



Undergraduate Research Program

Department of Civil Engineering and Construction Management

Research Duration:	Summer 2025 (June – August 2025)
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Title of Project:	Comparative Study of Precast Pretensioned and Post-Tensioned Concrete Girders for Highway Bridges

Introduction

The use of precast prestressed concrete girders is common for highway bridges in the United States. These girders can be fabricated using either pretensioned or post-tensioned methods. It is crucial for students to understand the differences between these two types of prestressing in terms of fabrication, construction, analysis, and design. Specifically, they should grasp the structural behavior of both pretensioned and post-tensioned concrete girders. This project aims to highlight these differences through numerical analysis of a simple-span bridge.

Goals

The goals of this project are to: 1) train students in the basic concepts of highway bridge analysis and design; 2) provide students with knowledge of both pretensioned and post-tensioned concrete girders; and 3) teach students the fundamentals of finite element analysis tools.

Expectations and Outcomes

Students will learn the fundamentals of bridge analysis and design, with a focus on prestressed concrete design concepts and practices. By expanding the scope of the summer research program in 2024, which centers on developing a finite element model for precast pretensioned concrete girders while accounting for time-dependent effects such as shrinkage and creep, this project will provide students with a comprehensive understanding of the fabrication, construction, analysis, and design of both pretensioned and post-tensioned concrete girders for highway bridges. Students will compare the structural behavior of these two prestressing methods through working stress designs to learn about their differences. By gaining hands-on experience with state-of-the-art analysis tools, students will be well-prepared for their future careers.