Repairable Precast Bridge Bents for Extreme Events

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Prepared for:

TriDueLE Website

Acknowledgements

PCI
Precast/Prestressed Concrete Institute

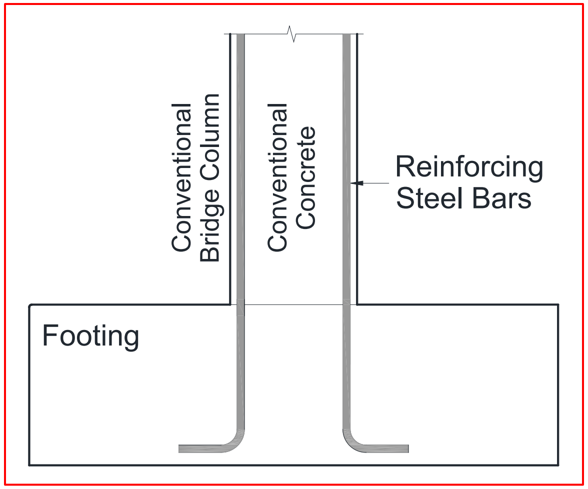
TriDurLE
National Center for Transportation Infrastructure Durability & Life-Extension

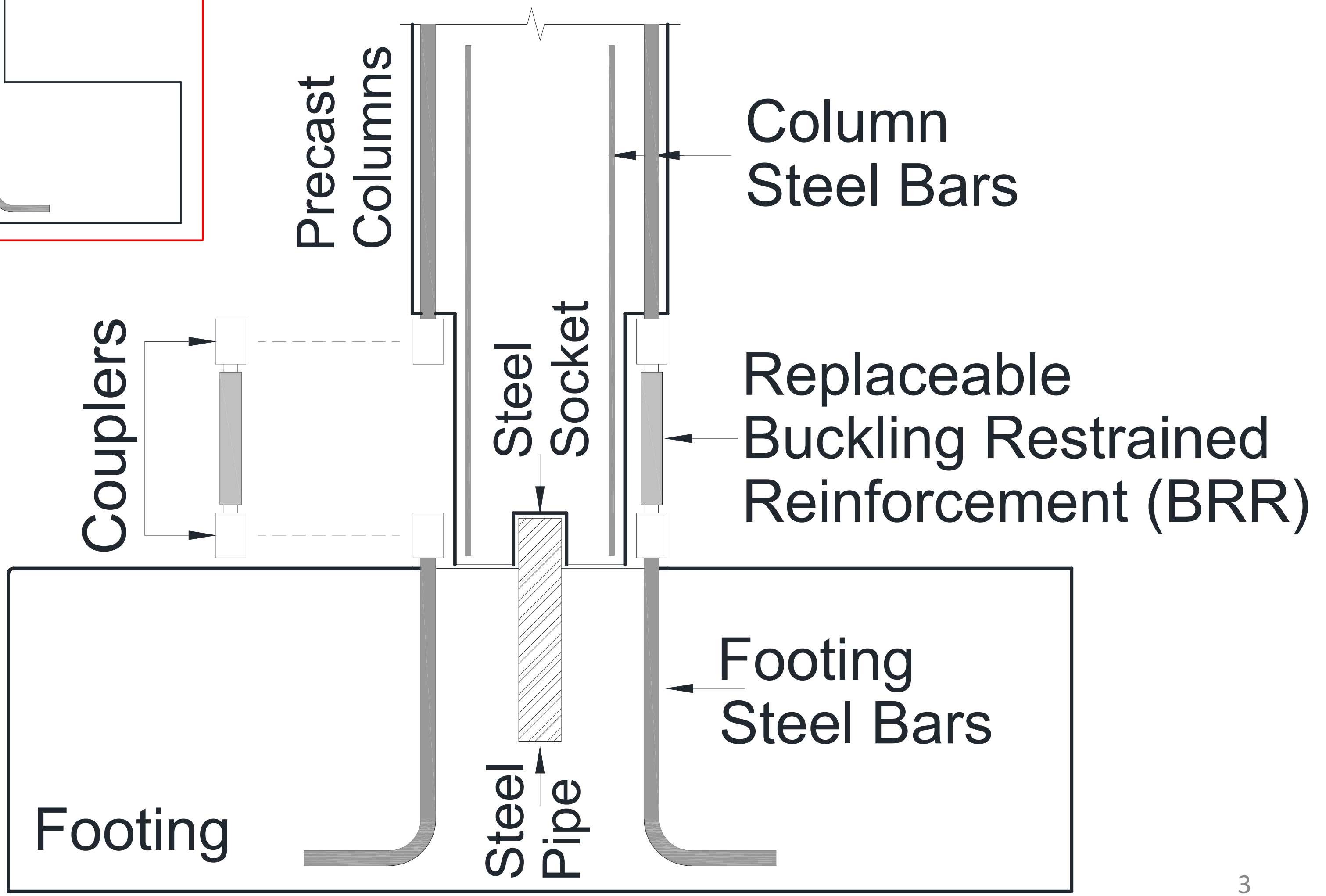
Gage Brothers

South Dakota State University

HRC
