



Piling – Cast-In-Place Concrete Piling

Revision and Approval

Revision	Date	Nature of Changes	Approved By
0	12-22-2022	Original Issue	Richard Foley

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Background

This process establishes the Structure Construction (SC) responsibilities and procedures for review and authorization of cast-in-place concrete piling submittals, quality assurance, materials, construction, and payment that apply to all cast-in-place concrete piling.

Prior to reviewing this Bridge Construction Memo (BCM), it is essential to review [Contract Specifications](#) (CS), Section 49-3, *Piling – Cast-In-Place Concrete Piling*, that this BCM is based on as identified in the title block above. The information in the CS typically will not be repeated in the text of this BCM.

Process Inputs

1. For all Cast-In-Place (CIP) concrete piling:
 - a. Concrete mix design:
 - i. Prequalification of concrete
 - ii. Mass concrete requirements, if applicable
 - b. Form [CEM-3101](#), *Notice of Materials to Be Used*
 - c. Form [TL-0029](#), *Report of Inspection of Material*
 - d. Crane certification
2. For all Cast-In-Drilled-Hole (CIDH) concrete piling and CIDH concrete piling rock sockets:

- a. The Contractor arranges CIDH pile preconstruction meeting
 - b. CIDH Pile forms, as applicable:
 - i. Form [SC-3801](#), *GGL Inspection Pipe Verification*
 - ii. Form [SC-3802](#), *Drilled Shaft Inspector's Checklist*
 - iii. Form [SC-3803](#), *Drilled Shaft Excavation Log*
 - iv. Form [SC-3804](#), *Drilled Shaft Excavation Profile*
 - v. Form [SC-3805](#), *Drilled Shaft Bottom Inspection*
 - vi. Form [SC-3806](#), *Slurry Test Record*
 - vii. Form [SC-3807](#), *Inspection Pipe and Rebar Coupler Log*
 - viii. Form [SC-3808](#), *Drilled Shaft Concrete Placement Log*
 - ix. Form [SC-3809](#), *Drilled Shaft Concrete Placement Graph*
 - x. Form [SC-4804](#), *Pile Quantity and Drilling Record (CIDH Piles)*
 - xi. Form [SC-4806](#), *Pile Layout Sheet*
 - c. Drilling equipment operational capacities, if applicable
 - d. Pile installation plan (PIP)
 - e. Plastic spacer manufacturer's data and sample
3. For CIDH concrete piling and CIDH concrete piling rock sockets constructed with inspection pipes:
- a. Authorized concrete test batch for concrete to be placed under slurry
 - b. Synthetic slurry manufacturer staff certifications
 - c. Pile acceptance test report from Foundation Testing and Instrumentation (FTI)
4. For rejected CIDH concrete piling:
- a. Revised pile installation plan
 - b. Coring logs and concrete cores, when required
 - c. *Pile Design Data Form* from FTI
 - d. CIDH concrete pile testing report for authorized tests performed by the Contractor on rejected piles
 - e. Contractor arranges CIDH Pile Nonstandard Mitigation Meeting, if applicable
 - f. Pile mitigation plan, if applicable
 - g. Pile mitigation plan review memo, if applicable
 - h. Pile mitigation report, if applicable

5. For all cast-in-steel-shell (CISS) concrete piling:
 - a. Submittal for cleanout method of open-ended steel shells
 - b. Steel shell submittals per BCM 49-2, *Piling – Driven Piling*

Procedure

1. All work associated with this process is charged as [Project Direct – Construction](#).
2. Inspection of field work for this process is:
 - a. [Benchmark](#) for:
 - i. Review of CIP concrete piling submittals
 - ii. Inspection and verification of materials used during construction
 - iii. Inspection of pile layout and reference elevations
 - b. [Intermittent](#) for:
 - i. Inspection of pile cage reinforcement
 - ii. Water removal
 - iii. Inspection pipe installation
 - iv. Concrete coring
 - v. Temporary casing installation
 - vi. Field welding of permanent casing and steel shells
 - c. [Continuous](#) for:
 - i. Installation of steel shells
 - ii. Drilling
 - iii. Inspection pipe integrity verification
 - iv. Cleaning drilled holes
 - v. Slurry testing
 - vi. Critical Lifts/Work adjacent to traffic
 - vii. Placing Concrete
 - viii. Pile mitigation work
3. Before construction begins, the Structure Representative (SR) or delegate must:
 - a. Perform the following document review and collaboration:
 - i. Identify environmental and other physical conditions that affect CIP concrete piling construction during a preconstruction jobsite visit.

