COMPUTING & INFRASTRUCTURE FRONTIERS

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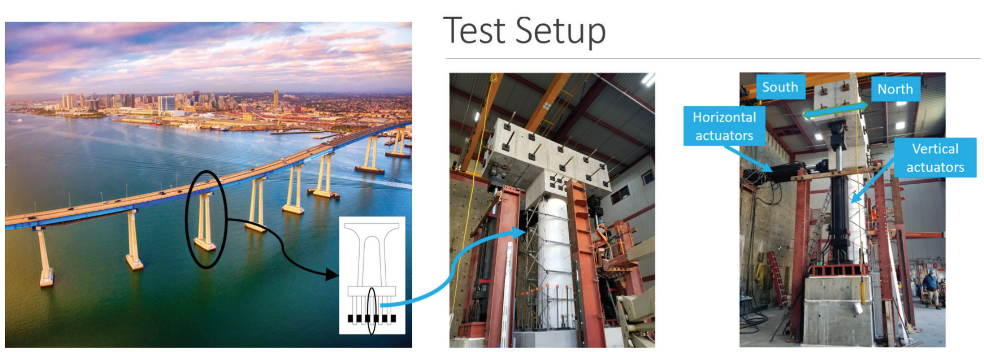
Dr. Kalliontzis conducts research in the areas of reinforced, prestressed/precast concrete, and masonry structural systems subjected to extreme loads induced by natural hazards – such as earthquakes, tsunamis, and hurricanes. His research interests include 1) the development of structurally resilient design details for these structural systems to ensure that they survive extreme events with minimal damage and low repair costs; 2) the assessment of performance, repair, and retrofit of existing structural systems that experience aging or are code-deficient; 3) the application of new concrete materials, such as Ultra-High Performance Concrete (UHPC); and 4) the design of free-standing non-structural components to prevent their damage during earthquake shakings. Dr. Kalliontzis research has been funded by the National Science Foundation, the California Department of Transportation, and the Precast/Prestressed Concrete Institute. He is a recipient of the Research Excellence Award from Iowa State University for his contributions to Structural Engineering.

PERFORMANCE ASSESSMENT OF THE FOUNDATION PILES IN THE SAN DIEGO-CORONADO BRIDGE



This research project was developed to assess the seismic response of the prestressed foundation piles in the San Diego Coronado Bay Bridge, which is expected to significantly influence the overall seismic performance of the bridge. The project included large-scale testing of scaled pile models and the development of performance-based analysis tools for the piles to predict the axial force-flexure-shear interaction in the individual piles during frame action of the pile groups.

SEISMIC SAFETY OF FREE-STANDING EQUIPMENT

Laboratory equipment, furniture, or other free-standing components (e.g., dry storage casks) may overturn during strong earthquake shakings. Their overturning can cause damage, resulting in economic losses. It is therefore important to examine the seismic safety of free-standing equipment and develop design recommendations for their protection. Dr. Kalliontzis research investigates the seismic behavior of such equipment and explores new ideas for connecting them with the underlying base. He investigated the use of thin rubber layers between the equipment and the underlying base to dissipate the seismic energy imparted to the equipment. His research demonstrated that the use of thin rubber layers can mitigate the seismic response of free-standing equipment.

Journal Publications

1. Kalliontzis, D., Schultz, A. E., and Sritharan, S. (2020). "Generalized Dynamic Analysis of Structural Single Rocking Walls (SRWs)." Earthquake Engineering and Structural Dynamics 49 (7), 633-656.

2. Kalliontzis, D., and Sritharan, S. (2020). "Dynamic Response and Impact Energy Loss in Controlled Rocking Members." Earthquake Engineering and Structural Dynamics 49 (4), 319-338.

