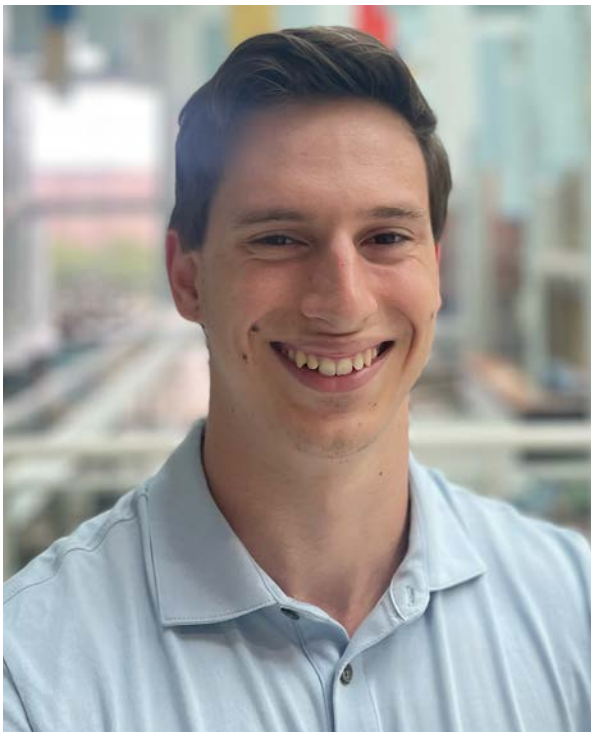
ENGINEERS GEOSCIENTISTS MANITOBA

2024 STUDENT ACHIEVEMENT AWARD

Anthony Guerreiro



With research being very minimal in effects of cold environment exposure to steel I girder and reinforced concrete deck composite bridge structures, Anthony aimed at designing and testing a structure that could be used as a baseline for future work.

Anthony's objective was to construct a replicable 1:6 scale model of a typical steel I girder bridge structure and subject it to ultimate structural failure to determine baseline physical behaviors of the structure. These behaviors will later be used for comparison with an identical structure tested at a much colder temperature to determine physical the effects of cold exposure to bridge structures.

In order to do this project, Anthony helped design, model, and create the reinforced concrete structure. He also used various sensors and acquisition techniques for this work including concrete and steel strain gauges and LVDT (linear variable displacement transformers) monitors. He additionally worked on creating a scaled downloading device which represents the design truck used in the AASHTO LRFD bridge design manual (used by Manitoba Transportation and Infrastructure).

Anthony modeled and created a finite element model and represented the real-world failure modes, distribution factors, modulus of elasticity and deflections. He found that the finite element model was weaker than the real-world tests which could be attributed to the model being highly simplistic in nature and the steel materials used being stronger than specified. With better material details specified in the finite element model, a closer match to the experimental strength capacity of the bridge could be achieved.

Anthony's work is already being used for additional experiment setups in a larger project to understand environmental effects on steel I girder and reinforced concrete deck composite bridge structures colder temperatures.