- ii. Review the [contract documents](#) for difficult pile installation conditions per [BCM 49-1, Piling – General](#).
 - iii. Review the [contract documents](#), Resident Engineer (RE) Pending File, foundation report, and supplemental project information for applicable environmental commitments and railroad requirements.
 - iv. Review the project-specific Code of Safe Practices and the requirements of Cal/OSHA Title 8, Chapter 4, Subchapter 4, [Construction Safety Orders](#), for CIP concrete piling construction, including but not limited to:
 - 1. [Article 6, Excavations](#)
 - 2. [Article 9, Derricks, Cranes, Boom-type Excavators](#)
 - 3. [Article 12, Pile Driving and Pile Extraction](#)
 - 4. [Article 15, Cranes and Derricks in Construction](#)
 - 5. [Article 24, Fall Protection](#)
 - 6. [Article 37, Confined Spaces in Construction](#)
 - v. For CIDH concrete piles over 20 feet in depth or 30 inches in diameter where there is potential of human entry, review the requirements of Cal/OSHA Title 8, Chapter 4, Subchapter 17, [Mine Safety Orders](#), and Cal/OSHA Title 8, Chapter 4, Subchapter 20, [Tunnel Safety Orders](#).
 - vi. Discuss with the RE and the Contractor any existing facilities concerns and agency requirements, such as overhead power lines, underground utilities, railroad requirements, and call Underground Service Alert (USA) if applicable.
 - vii. Notify the Foundation Testing and Instrumentation Branch (FTI) of the pile driving requirements for permanent casings and steel shells.
- b. Perform the following submittal review and authorization:
- i. For all CIP concrete piling:
 - 1. Review submittal requirements and identify when each submittal is needed per the contract documents. For information pertinent to submittal review, refer to the *Foundation Manual*, [Section 6-6, Inspection and Contract Administration](#); [Section 9-8, Inspection and Contract Administration](#); [Section 9-9, Pile Acceptance Testing](#); [Section 9-10, Defective Piles](#); and [Section 9-11, Pile Mitigation and Acceptance](#).
 - 2. Discuss submittal concerns with the Bridge Design (BD) Structure Project Engineer, Geotechnical Services GS Geoprofessional, FTI, the [SC Substructure Engineer](#) who is also the DES Pile Mitigation Committee Chair, and the Materials Engineering and Testing Services Representative ([METS Rep](#)).

3. Verify the concrete mix design, cementitious material content, and aggregate gradation requirements are met in accordance with the requirements of the contract documents. Discuss concrete testing requirements with the Contractor. For additional information, refer to [BCM 90-1](#), *Concrete – General*.
 4. Receive, review, and authorize or reject all required submittals. Notify the Contractor in writing.
 5. Track the status of all CIP concrete piling submittals for complete and timely review.
- ii. For Cast-in-Drilled-Hole (CIDH) concrete piling and CIDH concrete piling rock sockets:
1. Prior to the CIDH pile preconstruction meeting, receive and review the pile installation plan.
 2. Discuss submittal requirements, including complete and timely submittals, during the CIDH pile preconstruction meeting.
 3. Verify cementitious material content, and aggregate gradation requirements are met for the grout mix design or slurry cement backfill mix design for use with permanent steel casings.
 4. Verify drilling equipment operational capacities are included in the pile installation plan when required. Discuss whether the proposed drilling equipment is viable for the ground conditions with the SC Substructure Engineer, FTI, and GS Geoprofessional.
 5. Verify spacers meet the requirements of the contract documents and are field released via [Form SC-4102](#), *Material Inspected and Released on Job*, and [Attachment 6](#), *CIDH Concrete Piling – Materials*.
 6. CIDH concrete piling constructed without inspection pipes do not require submittals for slurry test records, inspection pipe and reinforcing cage couplers log, coring logs and concrete cores, testing reports, pile mitigation plans, or mitigation reports.
 7. For CIDH concrete piling and CIDH concrete piling rock sockets constructed with inspection pipes:
 - a. Verify appropriate certifications for trained Contractor employees, synthetic slurry, and any proposed additives are authorized for use as shown in the contract documents are submitted per Attachment 6, *CIDH Concrete Piling – Materials*.
 - b. Verify inspection pipes meet the requirements of the contract documents and are field released via Form SC-4102, *Material Inspected and Released on Job*.

- c. Witness the production of the concrete test batch and verify the requirements of the contract documents are met.
 8. Following the CIDH pile preconstruction meeting, authorize or reject the pile installation plan. Notify the Contractor in writing. Review and authorize revisions as needed.
- iii. For CISS concrete piling:
1. Refer to [BCM 49-2](#), *Piling – Driven Piling*, for submittal requirements for steel shells.
 2. Review and authorize the submittal for cleaning out open ended steel shells.
- c. CIDH pile preconstruction meeting:
- i. Identify and invite required CIDH pile preconstruction meeting attendees as described in [Attachment 1](#), *CIDH Concrete Piling – Preconstruction Meeting Instructions*.
 - ii. Provide the submitted pile installation plan to all required CIDH pile preconstruction meeting attendees.
 - iii. Prior to the CIDH pile preconstruction meeting:
 1. Visit the site of each CIDH concrete pile to evaluate potential conflicts.
 2. Discuss concerns with the SC Substructure Engineer, BD Structure Project Engineer, GS Geoprofessional, and FTI. Invite appropriate staff to the CIDH pile preconstruction meeting.
 3. Review the standard CIDH pile preconstruction meeting agenda in Attachment 1 with Caltrans attendees and the Contractor. Customize the standard CIDH pile preconstruction meeting agenda as needed with specific discussion topics. Distribute the meeting agenda to all invitees prior to the meeting.
 4. Coordinate the date, time, and location of the CIDH pile preconstruction meeting with the Contractor. Verify the Contractor schedules the CIDH pile preconstruction meeting in the time frame specified in the contract documents.
 - iv. Conduct the CIDH pile preconstruction meeting and take meeting minutes as described in the *Foundation Manual*, [Section 6-6.2](#), *CIDH Pile Preconstruction Meeting*, and Attachment 1.
 1. Discuss contingency plans for capturing risks and opportunities identified during the CIDH pile preconstruction meeting. Document them in the meeting minutes.
 2. Discuss the pile installation plan with attendees and discuss potential issues. Require resubmittal if needed.

