



# Piling – Micropiling

## Revision and Approval

Revision	Date	Nature of Changes	Approved By
0	04-29-2022	Original Issue	Richard Foley

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## Background

This process establishes Structure Construction (SC) responsibilities and procedures for the review and authorization of micropiling submittals, conducting the micropiling preconstruction meeting, review of the Contractor’s micropiling load testing, Department Acceptance activities for micropiling, micropiling materials inspection and release for construction, and micropiling construction.

Prior to reviewing this Bridge Construction Memo (BCM), it is essential to review the [Contract Specifications](#), Section 49-5, *Piling – Micropiling*, that this BCM is based on. The information in the contract specifications typically will not be repeated in the text of this BCM.

## Process Inputs

1. Contract work that requires micropiling
2. Submittals:
  - a. Summary of the micropile subcontractor’s experience qualifications
  - b. Micropiling shop drawings and calculations
  - c. Installation plan
3. Materials:
  - a. [Form CEM-3101](#), *Notice of Materials to be Used*
4. Construction:
  - a. Verification and proof load test acceptance criteria

- b. Installation logs
- c. Grout test results
- d. Load test data

## **Procedure**

1. All work associated with this process is charged as [Project Direct – Preconstruction](#).
2. Inspection for this process is:
  - a. [Benchmark](#) for any field work associated with authorization of submittals or field release of materials, and routine drilling.
  - b. [Continuous](#) for all contractor-performed micropile load testing, drilling when problems occur, grout placement and testing, mitigation work for failed micropiling, and installation of reinforcing steel assembly.
3. Before construction begins:
  - a. Review the following resources which identify the criteria for this process:
    - i. Contract documents
    - ii. Log of Test Borings plan sheets and the Foundation Reports found in the Information Handout
    - iii. [FHWA-SA-97-070](#), *Micropile Design and Construction Guidelines Implementation Manual*.
    - iv. [FHWA NHI-05-039](#), *Micropile Design and Construction Reference Manual*
    - v. Design files in RE Pending File
    - vi. Authorized shop drawings
    - vii. [Foundation Manual](#), Chapter 13, *Micropiles*, Appendix J, *Micropiles*, and Appendix K5, *Micropile Construction Checklist*.
  - b. Discuss potential problem areas, unusual details, and risk with the Bridge Construction Engineer, Bridge Design Project Engineer, Geoprofessional, such as:
    - i. Difficult drilling conditions
    - ii. Failing load and production testing
    - iii. Environmental work window restrictions.
  - c. Develop a submittal log
  - d. Remind the Contractor of their responsibilities for all the submittals listed in the contract.

- e. Review submittals. Authorize or reject micropile action submittals (other than shop drawings). Notify the Contractor in writing.
- f. Receive shop drawings from the [SC Office Associates](#). Provide micropiling shop drawing review comments to the Structure Designer.
- g. Prepare for and conduct the micropile preconstruction meeting with the Contractor per the requirements of the contract documents (refer to *Foundation Manual*, Appendix K5, *Micropiling Construction Checklist*).
- h. Confirm Structure Designer authorizes or rejects micropiling shop drawings.
- i. File all authorized submittals in the in the appropriate category in the project records as specified in the *Construction Manual*, [Section 5-102](#), *Contract Administration – Project Records and Reports – Organization of Project Documents*.
- j. For the preconstruction meeting:
  - i. Prepare an agenda. Address all issues required by the contract documents, including:
    - 1. Safety requirements:
      - a. Cal/OSHA [Construction Safety Orders](#) (CSO), and project specific requirements. Note that the CSOs are found in the California Code of Regulations, Title 8, Chapter 4, Subchapter 4.
      - b. Underground Dig Alerts
    - 2. Acceptance testing
    - 3. Environmental requirements.
  - ii. The meeting must include the Resident Engineer, Structure Representative, Assistant Structure Representatives, SC Substructure Engineer, Designer, Geotech, Contractor’s representatives, and any subcontractors involved in micropile construction.
  - iii. Discuss deficiencies identified in the initial review of submittals.
  - iv. Discuss contingency plans for capturing risks and opportunities identified during the micropile preconstruction meeting.
  - v. Generate micropile preconstruction meeting minutes, including discussion of any issues, solutions, action items, and resubmittals if required.
  - vi. Schedule additional micropile preconstruction meetings or focus meetings if necessary.
- k. For materials:
  - i. Review Form CEM-3101, *Notice of Materials to be Used* and discuss with the Materials Engineering and Testing Services (METS) Representative

which micropiling materials are to be inspected and released via [Form TL-0029](#), *Report of Inspection of Material*, and which micropiling materials are to be field released utilizing [Form SC-4102](#), *Materials Inspected and Released on Job*.

