



Piling – General

Revision and Approval

Revision	Date	Nature of Changes	Approved By
0	01-21-2022	Original Issue	Richard Foley

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Background

This process establishes the Structure Construction (SC) responsibilities and procedures for review and authorization of general piling submittals, quality assurance, materials, and construction that apply to all piling specified in Section 49 of the *Contract Specifications*.

Pile load tests are specified in the contract documents:

1. When piles are installed in soils with variable geologies or poor-quality soils where there is no other means to determine capacity.
2. To validate design assumptions.
3. To provide sufficient information to modify the design tip elevation when there is a potential for large cost savings.
4. When driven piles are too large (typically larger than 36-inch diameter) to use dynamic monitoring for bearing acceptance criteria.

Dynamic monitoring of driven piling is specified in the contract documents:

1. When the piles to be driven are too large (typically 18-inch to 36-inch diameter) to use the Gates Formula per [BCM 49-2, Piling – Driven Piling](#), for bearing acceptance criteria.
2. When ground conditions are not well known and bearing acceptance criteria needs to be established for the control zone.
3. To monitor driving stresses to prevent pile damage.

Dynamic monitoring may be required with pile load testing to:

1. Calibrate bearing acceptance criteria to the pile load test.
2. Evaluate capacity of static load test anchor piles.

Prior to reviewing this Bridge Construction Memo (BCM), it is essential to review the [Contract Specifications](#), Section 49-1, *Piling – General*, that this BCM is based on as identified in the title block above. The information in the contract specifications typically will not be repeated in the text of this BCM.

Process Inputs

1. Contract work that requires piling
2. Submittals:
 - a. Pile Handling Work Plan
 - b. Value Engineering Change Proposal (VECP) for revisions to specified tip elevations shown or installation methods
 - c. Test Boring Report and Log of Test Borings, if specified
3. Load Test Piles:
 - a. Pile Load Testing specified in the contract documents
 - b. Form [CEM-3101](#), *Notice of Materials to be Used*
 - c. [Static Pile Load Test Request form](#)
 - d. Authorized Pile Installation Plan for load test Cast-In-Drilled-Hole concrete piling per [BCM 49-3](#), *Piling - Cast-In-Place Concrete Piling*
4. Dynamic Monitoring:
 - a. Dynamic Monitoring specified in the contract documents
 - b. [Pile Driving Analysis Test Request Form](#)
 - c. Authorized Driving System Submittal for driven piling to be dynamically monitored per BCM 49-2, *Piling – Driven Piling*

Procedure

1. All work associated with this process is charged as [Project Direct – Construction](#).
2. Inspection for this process is:
 - a. [Benchmark](#) for:

- i. Work associated with authorization of submittals and field release of materials.
 - ii. Load test and anchor piles construction and pile load testing.
 - b. [Continuous](#) for:
 - i. Piles driven with dynamic monitoring.
- 3. Before construction begins:
 - a. Perform document review of the following:
 - i. Contract documents, Structures RE Pending File, Foundation Report, Authorized Driving System submittal, and authorized Pile Load Testing submittal. Also review Project Information Handout and contract documents for applicable environmental commitments and railroad requirements.
 - ii. Project-specific Code of Safe Practices (COSP) and the requirements of Cal/OSHA Title 8, Chapter 4, Subchapter 4, [Construction Safety Orders](#), for review of the Pile Handling Work Plan and work involving pile load testing and dynamic monitoring, including but not limited to:
 - 1. [Article 9](#), *Derricks, Cranes, Boom-type Excavators*
 - 2. [Article 12](#), *Pile Driving and Pile Extraction*
 - 3. [Article 15](#), *Cranes and Derricks in Construction*
 - 4. [Article 24](#), *Fall Protection*
 - iii. *Foundation Manual*, [Chapter 8](#), *Static Pile Load Testing and Pile Dynamic Analysis*, for additional information on the reasons for performing pile load testing and dynamic monitoring, and the expected results.
 - b. Perform review and authorization of submittals as follows:
 - i. Discuss with the Resident Engineer (RE) and the contractor any concerns with existing facilities and agency requirements, such as overhead power lines and underground utilities and the railroad requirements. Call Dig Alert (USA) if applicable.
 - ii. For Pile Handling Work Plan:
 - 1. Discuss the requirements of the Pile Handling Work Plan during the preconstruction conference.
 - 2. Receive, review, and authorize the Pile Handling Work Plan:
 - a. Review public safety requirements.
 - b. Review work zone layout for material and equipment conflicts, especially for cranes or other “boomed” equipment.
 - c. Review and mitigate any utility conflicts.

3. Notify the contractor in writing of authorization or rejection of the submittal.
- iii. For VECP revisions to specified tip elevations or installation methods:
 1. Receive, review, and authorize the VECP in accordance with the requirements of the *Construction Manual*, [Section 3-405](#), *Value Engineering*.
 - a. Discuss proposed revisions with the BCE, Structure, and Geotechnical Designer.
 - b. Get concurrence from the district construction deputy director if the VECP is unacceptable, as per Section 3-405 of the *Construction Manual*.
 2. Notify the contractor in writing of authorization or rejection of the submittal.
- iv. When test borings are specified in the contract documents:
 1. Discuss the following requirements of test borings during the preconstruction conference:
 - a. Direct the contractor to submit four (4) copies of the Test Boring Report and the Log of Test Borings to Structure Design (SD) Documents Unit.
 - b. If corrections are required, direct the contractor to submit one copy of the corrected test boring report and the log of test borings to SD Documents Unit.
 2. Receive notification of the submittal from the contractor.
 3. Coordinate the review with the Structure and Geotechnical Designer.
 4. Act upon the recommendations of the Structure and Geotechnical Designer.
- v. Review and forward to Materials Engineering and Testing Services (METS) Form CEM-3101, *Notice of Materials to be Used*.
- c. When Load Test Piles are specified in the contract documents:
 - i. Verify anchor pile layouts are correctly shown. Discuss any issue with the Geotech Engineer, Bridge Construction Engineer (BCE), and Substructure Engineer.
 - ii. Notify Foundation Testing and Instrumentation (FTI) Branch of scheduled pile load testing by submitting the *Static Pile Load Test Request Form*.
 - iii. Discuss requirements for pile load testing with FTI prior to the preconstruction conference.
 - iv. Discuss requirements for pile load testing with the contractor at the preconstruction conference.

- v. Review the contractor's schedule to verify load test piles are included with sufficient time to perform the test and generate a report.
 - vi. Discuss logistical requirements for performing the pile load test with FTI and the contractor and issue a change order in accordance with the requirements of the contract specifications.
 - vii. Assist the contractor and FTI with preparing the load test pile for load testing according to the *Foundation Manual, Chapter 8-4, Inspection Requirements During Static Load Testing and Pile Dynamic Analysis*:
 - 1. Coordinate installation of pile load test instrumentation package with FTI and the contractor.
 - viii. Review Driving System Submittal for driven piling per BCM 49-2, *Piling – Driven Piling*.
 - ix. Review requirements of AWS D1.1, *Structural Welding Code – Steel*, for load test piles that are to be incorporated into the permanent work (found in the [Engineering Workbench](#). SC staff must create an account).
- d. When Dynamic Monitoring is specified in the contract documents:
- i. Confirm with the Geotech Designer the intended control zones for piles to be dynamically monitored.
 - ii. Notify FTI of scheduled pile dynamic monitoring using the *Pile Driving Analysis Test Request Form*.
 - iii. Discuss requirements for pile dynamic monitoring with FTI prior to the preconstruction conference.
 - iv. Discuss requirements for pile dynamic monitoring with the contractor at the preconstruction conference.
 - v. Discuss the contractor's planned production pile driving procedures with FTI to confirm pile installation procedures for production piling match those used during dynamic monitoring.
 - vi. Review the contractor's schedule to verify dynamic monitoring is included with a sufficient time window to perform pile dynamic monitoring, generate a report, and generate bearing acceptance criteria.
 - vii. Discuss logistical requirements for performing dynamic monitoring with the contractor according to the *Foundation Manual, Chapter 8-3, Contract Administration of Static Pile Load Testing & Pile Dynamic Analysis*.
 - viii. Assist the contractor and FTI with preparing the pile(s) for dynamic monitoring according to the *Foundation Manual, Chapter 8-4, Inspection Requirements During Static Load Testing and Pile Dynamic Analysis*.

