

# Problem Statement and Goals

## MTOBridge

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Table 1: Revision History

Date	Developer(s)	Change
9/22/2022	Pedram Yazdinida	First Draft
9/24/2022	Pedram Yazdinida	First Revision
9/25/2022	Pedram Yazdinida	Second Revision

## 1 Problem Statement

### 1.1 Background

For years, Bridge engineers in Ontario have based their bridge analysis on the Canadian Highway Bridge Design Code (CHBDC) (CSA S6-19) which typically features conservatism and adds excessive costs. With the development of refined methods of analysis, engineers can precisely determine the properties and constraints of the proposed design. Nevertheless, the new methods of analysis have yet to be offered within a one-stop program with an intuitive and simple UX. Using refined methods of analysis to precisely determine the load-carrying capacity of bridge members would allow bridge engineers to make well-informed decisions on bridge repair and load posting as well.

### 1.2 Problem

As part of a direct collaboration with Ontario Ministry of Transport, the proposed solution will take advantage of the refined methods of analysis developed

by the Department of Civil Engineering to create a full-fledged application that can easily elevate the computations done by Bridge Engineers. MTOBridge will package the existing engine written in MATLAB with modern interactive User Interface (UI), well-defined Input/Output (I/O), and standard bridge section Database. The program will allow engineers to intuitively input their specifications on load, material, geometry, and prestress where the engine is then used to solve for variables on ultimate flexure, shear and torsion. The user will have the ability to switch between the refined and traditional methods of analysis, visualizing the cost savings and improvements across the board. Finally, the output will also include interactable graphs and charts where the user can find further specific information based on a given point.

### 1.3 Inputs and Outputs

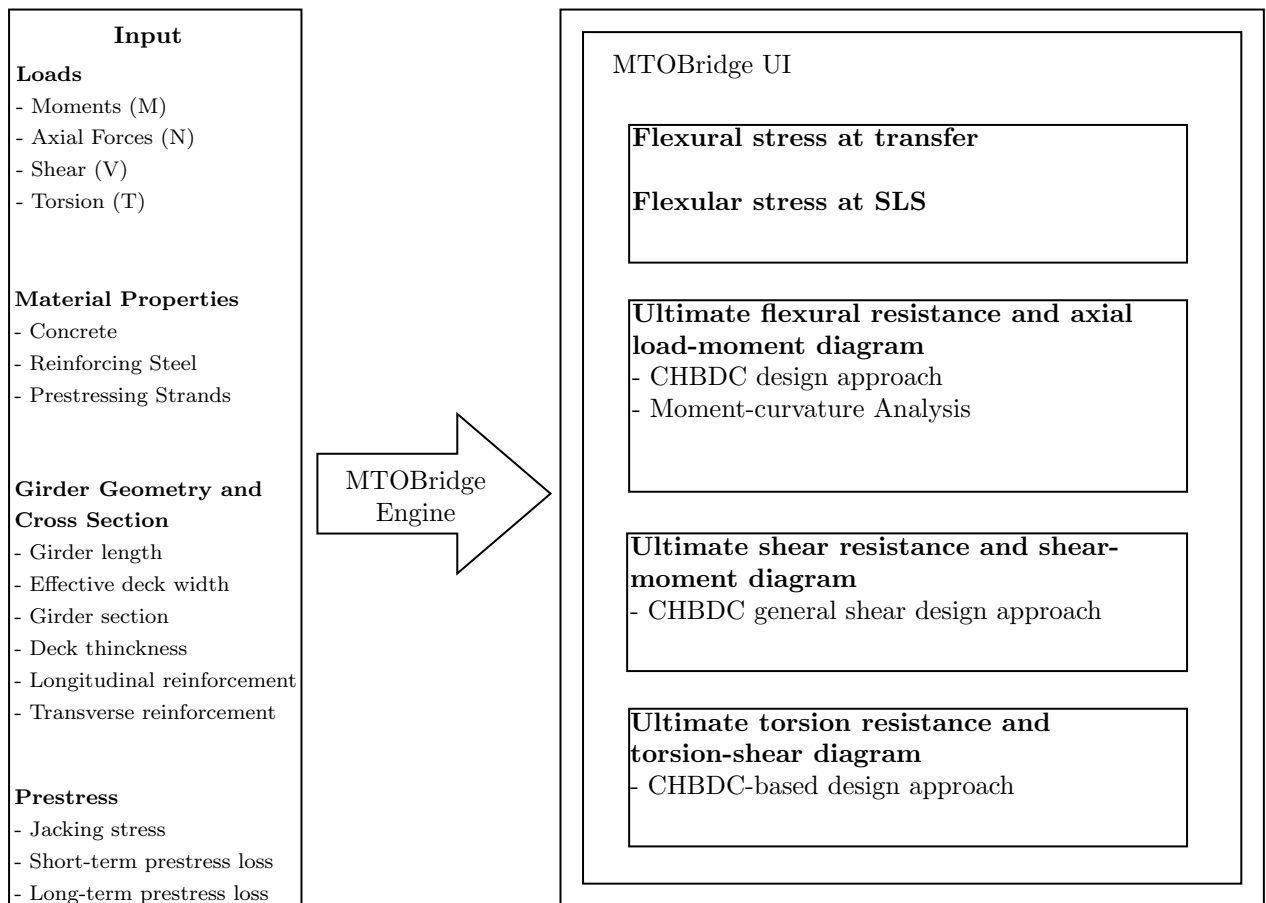


Figure 1: MTOBridge Data Flow

## **1.4 Stakeholders**

- Ontario Ministry of Transport
  - The proposed program will be primarily used by Engineers within Ontario Ministry of Transport.
- Department of Civil Engineering, McMaster
  - The proposed program will be directly developed in collaboration with Department of Civil Engineering.
- Department of Software Engineering, McMaster
  - The proposed program will be directly developed by Engineers from the Department of Software and Computing.

## **1.5 Environment**

- Compatible with the latest Windows 10 versions (20H1+)
- Fully operational offline
- Requires C++ GNU compiler

## **2 Goals**

### **2.1 Interactive UI**

### **2.2 Ease of Use**

### **2.3 Graphic Output**

### **2.4 Cost Savings**

### **2.5 Visualizing the Improvements**

## **3 Stretch Goals**

### **3.1 in-App Sketch function**

### **3.2 Customizable UI**