Headed Reinforcement Corp.

Conventional vs. Repairable Joints

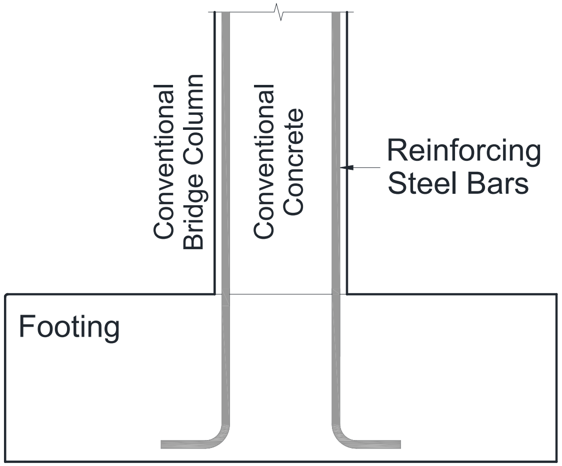




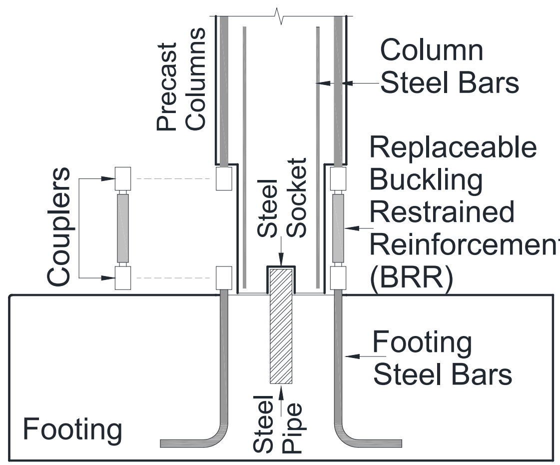
Project Work Plan

1. Detailing Alternative Development
2. Evaluation of Detailing Alternatives
3. Experimental Investigations
4. Analytical Investigations
5. Recommendations
6. Project Deliverables

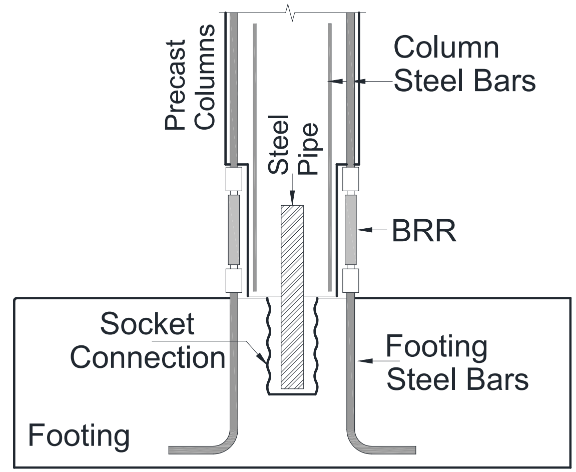
Task 1 – Detailing Alternative Development



