



Piling - Steel Soldier 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 Structure Construction (SC) responsibilities and procedures for review and authorization of steel soldier piling submittals, quality assurance, materials and construction that apply to all steel soldier piling.

This process is limited to installation of steel soldier piling. Contract requirements for administering the construction of soldier pile walls are located in the [Contract Specifications](#) (CS), Section 19, *Earthwork*, and guidance in [Section 19, Earthwork](#).

Prior to reviewing this Bridge Construction Memo (BCM), it is essential to review the CS, Section 49-4, *Piling – Steel Soldier 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. Submittals:
 - a. Pile installation plan
 - b. Drilling equipment operational capacities, if applicable
2. Materials:
 - a. [Form CEM-3101](#), *Notice of Materials to be Used*
 - b. [Form TL-0029](#), *Report of Inspection of Material*

- c. Certified material test reports and certificate of compliance for structural shape steel piling per [BCM 49-2](#), *Piling – Driven Piling*
 - d. Concrete mix designs
3. Construction:
- a. Authorized Pile Handling Work Plan required in CS, Section 49-1.01C(1), *Piling – General – Submittals – General*, and per guidance in [BCM 49-1](#), *Piling – General*
 - b. Authorized soldier pile wall shop drawings and calculations per guidance in [BCM 19-3.01C](#), *Earthwork - Structure Excavation and Backfill – Submittals*
 - c. Authorized welding quality control plan (WQCP) per guidance in [BCM 11](#), *Welding*
 - d. Authorized painting quality work plan per guidance in [BCM 59-2](#), *Structural Steel Coatings - Painting Structural Steel*
 - e. [Form SC-3803](#), *Drilled Shaft Excavation Log*
 - f. [Form SC-3805](#), *Drilled Shaft Bottom Inspection*
 - g. [Form SC-3806](#), *Slurry Test Record*

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 submittals
 - ii. Inspection and verification of materials used during construction
 - iii. Inspection of pile layout and reference elevations.
 - b. [Intermittent](#) for:
 - i. Temporary casing installation
 - ii. Field welding
 - iii. Inspection of steel soldier pile setting.
 - c. [Continuous](#) for:
 - i. Drilling
 - ii. Cleaning drilled holes
 - iii. Slurry testing
 - iv. Critical lifts/work adjacent to traffic

- v. Placing concrete.
3. Before construction begins:
- a. Perform document review of the following:
 - i. Log of test borings and foundation reports.
 - ii. Resident Engineer's (RE) pending file per [BCM C-2](#), *Using the Resident Engineer's Pending File for Structure Work*.
 - iii. *Foundation Manual*, [Chapter 14](#), Section 14-3.4, *Soldier Piling*.
 - iv. [SC Winter Training](#) presentation from 2014 titled, *06-Soldier Pile ERS*, and any other related and more current presentations.
 - b. Perform the review and authorization of submittals as follows:
 - i. Develop a submittal log to:
 - 1. Document submittal review milestones.
 - 2. Document conversations, review notes, and reasons for review delays.
 - 3. Monitor the submittal review time.
 - ii. Discuss the submittal review timelines with the Bridge Design (BD) Structure Project Engineer.
 - iii. Review the Contractor's responsibilities and timelines for all submittals listed in the contract documents including:
 - 1. Pile installation plan
 - 2. Concrete backfill placement report
 - 3. Shop drawings for soldier pile wall per [BCM 19-3.01C](#), *Earthwork – Structure Excavation and Backfill – Submittals*
 - 4. Welding quality control plan per CS, Section 11-2, *Welding – Welding Quality Control*, and guidance in [BCM 11](#), *Welding*
 - 5. Painting quality work plan per [BCM 59-2](#), *Structural Steel Coatings – Painting Structural Steel*
 - 6. Certified material test report and certificate of compliance for structural shape steel piling per [BCM 49-2](#), *Piling – Driven Piling*
 - 7. Drilling equipment operational capacities, if applicable
 - 8. Pile Handling Work Plan.
 - iv. During submittal review, discuss potential problem areas, unusual details, and risks with the Bridge Construction Engineer (BCE), BD Structure Project Engineer, Geotechnical Services (GS) Geoprofessional, and/or Substructure Engineer, which may include:
 - 1. Difficult drilling conditions

2. Groundwater and caving conditions
 3. Environmental work window restrictions.
 - v. Verify the submittals meet the requirements of the [contract documents](#), as follows:
 1. Check for agency/utility impacts.
 2. Forward the water pollution control program addendums to the RE for authorization.
 - vi. Review and authorize or reject (for resubmittal) the submittals. Notify the Contractor in writing.
- c. Prepare for material release and acceptance, as follows:
- i. Review and discuss with the Materials Engineering and Testing Services Representative ([METS Rep](#)) any 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*, and [Form SC-4101](#), *Materials Release Summary*. Utilize the forms to justify any materials on hand payments.
 - ii. For field welding of steel piling, verify the welding quality control plan and welder certification requirements have been met per CS, Section 11-2, *Welding – Welding Quality Control*, and guidance in [BCM 11](#), *Welding*.
 - iii. