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PEER Report [Year/number – to be filled out by PEER.]

Pacific Earthquake Engineering Research Center

Headquarters at the University of California, Berkeley

[Month Year – to be filled out by PEER.]

Abstract

[Sample text, 750 words maximum.] This report describes the design, construction, and shaking table response and computation simulation of a Low Seismic-Damage Bridge Bent built using Accelerated Bridge Construction methods. The proposed bent combines precast post-tensioned columns with precast foundation and bent cap to simplify off- and on-site construction burdens and minimize earthquake-induced damage and associated repair costs. Each column consists of reinforced concrete cast inside a cylindrical steel shell, which acts as the formwork, and the confining and shear reinforcement. The column steel shell is engineered to facilitate the formation of a rocking interface for concentrating the deformation demands in the columns, thereby reducing earthquake-induced damage. The precast foundation and bent cap have corrugated-metal-duct lined sockets, where the columns will be placed and grouted on-site to form the column–beam joints. Large inelastic deformation demands in the structure are concentrated at the column–beam interfaces, which are designed to accommodate these demands with minimal structural damage. Longitudinal post-tensioned high-strength steel threaded bars, designed to respond elastically, ensure re-centering behavior. Internal mild steel reinforcing bars, debonded from the concrete at the interfaces, provide energy dissipation and impact mitigation.

[Paragraph text.] Next paragraph text if needed.

Keywords: [Author to provide 5-7 maximum.]

Acknowledgements and Disclaimer

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This research study was funded by [FUNDING AGENCY name], under Contract No. #####. The opinions, findings, conclusions, and recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of [FUNDING AGENCY name], Pacific Earthquake Engineering Research (PEER) Center, or the Regents of the University of California.

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Definitions and Acronyms

(This section is optional)

AASHTO American Association of State Highway and Transportation Officials

…

LRFD Load and Resistance Factor Design

…

LVDT linear variable differential transformer

…

PTFE polytetrafluoroethylene

…

Notation

(This section is optional)

*Atr* area of transverse reinforcement

*Ag* gross cross-sectional area

…

*Keff* effective stiffness

…

*z* distance of a point from neutral axis in the direction perpendicular to …

…

** factor indicating the ratio of two parameters of interest

…

** change in the lateral displacement

…

** coefficient of friction

# Introduction[[1]](#footnote-1)

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# Literature Review

## Hybrid Self-Centering Systems

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# Prototype Bridge Study

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## Hybrid System Model Development and Verification

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# Conclusions

## Summary

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References[[3]](#footnote-3)

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AASHTO (2012). *AASHTO LRFD Bridge Design Specifications*, 7th ed., The American Association of State Highway and Transportation Officials, Washington DC.

Akkar S., Çağnan Z. (2010). A local ground-motion predictive model for Turkey, and its comparison with other regional and global ground-motion models, Bull. Seismo. Soc. Am., 100(6):2978–2995, doi: 10.1785/0120090367.

Alawaji H., Runesson K., Sture S., and Axelsson K. (1992). Implicit integration in soil plasticity under mixed control for drained and undrained response, Int. J. Num. Anal. Meth. Geomech., 16(10:737--756), doi: 10.1002/nag.1610161004.

Alawaji H.A.S. (1990). Formulation and Integration of Constitutive Relations in Soil Plasticity under Mixed Control for Drained and Undrained Control, PhD thesis, University of Colorado at Boulder, Boulder, CO.

Andrus R.D., Stokoe K.H. (2000). Liquefaction resistance of soils from shear wave velocity, J. Geotech. Geoenviron. Eng., 126(11): 1015–1025.

Armstrong R.J., Boulanger R.W., Beaty M.H. (2013). Liquefaction effects on piled bridge abutments: centrifuge tests and numerical analyses, J. Geotech. Geoenviron. Eng., 139(3):433–443, doi: 10.1061/(ASCE)GT.1943-5606.0000780.

Appendix A Construction Drawings

[Text, tables, and figures in Appendices use the same format as each Chapter in the main body of the report. Tables and figures shall be referenced in text. Text is followed by all tables, then by all figures.] Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur; see Table A.1 and Table A.2. [All tables shall be referenced in text.] Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur; see Figure A.1. [All figures shall be referenced in text.] Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

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