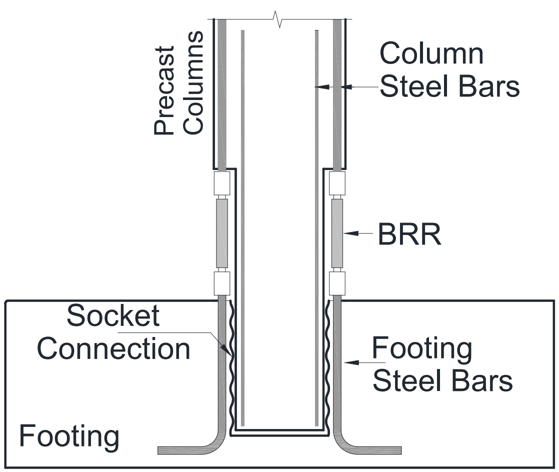
Cast-In-Place (CIP) Detailing



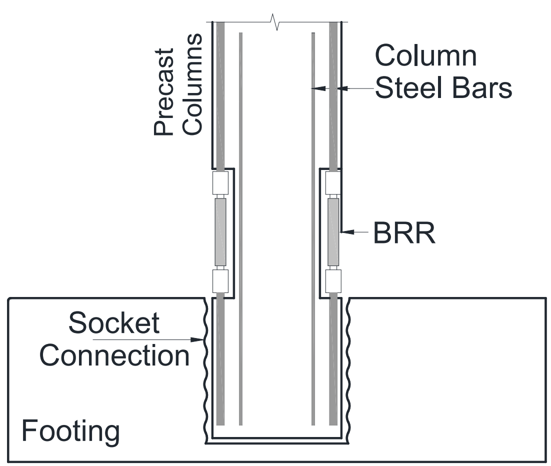
Repairable Precast ALI-1



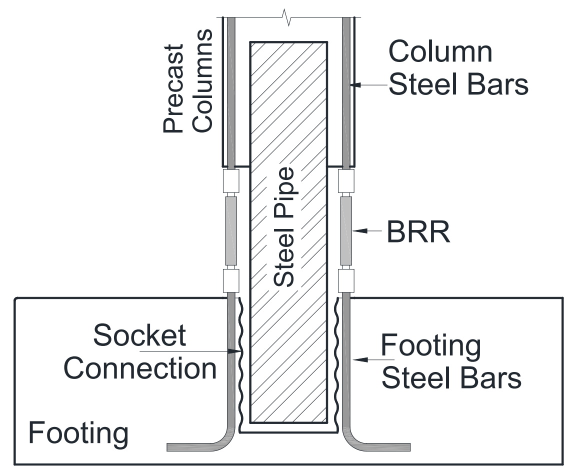
Repairable Precast ALI-2



Repairable Precast ALI-3



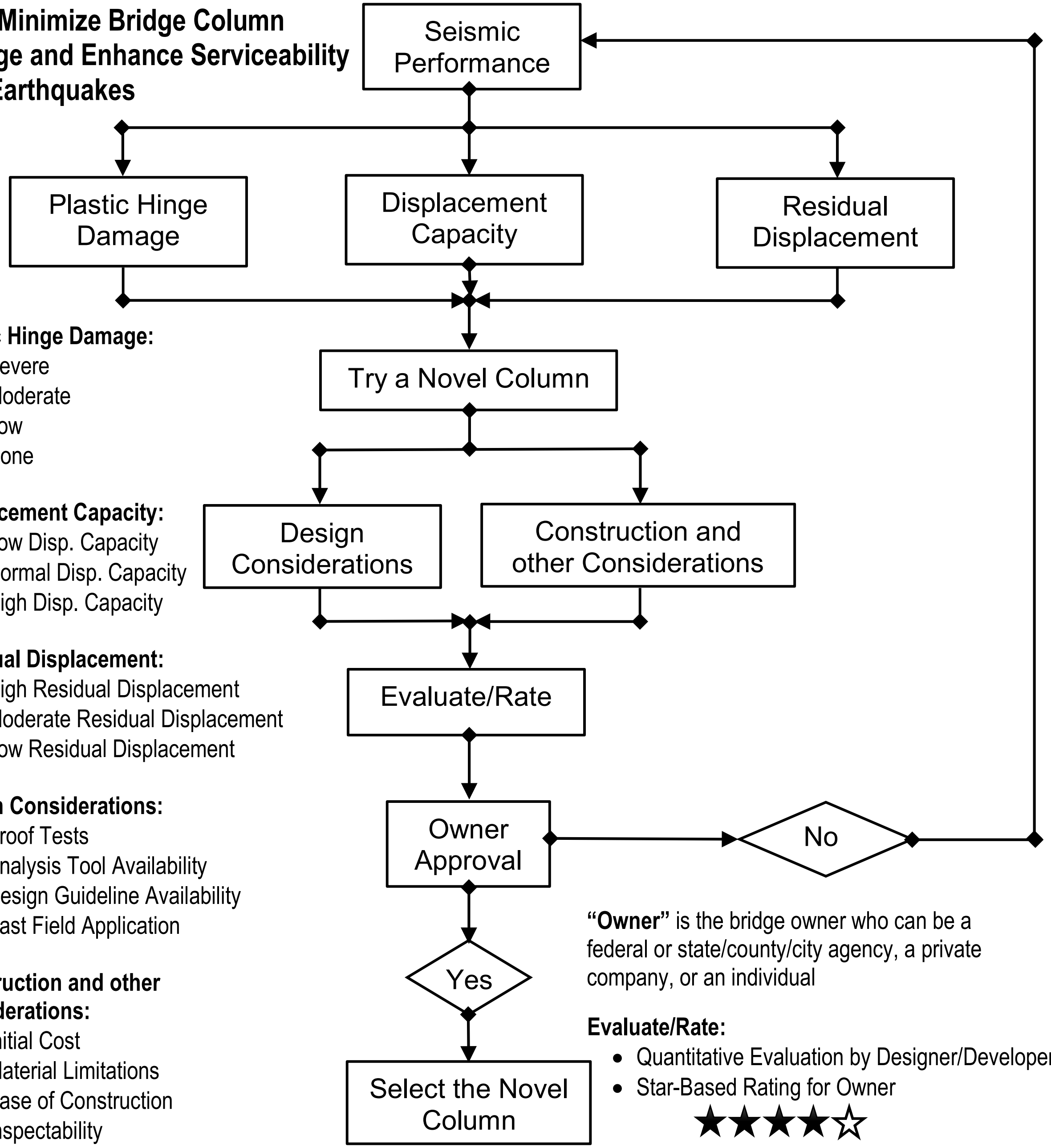
Repairable Precast ALI-4



Repairable Precast ALI-5

Task 2 - Quantitative Evaluation of Novel Columns

Goal: Minimize Bridge Column Damage and Enhance Serviceability after Earthquakes



Plastic Hinge Damage:
- Severe
- Moderate
- Low
- None

Displacement Capacity:
- Low Disp. Capacity
- Normal Disp. Capacity
- High Disp. Capacity

Residual Displacement:
- High Residual Displacement
- Moderate Residual Displacement
- Low Residual Displacement

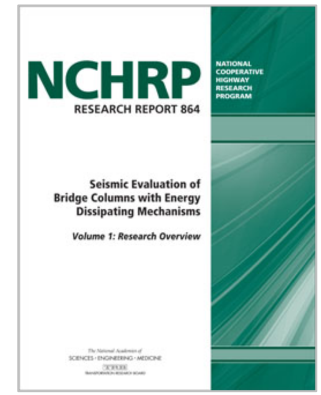
Design Considerations:
- Proof Tests
- Analysis Tool Availability
- Design Guideline Availability
- Past Field Application

Construction and other Considerations:
- Initial Cost
- Material Limitations
- Ease of Construction
- Inspectability
- Maintenance
- Post-Earthquake Repair Need
- System Performance

"Owner" is the bridge owner who can be a federal or state/county/city agency, a private company, or an individual

Evaluate/Rate:
- Quantitative Evaluation by Designer/Developer
- Star-Based Rating for Owner