- v. Following the CIDH pile preconstruction meeting:
 - 1. Distribute the meeting minutes to all invitees.
 - 2. File CIDH pile preconstruction meeting minutes and any other documented information from the meeting in the appropriate category in the project records as specified in the *Construction Manual*, [Section 5-102](#), *Organization of Project Documents*.
- vi. Review and authorize any revisions to the pile installation plan.
- d. Materials review:
 - i. Review and discuss with the [METS Rep](#) any CIP concrete piling materials to be inspected and released via Form CEM 3101, *Notice of Materials to be Used*, and Form TL-0029, *Report of Inspection of Material*, and which materials are to be field released via Form SC-4102, *Material Inspected and Released on Job*. Utilize the forms to justify any materials on hand payments.
 - ii. Discuss field welding requirements per the contract documents and AWS D1.1, *Structural Welding – Steel*, with the Contractor and the [METS Rep](#). The AWS D1.1, *Structural Welding – Steel*, can be accessed using the [Engineering Workbench](#) section of the Caltrans Transportation Library, which requires a one-time registration to access.
 - iii. Authorized or reject Field Welding Submittals, Personnel Qualifications and Certifications if necessary, per the CS, Section 11-2, *Welding – Quality Control*, and guidance in [BCM 11](#), *Welding*.
 - iv. Review the *Construction Manual*, [Section 6-107](#), *Materials Acceptance Sampling and Testing*, [Table 6-1.17](#), *Materials Acceptance Sampling and Testing Requirements: Concrete*, for CIP concrete piling materials testing schedules.
- e. Preparing for construction:
 - i. For all CIP concrete piling:
 - 1. Review the Log of Test Borings.
 - 2. Review the location of existing utilities.
 - 3. Review contract documents for mass concrete requirements, when applicable.
 - ii. For CIDH concrete piling and CIDH concrete piling rock sockets:
 - 1. Prepare Form SC-4806, *Pile Layout Sheet*, for each support location with CIDH concrete piling.
 - 2. Prepare Form SC-4804, *Pile Quantity and Drilling Record (CIDH Piles)*, for each support location with CIDH concrete piling.

3. For CIDH concrete piles less than 24 inches in diameter with potential groundwater issues, discuss the potential for increasing the diameter and revising the pile tip elevation with the Contractor. Tip elevation must not be revised for retaining walls and sound walls.
 4. Discuss drilling sequence with the Contractor when CIDH concrete piles are in close proximity per the requirements of the contract documents.
 5. Discuss with the Contractor the handling and disposal of drill cuttings and groundwater:
 - a. Coordinate environmental, water pollution control, and traffic control requirements with the Resident Engineer.
 - b. Verify compliance with authorized project Authorized Storm Water Pollution Prevention Plan or Water Pollution Control Program.
 6. If proposed for use, verify drilling slurry and any proposed additives are authorized for use as described in the contract documents, and that appropriate certifications for trained Contractor employees are submitted. For additional information refer to [Attachment 6](#), *CIDH Concrete Piling – Materials*.
 7. If used, verify plastic spacers meet the requirements of the contract documents per [Attachment 6](#), *CIDH Concrete Piling – Materials*.
 8. If used, verify permanent steel casings are inspected and released by the [METS Rep](#).
 - a. For permanent steel casings, verify welding quality control plan and welder certification requirements have been met per the CS, Section 11-2, *Welding – Quality Control*, and guidance in [BCM 11](#), *Welding*.
- iii. For CISS concrete piling:
1. As applicable discuss with FTI and the GS Geoprofessional dynamic monitoring, pile load testing, potential damage to permanent steel casings or steel shells, and mitigation methods to repair damage.
 2. Discuss with the GS Geoprofessional potential risks with soil plugs and seal course and potential mitigation methods.
4. During construction, the SR or delegate must:
- a. For all CIP concrete piling:
 - i. Review materials as they are delivered to the job site.
 1. Collect Form TL-0624, *Inspection Release Tag*, also known as the orange inspection release tag, and match them to Form TL-0029, *Report of Inspection of Material*.

2. Collect certificates of compliance for the steel reinforcement.
 3. Complete [Form SC-4101](#), *Materials Release Summary*, and [Form SC-4102](#), *Material Inspected and Released on Job*.
- ii. Discuss CIP concrete piling operations in a tailgate safety meeting before field operations begin:
 1. Assure personal protective equipment, including fall protection harness and lanyard, is available and ready for use.
 - iii. Document and photograph all equipment and tooling on the job site.
 - iv. Verify crane and operator certifications meet the requirements of Cal/OSHA Title 8, Chapter 4, Subchapter 4, *Construction Safety Orders*, [Article 15](#), *Cranes and Derricks in Construction*.
 - v. Sample and test CIP concrete materials per the requirements of the contract documents, as outlined in the *Construction Manual*, Section 6-107, *Materials Acceptance Sampling and Testing*, Table 6-1.17, *Materials Acceptance Sampling and Testing Requirements: Concrete*.
 - vi. Complete bid item payment and materials on hand payment for the applicable CIP concrete piling bid items upon successful placement of the pile concrete, including receipt of all required forms from the Contractor.
- b. For CIDH concrete piling and CIDH concrete piling rock sockets:
 - i. Review the authorized pile installation plan.
 - ii. Review Form SC-3802, *Drilled Shaft Inspector's Checklist, Contractor and Equipment Arrive on Site* section. Use this form to verify all applicable items are completed.
 - iii. Review [Outline of Field Construction Practices](#), Section 4, *Cast-In-Place (CIP) Concrete Piling*.
 - iv. Complete Form SC-4804, *Pile Quantity and Drilling Record (CIDH Piles)*, for each support location with CIDH concrete piling.
 - v. If used, for permanent steel casings, verify welding quality control plan and welder certification requirements have been met per the CS, Section 11-2, *Welding – Quality Control*, and guidance in [BCM 11](#), *Welding*.
 - vi. Inspect drilled holes per the *Foundation Manual*, [Chapter 6](#), *Cast-In-Drilled-Hole Piles*, and [Chapter 9](#), *Slurry Displacement Piles*, and Attachments 1-6.
 1. Review Form SC-3802, *Drilled Shaft Inspector's Checklist, Shaft Excavation and Cleaning* section. Use this form to verify all applicable items are completed:
 - a. Assure that suitable tools, such as a mirror or flashlight, are available for inspecting the conditions of the drilled hole.

2. Using Form SC-4806, *Pile Layout Sheet* and the contract documents, verify the Contractor's pile layout of CIDH concrete piling. Verify the location of the drilled hole is within tolerance specified in the contract documents.
3. Verify concrete will be placed against undisturbed material at the limits of excavation.
4. Verify hole drilling pattern conforms to the requirements of the contract documents.
5. For piles 24 inches in diameter or larger, as each hole is being drilled, complete Form SC-3803, *Drilled Shaft Excavation Log*.
6. Evaluate whether the material excavated from the drilled hole is consistent with the material description in the contract documents:
 - a. Document deviations on Form SC-3803 for potential identification of differing site conditions.
 - b. Discuss deviations with the GS Geoprofessional and the SC Substructure Engineer to determine whether a differing site condition exists.
 - c. If the Contractor submits notification of a differing site condition, follow the procedures in the *Construction Manual*, [Section 3-404](#), *Differing Site Conditions*.
7. Verify plumbness of the drilled hole.
8. If caving holes or groundwater are encountered, verify the Contractor uses methods that conform to the requirements of the contract documents.
9. If drilling slurry is introduced into the drilled hole, verify the Contractor's use of drilling slurry per the requirements of the contract documents and Attachment 6, *CIDH Concrete Piling – Materials*.
 - a. Verify that drilling slurry is tested at specified intervals. Verify the Contractor documents results of slurry testing on Form SC-3806, *Slurry Test Record*:
 - i. Assure a slurry test kit is available for sampling and testing the drilling slurry periodically per Attachment 6, *CIDH Concrete Piling – Materials*.
 - ii. The Contractor can submit this information on their own form, provided the form contains all information required in the contract documents.
 - b. Verify drilling slurry levels in the drilled hole are maintained as required in the contract documents.

10. Verify pile tip elevation.
11. For piles 24 inches in diameter or larger, when the pile tip elevation has been reached, complete Form SC-3804, *Drilled Shaft Excavation Profile*:
 - a. If special testing is required in the contract documents for the bottom of the hole, verify FTI performs the testing before the Contractor places the pile reinforcement cage and prior to concrete placement.
12. Verify the bottom of the drilled hole is clean. For piles 24 inches in diameter or larger, complete Form SC-3805, *Drilled Shaft Bottom Inspection*, to document the condition of the bottom of the drilled hole.
13. Verify the Contractor provides worker protection for the area per Cal/OSHA Title 8, Chapter 4, Subchapter 4, *Construction Safety Orders*, [Article 24](#), *Fall Protection*.
- vii. If used, inspect use of temporary casing per *Foundation Manual*, Chapter 6, *Cast-In-Drilled-Hole Piles*, and Chapter 9, *Slurry Displacement Piles*, and Attachments 1-6:
 1. Discuss potential issues with the use of temporary casings with the Contractor.
 2. Verify temporary casings are used in accordance with the requirements of the contract documents.
 3. For piles 24 inches in diameter or larger, document any use of temporary casings on Form SC-3804, *Drilled Shaft Excavation Profile*.
 4. During concrete placement, verify the Contractor removes the temporary casing in accordance with the requirements of the contract documents.
- viii. If used, inspect permanent steel casing Installation per *Foundation Manual*, Chapter 6, *Cast-In-Drilled-Hole Piles*, and Chapter 9, *Slurry Displacement Piles*, and Attachments 1-7.
 1. When permanent steel casings are required:
 - a. Verify the permanent steel casing is installed as specified in the contract documents.
 - b. Verify grout placement to seal the permanent steel casing is performed in accordance with the requirements of the contract documents.
- ix. Inspect pile reinforcement placement per *Foundation Manual*, Chapter 6, *Cast-In-Drilled-Hole Piles*, and Chapter 9, *Slurry Displacement Piles*, and Attachments 1-6.

