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| **UTC Project Information** | |
| Project Title | MPC-583 – Composite Repair for Concrete Bridges Subjected to Alkali-Silica Reaction |
| University | University of Colorado Denver |
| Principal Investigator | Yail Jimmy Kim |
| PI Contact Information | Professor  University of Colorado Denver  Phone: (303) 315-7497  Email: jimmy.kim@ucdenver.edu  ORCID: 0000-0002-4286-1461 |
| Funding Source(s) and Amounts Provided (by each agency or organization) | USDOT, Research and Innovative Technology Administration  $50,000  Faculty time and possible external scholarship/support awarded to participating individuals  $50,000 |
| Total Project Cost | $100,000 |
| Agency ID or Contract Number | 69A3551747108 |
| Start and End Dates | December 14, 2018 to July 31, 2022 |
| Brief Description of Research Project | This research aims to quantify the deleterious effects of alkali-silica reaction (ASR) on the behavior of concrete bridges, to examine the efficacy of composite-based repair to improve the capacity of ASR-damaged concrete members, to develop a theoretical model which can predict the performance of ASR-damaged and composite-repaired concrete members, and to propose design/practice recommendations for the implementation of the proposed composite repair method. |
| Describe Implementation of Research Outcomes (or why not implemented)  Place Any Photos Here | The assessment of the present ACI 440.2R-17 equation revealed its limitation in predicting the confined strength of ASR-damaged concrete members. The efficiency factors resulting from the formulated analytical model are recommended to implement performance-based design for ASR-affected concrete confined with CFRP sheets. |
| Impacts/Benefits of Implementation  (actual, not anticipated) | The structural responses of the plain and confined concrete specimens were examined with an emphasis on load-carrying capacity, toughness, and failure characteristics. An analytical model was developed to complement the experimental findings and to propose design recommendations. |
| Web Links   * Reports * Project Website | * MPC Research Report – [Composite Repair for Concrete Bridges Subjected to Alkali-Silica Reaction](https://www.ugpti.org/resources/reports/details.php?id=1068) * Journal Paper – [Thermal and Energy Characteristics of Composite Structural Insulated Panels Consisting of Glass Fiber Reinforced Polymer and Cementitious Materials](https://doi.org/10.1016/j.jobe.2021.102483) * Journal Paper – [Basalt Fiber-Reinforced Polymer and Hybrid Grid-Confined Concrete with Organic/Inorganic Resins](https://doi.org/10.14359/51728068) * Journal Paper – [Strengthening of Reinforced Concrete Beams Using Embedded Carbon Fiber-Reinforced Polymer with Polyester-Silica](https://doi.org/10.14359/51725906) * Journal Paper – [Post-Peak Crack Control of Concrete with Basalt Fiber-Reinforced Polymer Grids](https://doi.org/10.1016/j.conbuildmat.2021.122716) * Journal Paper – [Out-of-Plane Peeling of Carbon Fiber-Reinforced Polymer- Concrete Interface at Elevated Temperatures](https://doi.org/10.14359/51724681) * Journal Paper – [Stochasticity on Long-Term Behavior of Steel-/Carbon Fiber-Reinforced Polymer Prestressed Girders](https://doi.org/10.14359/51723512) * Journal Paper – [Infiltration of H2SO4 through Concrete with and without Carbon Fiber-Reinforced Polymer Confinement](https://doi.org/10.14359/51728148) * Journal Paper – [Performance Characterization of Plain and CFRP-Bonded Concrete Subjected to Sulfuric Acid](https://doi.org/10.1016/j.matdes.2020.109176) * Journal Paper – [Splice of Glass Fiber-Reinforced Polymer-Reinforced Concrete Mixed with Superabsorbent Polymer](https://doi.org/10.14359/51723503) * Journal Paper – [Debonding Mitigation of Carbon Fiber-Reinforced Polymer-Strengthened Reinforced Concrete Beams with Grooved Bonding](https://doi.org/10.14359/51721314) * Journal Paper - [Alkali-Silica Reaction for Concrete Confined with Carbon Fiber-Reinforced Polymer Sheet](https://doi.org/10.14359/51718077) * Journal Paper – [Hollow Concrete Cylinders Confined with CFRP: Strength and Size Effect](https://doi.org/10.1016/j.conbuildmat.2020.118839) * Journal Paper - [Thermomechanical-Coupled Distress for Reinforced Concrete Beams Strengthened with Carbon Fiber-Reinforced Polymer](https://doi.org/10.14359/51718016) * Journal Paper – [Splitting of Concrete with Steel, Glass Fiber-Reinforced Polymer, and Basalt Fiber-Reinforced Polymer Bars Exposed to MgSO4](https://doi.org/10.14359/51726799) * Journal Paper – [Chaos Expansion for Long-Term Behavior of Carbon Fiber- Reinforced Polymer-Strengthened Reinforced Concrete Beams](https://doi.org/10.14359/51716805) * Journal Paper – [Grid U-Wrap Anchorage for Reinforced Concrete Beams Strengthened with Carbon Fiber-Reinforced Polymer Sheets](https://doi.org/10.14359/51716772) * Journal Paper – [Uncertainty Modeling of Carbon Fiber-Reinforced Polymer-Confined Concrete in Acid-Induced Damage](https://doi.org/10.14359/51716761) * Journal Paper – [Continuous Reinforced Concrete Beams with Various Carbon Fiber-Reinforced Polymer Systems under Soil Settlement](https://doi.org/10.14359/51715576) * Journal Paper – [Durability Investigations into CFRP-confined Concrete in H2SO4](https://doi.org/10.14359/51715598) * Journal Paper – [Corrosion Mitigation of CFRP-Steel Interface with Sacrificial Anodes](https://doi.org/10.1080/09276440.2018.1522193) |