★★★★☆



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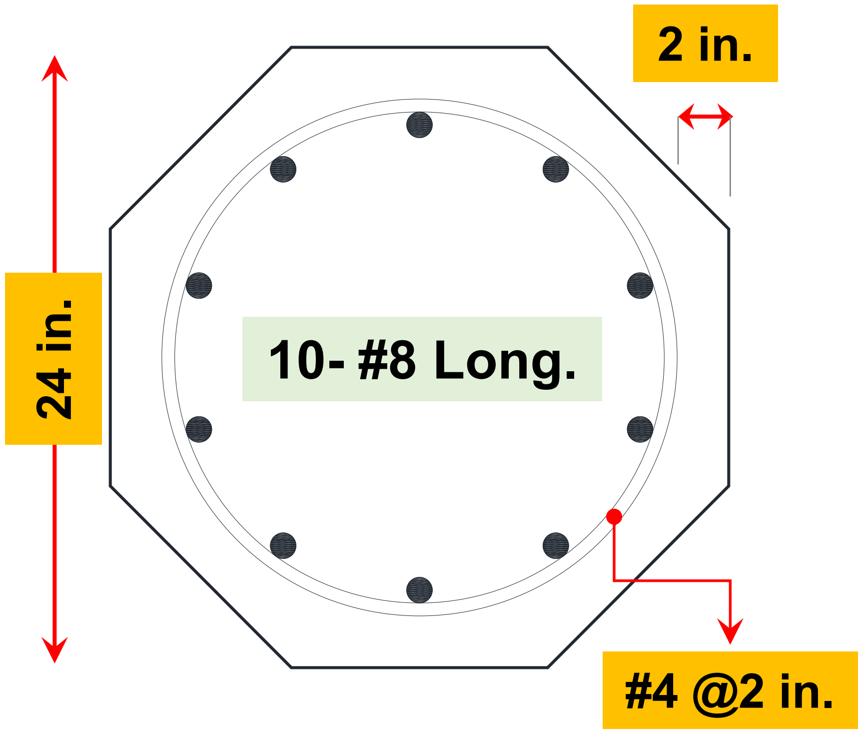
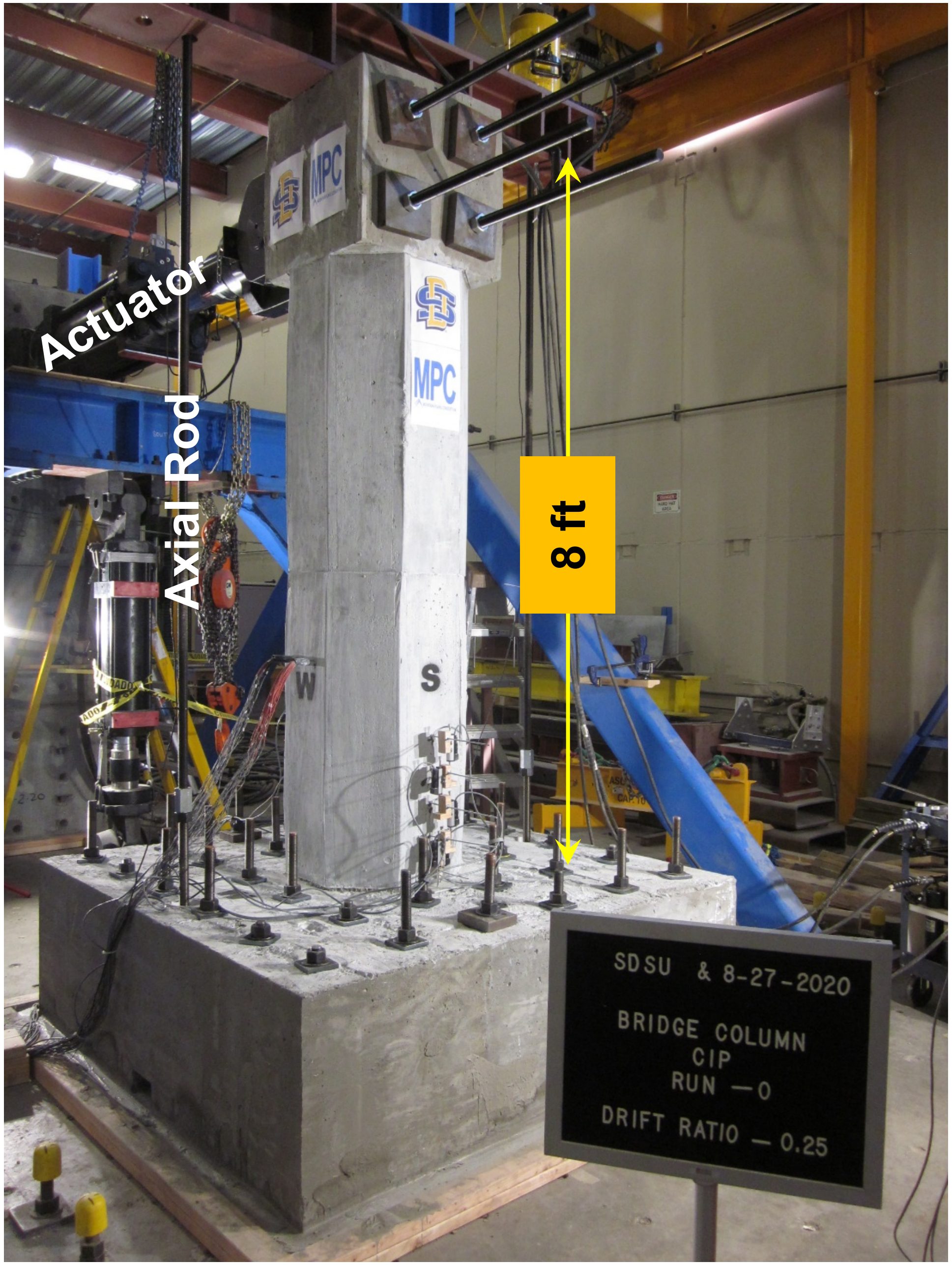
Task 3 - Experimental Investigations