1. Review Form SC-3802, *Drilled Shaft Inspector's Checklist, Reinforcing Cage* section. Use this form to verify all applicable items are completed.
2. For piles 24 inches in diameter or larger, verify the Contractor documents and submits the locations of any bar reinforcement couplers on Form SC-3807, *Inspection Pipe and Rebar Coupler Log*. The Contractor can submit this information on their own form, provided the form contains all information required in the contract documents.
3. For cages 4 feet in diameter or larger, verify sufficient rebar intersection ties are present per the requirements of the contract documents.
4. For drilled holes that have authorized increased diameters or revised tip elevations, verify the requirements of the contract documents are met.
5. If plastic spacers are used, verify the location and spacing of the plastic spacers conforms to manufacturer's recommendations and the requirements of the contract documents per Attachment 6, *CIDH Concrete Piling – Materials*.
6. Verify the bottom of the drilled hole is clean before placing the pile reinforcement cage.
7. Verify the position of the pile and/or column reinforcement conforms to the tolerance and clearance requirements of the contract documents.
8. For any shaft where the reinforcement cage extends 20 feet or more in height above grade, verify the Contractor installs the temporary support system per [BCM 52-1](#), *Reinforcement – General*.
- x. If used, inspect vertical inspection pipes per *Foundation Manual*, Chapter 9, *Slurry Displacement Piles*, and Attachments 1-6:
 1. Assess the conditions of the drilled hole and verify whether inspection pipes are required.
 2. Verify installation of inspection pipes during fabrication of the pile reinforcement cage is performed in accordance with the requirements of the contract documents.
 3. Verify the Contractor documents the locations of inspection pipe couplers on Form SC-3807, *Inspection Pipe and Rebar Coupler Log*.
 4. Following placement of pile concrete:
 - a. Verify inspection pipes are clear for acceptance testing as specified in the contract documents. Document the results on Form SC-3801, *GGL Inspection Pipe Verification*.

- b. For any blocked inspection pipes:
 - i. Discuss the nature of the blocked inspection pipes with the DES Pile Mitigation Committee, starting with the SC Substructure Engineer.
 - ii. Unless the DES Pile Mitigation Committee recommends otherwise, verify the Contractor performs coring to replace the blocked inspection pipe as specified in the contract documents.
- xi. If used, inspect construction joints per *Foundation Manual*, Chapter 9, *Slurry Displacement Piles*, and Attachments 1-6:
 - 1. Verify the Contractor installs a permanent steel casing for worker protection at the location of the construction joint in accordance with the requirements of the contract documents.
 - 2. Following concrete placement, verify that excess concrete is removed to the elevation of the construction joint. Verify the Contractor's safety procedures are in accordance with the requirements of Cal/OSHA Title 8, Chapter 4, Subchapter 4, *Construction Safety Orders*, [Article 6](#), *Excavations*, and [Article 37](#), *Confined Spaces in Construction*.
- xii. Inspect concrete placement for all CIDH concrete piling per *Foundation Manual*, Chapter 6, *Cast-In-Drilled-Hole Piles*, and Attachments 1-6:
 - 1. Review Form SC-3802, *Drilled Shaft Inspector's Checklist*, *Concrete Placement* section. Use this form to verify all applicable items are completed.
 - 2. Verify the concrete placement method used by the Contractor will not cause segregation of the concrete being placed.
 - 3. Unless placing concrete under slurry, verify that the upper 15 feet of the pile is vibrated per the requirements of the contract documents.
 - 4. Verify concrete cure is performed on the exposed top of pile per [BCM 51-1.03H](#), *Concrete Structures - General – Construction – Curing Concrete Structures*.
 - 5. Verify the Contractor completes Form SC-3808, *Drilled Shaft Concrete Placement Log*, and Form SC-3809, *Drilled Shaft Concrete Placement Graph*, during concrete placement and submits these forms following concrete placement.
- xiii. Inspect CIDH concrete piling concrete placement under drilling slurry per *Foundation Manual*, Chapter 9, *Slurry Displacement Piles*, and Attachments 1-6.
 - 1. Prior to concrete placement:

- a. Review Form SC-3802, *Drilled Shaft Inspector's Checklist*, *Concrete Placement* section. Use this form to verify all applicable items are completed.
 - b. Verify the drilling slurry meets the specified material requirements per Attachment 6, *CIDH Concrete Piling – Materials*. Verify the Contractor documents results of slurry testing on Form SC-3806, *Slurry Test Record*.
 - c. Verify the Contractor performs a final cleaning of the bottom of the drilled hole.
 - d. Verify the Contractor has Form SC-3808, *Drilled Shaft Concrete Placement Log*, and Form SC-3809, *Drilled Shaft Concrete Placement Graph*, and is ready to fill them out during concrete placement.
 - e. Verify the Contractor has all necessary equipment and contingency equipment specified in the contract documents.
2. During concrete placement:
- a. Verify the concrete mix delivered is the authorized concrete mix design.
 - b. Verify the Contractor caps or plugs the concrete delivery tube prior to first discharge of concrete into the pile:
 - i. Verify the Contractor recovers the cap or plug after concrete placement begins.
 - c. Verify the Contractor maintains concrete delivery tube embedment and drilling slurry elevations as specified in the contract documents.
 - d. When temporary casing is used, verify the Contractor is continuously monitoring the elevation at the bottom of temporary casing as it is removed.
 - e. If the Contractor loses the seal on the concrete delivery tube, verify the Contractor reinserts the concrete delivery tube per the requirements of the contract documents.
 - f. Verify the Contractor “wastes” any slurry-contaminated concrete from the top of the pile.
 - g. After concrete placement is completed:
 - i. Verify the Contractor fills the inspection pipes with water.
 - ii. If visible, observe the top pile concrete for signs of excessive bleed water or subsidence.

