

10.9 MICROPILES

10.9.1 SCOPE

This policy establishes design requirements and limitations of micropiles used to support bridges and earth retaining systems (ERS). Micropiles must meet requirements of the AASHTO LRFD Bridge Design Specifications and California Amendments as well as additional design requirements herein.

10.9.2 STRUCTURAL COMPONENTS

Micropiles for new or retrofit footings must include a full-length central steel reinforcement and a partial or full length steel casing, pipe or round hollow structural section, collectively referred to as “casing” in this document.

10.9.3 GENERAL DESIGN REQUIREMENTS

The required axial nominal resistance of the micropile and the required minimum length of the casing must be shown on the contract plans. The contribution of the steel casing to tensile structural resistance must be ignored.

Micropiles shall not be used in any of the following conditions:

- In corrosive soil when subjected to tension load under any of the applicable limit state load combinations.
- Under sustained lateral loading such as at abutments or as ERS piles, unless lateral testing procedures are specified in the contract special provisions.
- Where an artesian ground water condition exists.

Battered micropiles shall not be used without project specific design and testing requirements.

10.9.4 SEISMIC LIMITATIONS

Micropiles shall not be used for new structures in Class S2 soil. Micropiles shall not be used for foundations of new bridges or earth retaining systems in Class S1 soil in any of the following applications:

- As a seismic critical member
- Without continuous soil support

In Class S1 soil, shear force must be resisted by the casing element. The effect of casing splices must be considered in shear resistance calculations.



Micropiles may be used for seismic retrofit applications in Class S2 soil; however, the contribution of the micropile to resist seismic forces must be limited to only axial force (tension or compression).

10.9.5 TESTING REQUIREMENTS

Micropiles require construction load testing to demonstrate their structural and geotechnical performance.

10.9.6 REFERENCES

1. AASHTO (2017), *AASHTO LRFD Bridge Design Specifications*, 8th Edition, American Association of State Highway and Transportation Officials, Washington, DC.
2. Caltrans (2019), *California Amendments to AASHTO LRFD Bridge Design Specifications*, 8th Edition, California Department of Transportation, Sacramento, CA.
3. Caltrans (2019), *Seismic Design Criteria 2.0*, California Department of Transportation, Sacramento, CA.
4. FHWA (2005), *Micropile Design and Construction Reference Manual*, Publication No. FHWA NHI-05-039, National Highway Institute, FHWA, US DOT, Washington, DC.