- We will test top **two** repairable candidates under cyclic loading
- Half-Scale specimens





Task 4 – Analytical Investigations

1. Model Development/Verification

2. Pushover Analyses

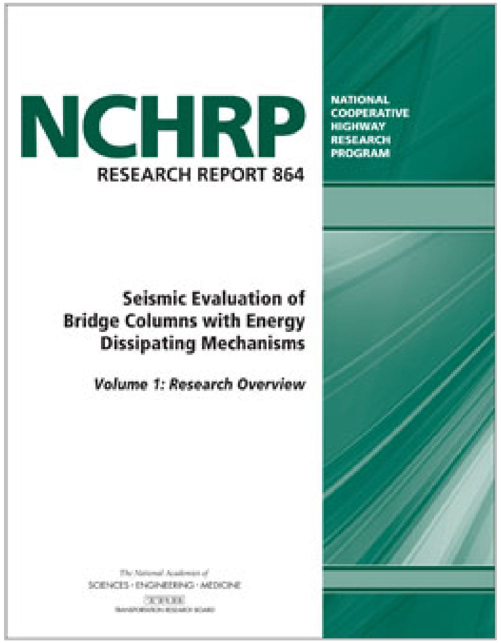
3. Dynamic Analyses

Analysis Parameters:

- BRR length,
- BRR materials,
- Single-column and multi-column bents

Task 5 – Recommendations

Based on the experimental and analytical findings, design and construction guidelines will be proposed for the selected design alternatives.



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Task 6 – Project Deliverables

A comprehensive final report will be prepared by the research team, which will document all aspects of the project including details of the findings for each task. The final report will be reviewed by the PCI advisory committee and will be revised per their comments

Repairable Precast Bridge Columns

Sponsors:

The Precast/Prestressed Concrete Institute (PCI), and the National Center for Transportation Infrastructure Durability and Life-Extension (TriDurLE) – University Transportation Center (UTC)

Project Funds: $134,444 ($40,000 from PCI, $67,045 from TriDurLE, and $27,399 match from SDSU)

Year: 2021-2022

Project Website

Click or copy and paste:

https://sites.google.com/people.unr.edu/mostafa-tazarv/research/repairable-bridge-bents

Questions?

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