- h. Verify the Contractor completes Form SC-3808, *Drilled Shaft Concrete Placement Log*, and Form SC-3809, *Drilled Shaft Concrete Placement Graph*, during concrete placement and submits these forms following concrete placement. The Contractor can submit information on the Contractor's forms, provided the Contractor's forms contain all information required in the contract documents.
 - xiv. Document all inspection, construction, and quality assurance activities in the daily reports per [BCM C-7](#), *Daily and Weekly Reports*.
 - xv. Complete Form SC-4804, *Pile Quantity and Drilling Record (CIDH Piles)*, for each pile placed.
 - c. For CISS concrete piling:
 - i. Review [BCM 49-2](#), *Piling – Driven Piling*, for steel shell submittals, materials, and driving requirements.
 - ii. Review materials as they are delivered to the job site.
 - 1. Collect Form TL-0642, *Inspection Release Tag*, also known as the orange inspection release tag, and match them to Form TL-0029, *Report of Inspection of Material*.
 - 2. Collect certificate of compliance for the steel reinforcement.
 - 3. Complete Form SC-4101, *Materials Release Summary*, and Form SC-4102, *Material Inspected and Released on Job*.
 - iii. Inspect steel shells as they are driven for compliance with the requirements of the contract documents.
 - iv. Inspect steel shells after they are driven for damage or reduced diameter.
 - 1. If the steel shells are damaged, reject the steel shell.
 - 2. Resolve rejected steel shells in coordination with the Contractor, the BD Structure Project Engineer and the GS Geoprofessional.
 - v. For open-ended steel shells:
 - 1. If ground water is present in the steel shell, determine whether:
 - a. To allow the Contractor to dewater the steel shell, or
 - b. To require the Contractor to seal the bottom of the steel shell with a seal course.
 - c. To use of the slurry displacement method if appropriate.
 - 2. Verify the Contractor does not damage or disturb the soil plug at the bottom of the steel shell.

3. Verify the Contractor cleans out the inside of the steel shell in accordance with the requirements of the contract documents.
 4. Verify steel shells are clean and free of debris before placing bar reinforcement and concrete.
- vi. Verify placement of reinforced concrete in the steel shell is in accordance with the requirements of the contract documents.
 - vii. Document all inspection, construction, and quality assurance activities in the daily reports per [BCM C-7](#), *Daily and Weekly Reports*.
- d. Complete the following forms for each CIP concrete pile as applicable:
 - i. Form SC-4804, *Pile Quantity and Drilling Record (CIDH Piles)*
 - ii. Form SC-4806, *Pile Layout Sheet*
 - iii. Form SC-3801, *GGL Inspection Pipe Verification*
 - iv. Form SC-3802, *Drilled Shaft Inspector's Checklist*
 - v. Form SC-3803, *Drilled Shaft Excavation Log*
 - vi. Form SC-3804, *Drilled Shaft Excavation Profile*
 - vii. Form SC-3805, *Drilled Shaft Bottom Inspection*
 - e. Verify receipt of the following forms from the Contractor for each CIP concrete pile as applicable. The Contractor can submit information on the Contractor's forms, provided the Contractor's forms contain all information required in the contract documents:
 - i. Form SC-3806, *Slurry Test Record*.
 - ii. Form SC-3807, *Inspection Pipe and Rebar Coupler Log*
 - iii. Form SC-3808, *Drilled Shaft Concrete Placement Log*
 - iv. Form SC-3809, *Drilled Shaft Concrete Placement Graph*
 - f. For Department Acceptance of CIDH concrete piling and CIDH concrete piling rock sockets (applies to CIDH concrete piling with inspection pipes):
 - i. Notify FTI of pile acceptance testing within 15 days of anticipated need. Submit the [CIDH Pile Acceptance Test Request Form](#) per [Attachment 2](#), *CIDH Concrete Piling – Contract Administration and Department Acceptance*.
 - ii. Verify the Contractor prepares for pile acceptance testing per [California Test 233](#), *Method of Ascertaining the Homogeneity of Concrete in Cast-In-Drilled-Hole (CIDH) Piles Using the Gamma-Gamma Test Method*.
 1. Verify that inspection pipes are clear for pile acceptance testing equipment per Attachment 2:

- a. Complete Form SC-3801, *GGL Inspection Pipe Verification*, and request pile acceptance testing from FTI per Attachment 2.
 - b. If the inspection pipes are not clear for pile acceptance testing, discuss next steps with the DES Pile Mitigation Committee per Attachment 2, Section titled *Piles with Blocked Inspection Pipes*. See [Attachment 3](#), *CIDH Pile Mitigation Committee*, for other services and roles of the DES Pile Mitigation Committee.
 - c. If the Contractor cores the CIDH concrete pile to replace blocked inspection pipes:
 - i. Verify that the coring and logging operation comply with the contract requirements.
 - ii. Confirm receipt of the coring logs and concrete cores.
 - iii. Forward coring logs to FTI for coordinated review and recommendations per the contract documents, and the *Foundation Manual*, [Section 9-9](#), *Pile Acceptance Testing*. Retain the concrete cores on site for further evaluation if needed.
2. Verify safe access for FTI staff around all installed CIDH concrete piling.
 3. Verify the Contractor provides a 25' radius clear zone around the CIDH concrete pile in preparation for acceptance testing in accordance with the requirements of the contract documents.
 4. Document all inspection, construction, and quality assurance activities associated with inspection pipe clearance in the daily reports per [BCM C-7](#), *Daily and Weekly Reports*.
- iii. Prior to acceptance testing of constructed CIDH concrete piling:
 1. Forward the following completed forms for each CIDH concrete pile to FTI:
 - a. Form SC-3801, *GGL Inspection Pipe Verification*
 - b. Form SC-3807, *Inspection Pipe and Rebar Coupler Log*
 - c. Form SC-3808, *Drilled Shaft Concrete Placement Log*
 - iv. Track and maintain accurate timeline of all testing and mitigation activities below.
 - v. FTI performs acceptance testing using [California Test 233](#), *Method of Ascertaining the Homogeneity of Concrete in Cast-In-Drilled-Hole (CIDH) Piles Using the Gamma-Gamma Test Method*.
 1. Verify inspection pipe tops are cut off level and to the elevation confirmed with FTI.

