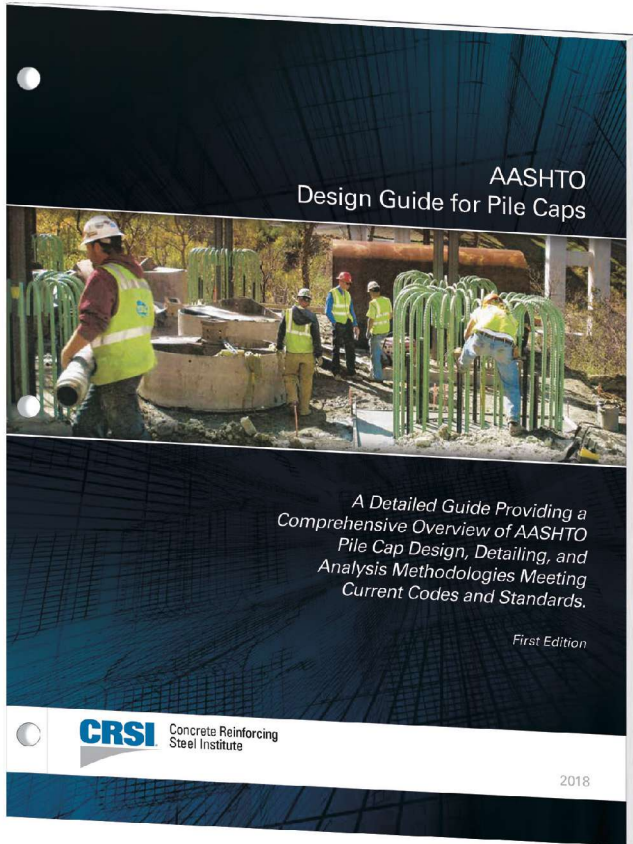


# Design of Reinforced Concrete Pile Caps in Accordance with the 2014 AASHTO LRFD Specifications

by David A. Fanella and Gregory E. Halsted, Concrete Reinforcing Steel Institute



The Concrete Reinforcing Steel Institute's *AASHTO Design Guide for Pile Caps*. All Figures: Concrete Reinforcing Steel Institute.

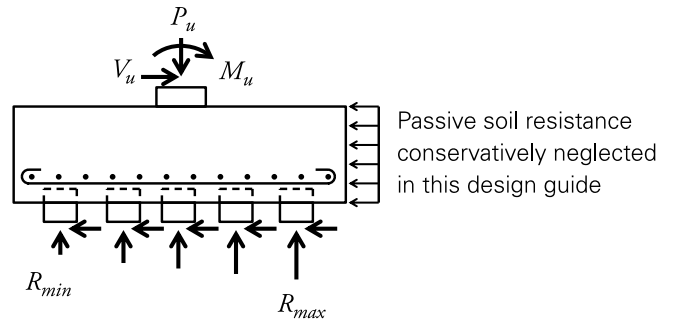
The Concrete Reinforcing Steel Institute's *AASHTO Design Guide for Pile Caps* provides comprehensive information on the analysis, design, and detailing of reinforced concrete pile caps in accordance with the 2014 edition of the American Association of State Highway and Transportation Officials' *AASHTO LRFD Bridge Design Specifications*.<sup>1</sup> The main purpose of this design guide is to provide state-of-the-art, practical procedures that engineers can apply in everyday practice without the use of finite element models.

The design guide covers both gravity and lateral load effects based on the loads defined in the AASHTO LRFD specifications. An overview of applicable load types and limit states is given in Chapter 2.

Chapter 3 shares the assumptions used to determine load distributions for two basic load cases. In Load Case I, only factored vertical loading is considered. Combined axial, shear, and moment demands are included in Load Case II.

Chapter 4 presents the pile cap configurations that are considered in the design guide. This chapter also includes a general overview of the AASHTO provisions for dimensioning and detailing pile caps and recommended reinforcement layouts.

Chapters 5 and 6 contain pile cap design procedures for vertical and lateral/overturning loads, respectively. Methods are given for flexure, one-way



Model of pile cap resisting axial force, shear force, and bending moment.

shear, and two-way shear, which can be applied to any pile configuration.

Seismic design of piles caps is covered in Chapter 7. The chapter gives an overview of seismic design provisions for pile caps supporting reinforced concrete columns for bridge structures. Although the 2014 AASHTO LRFD specifications have special provisions for foundation systems based on the seismic performance zone, similar provisions directly related to the design of pile caps are minimal.

Chapter 8 gives six practical, numerical design examples that illustrate the proper application of the required provisions. The examples were selected to demonstrate all the important information on analysis, design, and detailing covered in the design guide.

Chapter 9 includes tabulated pile cap designs for both vertical loads and combined vertical, lateral, and overturning effects. These tables can be used to quickly obtain required reinforcement and material quantities, and other information for various pile configurations with factored pile loads up to and including 600 tons.

Detailed derivations for several simplified design equations are given in Appendix A, and column-to-pile cap and pile-to-pile cap connection details are presented in Appendices B and C, respectively.

## References

1. American Association of State Highway and Transportation Officials (AASHTO). 2014. *AASHTO LRFD Bridge Design Specifications*. 7th ed, Washington, DC: AASHTO.

*David A. Fanella is the senior director of engineering at the Concrete Reinforcing Steel Institute in Schaumburg, Ill., and Gregory E. Halsted is the western region manager and transportation engineer at the Concrete Reinforcing Steel Institute in Bellingham, Wash.*

## EDITOR'S NOTE

*AASHTO Design Guide for Pile Caps* may be purchased from the Concrete Reinforcing Steel Institute by visiting <https://goo.gl/2j4xRN>.