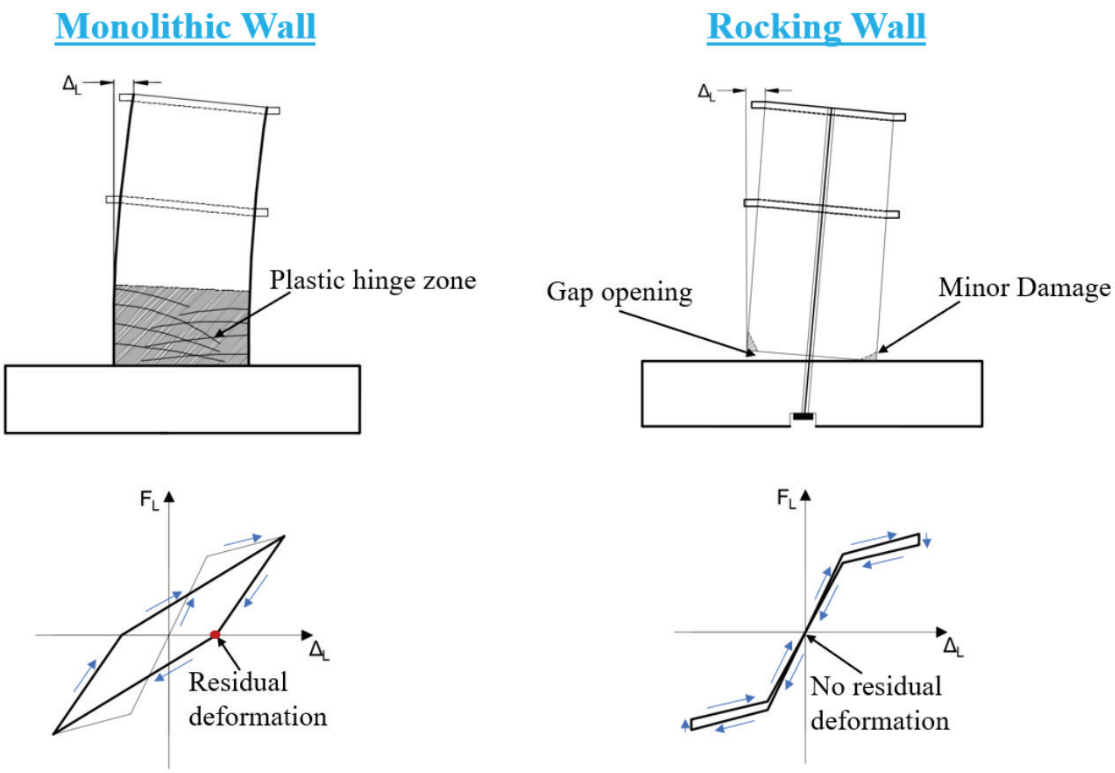
3. Kalliontzis, D., and Sritharan, S. (2018). "Characterizing Dynamic Decay of Motion of Free-Standing Rocking Members." Earthquake Spectra 34 (2), 843-866.

4. Kalliontzis, D., and Schultz, A. E. (2017). "Characterizing the In-Plane Rocking Response of Masonry Walls with Unbonded Posttensioning." ASCE Journal of Structural Engineering 143 (9), 04017110.

5. Kalliontzis, D., and Schultz, A. E. (2017). "Improved Estimation of the Reverse-Cyclic Behavior of Fully-Grouted Masonry Shear Walls with Unbonded Post-tensioning." Engineering Structures 145, 83-96.

6. Kalliontzis, D., Sritharan, S., and Schultz, A. E. (2016). "Improved Coefficient of Restitution Estimation for Free Rocking Members." ASCE Journal of Structural Engineering 142 (12), 06016002.

SELF-CENTERING ROCKING WALLS AND BRIDGE PIERS FOR SEISMIC RESILIENT STRUCTURES



The significant human and economic losses caused by natural disasters underline the need to develop new design concepts to promote resiliency in buildings and bridges. For this purpose, Dr. Kalliontzis has developed self-centering rocking structural systems that can resist lateral loads with minimal damage. He conducts large-scale testing of self-centering rocking walls and bridge piers and develops robust performance-based analysis tools for these systems.

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