2. Verify the Contractor secures the site from unauthorized entry.
3. Verify all construction staff follow radiation safety protocols.
- vi. Review the pile acceptance test report upon receipt from FTI per Attachment 2.
- vii. If the pile acceptance test report recommends pile acceptance, accept the pile. Notify the Contractor in writing per Attachment 2.
- viii. If the pile acceptance test report recommends rejecting the pile, reject the pile. Notify the Contractor in writing per Attachment 2.
- ix. For rejected piles:
 1. Suspend concrete placement in the remaining piles.
 2. Suspend subsequent reinforcing and concrete work on footings and abutments supported by the rejected pile(s).
 3. Request a revised pile installation plan from the Contractor.
 - a. Authorize the revised pile installation plan if it addresses the reasons for pile rejection. Notify the Contractor in writing and allow concrete placement to resume in the remaining piles.
 4. If the Contractor chooses to perform CIDH concrete pile testing on a rejected pile:
 - a. Confirm receipt of the testing report.
 - b. Forward the testing report to FTI for coordinated review and recommendations per the *Foundation Manual*, [Section 9-11](#), *Pile Mitigation and Acceptance*.
 - c. Authorize or reject the acceptance testing report. Notify the Contractor in writing.
 5. The pile acceptance test report will specify if FTI is planning to perform cross-hole sonic logging (CSL) testing. Contact FTI to confirm timely testing schedule to minimize debonding of PVC inspection pipes from the concrete pile, which can occur within 7-10 days.
 6. Determine whether the rejected pile requires mitigation per Attachment 2:
 - a. For rejected piles, the pile acceptance test report includes a *Pile Design Data Form* (PDDF). Send the PDDF to the BD Structure Project Engineer, GS Geoprofessional, and the [METS Rep](#) for Corrosion for completion and return in the time frame specified in the contract documents.
 - b. If the pile acceptance test report requires additional pile testing, discuss and schedule additional pile testing with FTI:

- i. Upon completion of additional pile testing, send the revised PDDF to the BD Structure Project Engineer, GS Geoprofessional, and the [METS Rep](#) for corrosion.
 - c. Upon receipt of the completed PDDF from the BD Structure Project Engineer, GS Geoprofessional, and the [METS Rep](#) corrosion:
 - i. Send the completed PDDF to the SC Substructure Engineer (DES Mitigation Committee Chair) per [BCM C-6](#), *Required Documents to be Submitted During Construction*.
 - ii. Discuss whether mitigation is required with the DES Pile Mitigation Committee.
 - iii. If the rejected pile requires mitigation, discuss whether the pile can be repaired using the [Caltrans Authorized – ADSC Standard Mitigation Plan](#) with the DES Pile Mitigation Committee.
- 7. If the rejected pile does not require mitigation:
 - a. Notify the Contractor in writing per Attachment 2.
 - b. Calculate the administrative deduction and withhold the deduction from the next monthly progress payment.
 - c. Accept the pile.
 - d. If the Contractor elects to mitigate the pile in lieu of the administrative deduction, proceed to the next step.
- 8. If the rejected pile requires mitigation:
 - a. Require the Contractor to submit a pile mitigation plan.
 - b. Withhold 30% of the bid item price of the rejected pile in accordance with [BCM C-9](#), *Preparation of Progress Payment Documents*, from the next progress pay estimate.
 - c. If the rejected pile requires mitigation and the pile cannot be repaired using the ADSC Standard Mitigation Plan:
 - i. Remind the Contractor to schedule a CIDH Pile Nonstandard Mitigation Meeting, per the requirements of the contract documents.
 - ii. Notify the DES Pile Mitigation Committee of the scheduled meeting.
 - iii. Conduct the meeting per [Attachment 4](#), *CIDH Pile Nonstandard Mitigation Meeting*, and come to consensus with the Contractor regarding whether the rejected pile will be repaired using a nonstandard mitigation plan, supplemental piling, or replacement piling.