- ii. For anticipated field welding, verify Welding Quality Control Plan and welder certification requirements have been met per [BCM 11](#), *Welding*, and conforms to AWS D1.1 or current code.
- iii. Discuss concerns with SC Substructure Engineer, when necessary.
- I. Preparing for load testing:
  - i. Review the *Foundation Manual*, Chapter 13, *Micropiles*, Appendix J, *Micropiles*, and Appendix K5, *Micropile Construction Checklist*, for information pertinent to load testing of micropiling.
  - ii. Verify grout has attained the compressive strength specified in the contract documents.
  - iii. Remind the Contractor to notify the engineer prior to performing each load test.
  - iv. Verify that Department-furnished pressure cell and strain indicators (load cells) are calibrated, which will be used to verify the Contractor's testing equipment. Refer to the [Prestress Manual](#), Appendix B, *Strain Indicator – Pressure Cell*, for guidance.
  - v. Discuss with the Contractor the contract requirements including micropile load data submittal, acceptance criteria and the contract requirements for failed load test.
  - vi. Verify that the Contractor can record load test data.
- m. Preparing for micropiling production work:
  - i. Review authorized micropiling submittals.
  - ii. Review the *Foundation Manual*, Chapter 13, *Micropiles*, and Appendix K5, *Micropile Construction Checklist*.
  - iii. Review FHWA-SA-97-070, 2000, *Micropile Design and Construction Guidelines*.
  - iv. Discuss with the RE and Contractor any existing facilities concerns and agency requirements, such as underground utilities and overhead power lines.
  - v. Verify that micropiling materials have been released for construction by METS using Form TL-0029, *Report of Inspection of Materials*, and match with the orange tags collected in the field.

- vi. Check the Contractor's material storage area for environmental compliance.
  - vii. Prepare Quantity Record Sheet, Log Micropile Sheet, and Micropile Layout Sheet:
    - 1. Until dedicated forms are developed, the following existing forms (from the [SC Forms](#) link) for piles can be modified for use:
      - a. Form SC-4803, *Pile Quantity & Driving Record (Driven Piles)*
      - b. Form SC-4805, *Log Pile Sheet*
      - c. Form SC-4806, *Pile Layout Sheet*.
  - viii. Refer to [BCM 50](#), *Prestressing Concrete*, for information and links to prepare the following forms:
    - 1. Load Cell data collection form for load verification testing (Proof Load and Verification Load testing, Load Test).
    - 2. Grouting record form.
4. During construction:
- a. For submittals received and testing performed during construction:
    - i. For each micropile, verify the Contractor submits the following in accordance with the requirements of the contract documents:
      - 1. Micropile installation log (Informational Submittal)
      - 2. Grout test results
      - 3. Load test data
    - ii. Review and authorize submittals before accepting each micropile. Reject incomplete submittals. Work with Contractor to obtain missing information.
    - iii. For failed verification load testing:
      - 1. Notify the Contractor of the requirements for revised submittals as stated in the contract documents.
      - 2. Review and authorize revised submittal.
    - iv. Discuss project-specific issues or concerns with acceptance or rejection of micropiling with the SC Substructure Engineer, Bridge Design Project Engineer, and Geotechnical Designer.
    - v. File all authorized submittals in the in the appropriate category in the project records as specified in the *Construction Manual*, [Section 5-102](#), *Contract Administration – Project Records and Reports – Organization of Project Documents*.

- b. Materials:
  - i. Discuss project-specific issues or concerns with micropiling materials with METS.
  - ii. Document all micropiling materials verification activities in the Daily Reports.
- c. Construction:
  - i. Verify reinforcing steel assemblies and micropile assembly lengths.
  - ii. Verify micropile layout and alignment and ensure Contractor used adequate means to control pile alignment.
  - iii. Confirm stability of each drilled hole.
  - iv. If temporary casing is used, record casing type and length.
  - v. Record observations made during drilling such as material excavated, difficult drilling, missed production, etc.
  - vi. Verify drilled hole cleanliness.
  - vii. Verify micropile depths and ensure contract plan tip elevation has been reached.
  - viii. Verify cleanliness of the reinforcing steel, and appropriate use of centralizers during placement of reinforcing steel.
  - ix. Verify that all grouting equipment are in good working condition.
  - x. Record grout volumes and grout pressure for each micropile. Watch for grout loss and communication between adjacent holes.
  - xi. Verify quality of grout at ground surface (when the hole is full of grout).
  - xii. Collect grout samples.
  - xiii. Be present at the jobsite during load testing.
  - xiv. Verify that the Contractor's testing equipment complies with the authorized micropiling submittals.
  - xv. Verify that the Contractor measures and records the micropile movements for both verification and proof loading testing per the tables in the contract documents.
  - xvi. Document all inspection, construction, and quality assurance activities in the daily reports per [BCM C-7](#), *Daily and Weekly Reports*.
- 5. Following construction:
  - a. Complete all micropiling project records.
  - b. File all project documentation (correspondence, material acceptance documentation, test results, micropiling records, daily reports, etc.) in the

appropriate category in the project records as specified in the *Construction Manual*, Section 5-102, *Organization of Project Documents*.

## **Process Outputs**

1. Submittals:
  - a. Authorized micropiling submittals
  - b. Micropile load test data
  - c. Accepted micropiling installation logs
  - d. Accepted grout test results
  - e. Accepted load test data
2. Preconstruction meeting:
  - a. Communication protocol
  - b. Established delineation of responsibilities among all parties
  - c. Micropile preconstruction meeting minutes
  - d. Document risks identified during the micropile preconstruction meeting that may need to be communicated to the Caltrans Project Manager and other interested parties
  - e. Action items that result from the micropile preconstruction meeting
3. Materials:
  - a. Form SC-4102, *Materials Inspected and Released on Job*
4. Construction:
  - a. Load test data
  - b. Completed installation logs for each micropile
  - c. Completed load test data for each micropile
  - d. Completed micropile grout test reports
  - e. Daily reports

## **Attachments**

None