# Research Project Highlight

# Performance Monitoring of Centennial Bridge Using Fiber Optic Sensing

*Project #* NCTRDJ

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**Start-End Dates:**
January 1, 2024 – December 31, 2026

**Abstract**
Fiber optic sensing (FOS) provides distributed strain or temperature measurement along the length of fiber optic cables that can be embedded in concrete or attached to the surface of a structure. It has proven useful for both structural health monitoring (SHM) and field and laboratory testing. The main objective of this proposal is to investigate the use of fiber optic sensing (FOS) strain measurements in critical locations of a new reinforced concrete bridge to be constructed on the UC Berkeley campus to evaluate structural performance over time, and to prepare for future earthquake events. Regarding structural performance, FOS will be used to measure: 1) strains and load distributions during and after construction, which could inform lean construction methods, 2) strains to evaluate the prestressing process and long-term creep effects or other environmental factors that can cause loss of prestress, 3) load distribution (both static and dynamic) to evaluate seasonal temperature effects and real dynamic strains during vehicle passage to quantify long-term fatigue loading. Measurements will be interpreted in comparison with computational simulations. Regarding damage detection, the FOS system will be in place long-term to provide rapid post-earthquake measurement of internal damage, potential loss of prestressing, and to evaluate any long-term deformations such as those caused by settlement due to embankment movement.

**Deliverables**
A PEER report and several conference and journal papers describing and interpreting the computational modeling results. Monitoring data will also be made available to other researchers via designsafe

**Research Impact**
The proposed work could provide very practical guidance on how to install embedded fiber optic cables and how to interpret monitoring data to provide useful information on bridge performance during construction, typical traffic loading, and future seismic events, and in the process enable creation of a digital twin. In the long term, the project will also provide understanding and guidance on design assumptions for bridge structures and inform future monitoring objectives.

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**Project Image**



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