- iv. Require the Contractor to submit a pile mitigation plan for non-standard repair, supplemental piling, or replacement piling.
 - d. Perform an initial review of the pile mitigation plan for completeness.
 - e. Send the reviewed pile mitigation plan to the DES Pile Mitigation Committee for technical review per the *Foundation Manual*, [Section 9-11.6](#), *Pile Mitigation Plan Development and Authorization Procedures*.
 - f. FTI reviews the pile mitigation plan and issues a pile mitigation plan review memo to the DES Pile Mitigation Committee Chair.
 - g. Upon receipt of the pile mitigation plan review memo and review comments from the [METS Rep](#) for corrosion, BD Structure Project Engineer, GS Geoprofessional, and the DES Pile Mitigation Committee Chair issues the DES Pile Mitigation Committee Memo recommending authorization or rejection of the proposed pile mitigation plan.
9. Authorize or reject the pile mitigation plan per the recommendations of the DES Pile Mitigation Committee Memo.
 10. Send the authorized pile mitigation plan to the SC Substructure Engineer (Mitigation Committee Chair) per [BCM C-6](#), *Required Documents to be Submitted During Construction*.
 11. Inspect the pile mitigation work performed in the field per Attachment 2 and the *Foundation Manual*, [Section 9-11.10](#), *What to Expect in the Field During Pile Mitigation*:
 - a. Verify the Contractor follows the requirements of the authorized pile mitigation plan.
 - b. Accept or reject the mitigation work based on field conditions encountered during the mitigation work.
 - c. Document all inspection, construction, and quality assurance activities associated with pile mitigation activities in the daily reports per [BCM C-7](#), *Daily and Weekly Reports*.
 12. Request the Contractor to submit a mitigation report:
 - a. Perform an initial review of the mitigation report and send the reviewed mitigation report to the SC Substructure Engineer (DES Pile Mitigation Committee Chair) per [BCM C-6](#), *Required Documents to be Submitted During Construction*:
 - i. If the report does not match mitigation work performed, reject the mitigation report and request resubmittal. Review the mitigation report along with the daily reports.

- b. Discuss the mitigation report with the DES Pile Mitigation Committee:
 - i. If the mitigation report is in accordance with the authorized pile mitigation plan and reflects the mitigation work performed per the *Foundation Manual, Section 9-11.11, Procedures for Authorizing the Pile Mitigation Work Performed in the Field and Pile Acceptance*, accept the pile. Notify the Contractor in writing.
 - c. Release any payment withholds taken upon pile acceptance.
 - d. Inspection pipes can be grouted and sealed per the contract documents.
13. Document all inspection, construction, and quality assurance activities, pertinent to this BCM, in the daily reports per [BCM C-7](#), *Daily and Weekly Reports*.
14. File all test results and daily reports in the appropriate category in the project records as specified in the *Construction Manual, Section 5-102, Organization of Project Documents*.
5. Following construction, the SR or delegate must:
- a. File authorized submittals in the appropriate category of the project records as specified in the *Construction Manual, Section 5-102, Organization of Project Documents*.
 - b. Review the contract requirements for CISS concrete piling furnish and drive contract items and make monthly progress payments in accordance with:
 - i. [Attachment 7](#), *Cast-In-Steel Shell Concrete Piling – Measurement and Payment*
 - ii. [BCM 49-2](#), *Piling – Driven Piling*.
 - c. When all CIDH concrete piles for the project have been accepted, fill out and submit the [Form SC-3812](#), *CIDH Pile Information for Piles Tested by the Foundation Testing Branch (FTB) Memo*, to the SC Substructure Engineer (DES Pile Mitigation Committee Chair) per [BCM C-6](#), *Required Documents to be Submitted During Construction*.
 - d. Submit completed applicable final pile records to SC HQ per BCM C-6, *Required Documents to be Submitted During Construction*.
 - e. Complete a Pile Construction Report (PCR) for each applicable CIDH concrete pile per [Attachment 5](#), *Pile Construction Report*.
6. File all project documentation (correspondence, materials acceptance documentation, test results, completed forms, PCRs, daily reports, etc.) in the appropriate category in the project records as specified in the *Construction Manual, Section 5-1.02, Organization of Project Documents*.

Process Outputs

1. Authorized CIP concrete piling submittals
2. CIDH pile preconstruction meeting minutes
3. CIDH pile preconstruction meeting list of contacts and a communications protocol
4. CIDH pile preconstruction meeting documented risks and opportunities identified during the meeting that may need to be communicated to the Caltrans Project Manager and other interested parties
5. CIDH pile preconstruction meeting action items
6. Authorized revisions to the pile installation plan (if applicable)
7. Completed Form TL-0029, *Report of Inspection of Material*, and matching Form TL-0624, *Inspection Release Tag* (orange tag)
8. Completed Form SC-4101, *Materials Release Summary*, and completed Form SC-4102, *Material Inspected and Released on Job*
9. Completed CIP concrete pile construction forms and Pile Construction Reports
10. *Pile Acceptance Test Report* (and completed PDDF when required), if applicable
11. Pile Acceptance or Rejection letter, if applicable
12. Pile mitigation plan authorization or rejection letter, if applicable
13. Authorized pile mitigation plan, if applicable
14. Pile Mitigation Report, if applicable
15. Daily reports

Attachments

[Attachment 1](#), *CIDH Concrete Piling – Preconstruction Meeting Instructions*

[Attachment 2](#), *CIDH Concrete Piling – Contract Administration and Department Acceptance*

[Attachment 3](#), *CIDH Pile Mitigation Committee*

[Attachment 4](#), *CIDH Pile Nonstandard Mitigation Meeting*

[Attachment 5](#), *CIDH Concrete Pile Construction Report (PCR)*

[Attachment 6](#), *CIDH Concrete Piling – Materials*

[Attachment 7](#), *Cast-In-Steel-Shell Concrete Piling – Measurement and Payment*