- ix. Review the Driving System Submittal for driven piling per BCM 49-2, *Piling – Driven Piling*.
- e. Preparing for construction of production piling:
 - i. When difficult pile installation conditions are specified: Discuss expected difficult pile installation conditions with the geotechnical and structural designers.
 - ii. Discuss expected difficult pile installation conditions in the preconstruction conference (or preconstruction meeting for Cast-In-Place (CIP) concrete piles per [BCM 49-3](#), *Piling – Cast-In-Place Concrete Piling*).
- 4. During construction:
 - a. For Load Test Piles:
 - i. Discuss pile driving operation safety at a Tailgate Safety meeting prior to start of field work.
 - ii. Inspect and verify construction of the load test pile and anchor piling according to *Foundation Manual*, Chapter 8-4, *Inspection Requirements During Static Load Testing and Pile Dynamic Analysis*:
 - 1. For driven load test and anchor piling, log pile details such as blow count and stroke on Form [SC-4805](#), *Log Pile Sheet*, and provide to FTI.
 - 2. For CIDH load test and anchor piling, provide authorized pile submittals per BCM 49-3, *Piling - Cast-In-Place Concrete Piling*, to FTI.
 - 3. Document inspection of construction of the test pile and anchor piling in the daily reports.
 - iii. Assist FTI with pile load testing according to the *Foundation Manual*, [Chapter 8](#), *Static Pile Load Testing and Pile Dynamic Analysis*.
 - iv. Suspend any of the contractor's operations in conflict with the pile load testing work until pile load testing is completed.
 - b. For Dynamic Monitoring:
 - i. Discuss pile driving operation safety at a Tailgate Safety meeting prior to start of field work.
 - ii. Inspect and verify construction of the pile being dynamically monitored according to the *Foundation Manual*, Chapter 8-4, *Inspection Requirements during Static Load Testing and Pile Dynamic Analysis*:
 - 1. Assist FTI with pile dynamic monitoring.
 - 2. Document inspection of construction of the pile being dynamically monitored in the daily reports.

3. Log pile details, blow count and stroke on Form SC-4805, *Log Pile Sheet*, and provide to FTI.
 - iii. Suspend any of the contractor's operations in conflict with the pile dynamic monitoring work until dynamic monitoring is completed.
 - c. For Production Piling:
 - i. When difficult pile installation conditions are specified:
 1. Inspect pile installation and verify and record encountered difficult conditions.
 2. Contact geotechnical and structural designers when unexpected pile installation conditions are encountered.
5. Following Construction:
 - a. For Load Test Piles:
 - i. Receive the Pile Load Test report from FTI.
 - ii. Review the Pile Load Test report and coordinate with the Geotechnical Designer and the Structure Designer to obtain recommendations for raising or lowering the piling specified tip elevations.
 - iii. Notify the contractor of final specified tip elevations in writing.
 - iv. If necessary, issue a change order to implement revised specified tip elevations.
 - b. For Dynamic Monitoring:
 - i. Receive the Dynamic Monitoring Test report and bearing acceptance criteria from FTI.
 - ii. Review the Dynamic Monitoring Test report and coordinate with the Geotechnical and Structural Designers to obtain final specified tip elevations.
 - iii. Notify the contractor of final specified tip elevations and bearing acceptance criteria in writing.
 - iv. If necessary, issue a change order to implement revised specified tip elevations.
6. Document all inspection construction, and quality assurance activities, pertinent to the BCM, in the Daily Reports per [BCM C-7](#), *Daily and Weekly Reports*.
7. File all materials acceptance documents and Daily Reports in the in the appropriate category in the project records as specified in the *Construction Manual*, [5-102](#), *Organization of Project Documents*.

Process Outputs

1. Authorized submittals
2. Completed Static Pile Load Test Request and/or Pile Driving Analysis Test Request Forms
3. Form SC-4805, *Log Pile Sheet*
4. Daily reports
5. Static Pile Load Test report and/or Dynamic Monitoring Test report
6. Bearing acceptance criteria
7. Change order for revisions to specified tip elevations if required

Attachments

None