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| **UTC Project Information** | |
| Project Title | MPC-609 – Durable Bridges Using Glass Fiber Reinforced Polymer and Hybrid Reinforced Concrete Columns |
| University | University of Utah |
| Principal Investigator | Chris P. Pantelides, Ph.D., P.E., S.E |
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| Funding Source(s) and Amounts Provided (by each agency or organization) | USDOT, Office of the Assistant Secretary for Research and Technology  $74,173  Owens Corning and Corebrace LLC  $104,045 |
| Total Project Cost | $178,218 |
| Agency ID or Contract Number | 69A3551747108 |
| Start and End Dates | February 18, 2020 to July 31, 2024 |
| Brief Description of Research Project | The objective of this project is to investigate alternative methods for constructing bridge columns in high seismic regions using longitudinal Glass Fiber Reinforced Polymer (GFRP) bars and GFRP spirals; in addition, self-centering in terms of Carbon Fiber Reinforced Polymer (CFRP) post-tensioning of bridge columns and damage-resistant end joints as rocking devices will be utilized. Hybrid systems of reinforcement promote sustainable performance, long service life, and cost-effective maintenance of bridge columns in harsh weather. In addition, analytical models will be developed for self-centering in terms of post-tensioning of columns in bridges with CFRP corrosion-free tendons. The proposed hybrid systems consist of two cast-in-place (CIP) columns: one with two layers of all-GFRP longitudinal bars and spirals, and one with an inner layer of conventional steel longitudinal bars and a GFRP spiral, and an outer layer of longitudinal GFRP bars and spirals. In addition, two precast post-tensioning columns with resilient end joints will be investigated with the same hybrid reinforcement. Post-tensioning accommodating self-centering will be designed with high-strength CFRP tendons. |
| Describe Implementation of Research Outcomes (or why not implemented)  Place Any Photos Here | Currently, the Departments of Transportation in areas where corrosion is prevalent are examining the use of glass fiber reinforced polymer (GFRP) bars and spirals. Nevertheless, in seismic regions the use of such bars alone is not considered favorable. This research examines a combination of both steel and GFRP bars and spirals for providing both adequate protection against corrosion and superior seismic performance. |
| Impacts/Benefits of Implementation  (actual, not anticipated) | The benefit of this research is to create durable bridge columns with high resistance to corrosion and superior performance. The seismic performance was enhanced by providing post-tensioning using high strength steel bars, which reduced the residual displacement of both all-steel and hybrid the bridge columns. |
| Web Links   * Reports * Project Website | * MPC Report – [Durable Bridges Using Glass Fiber Reinforced Polymer and Hybrid Reinforced Concrete Columns](https://www.ugpti.org/resources/reports/details.php?id=1152) |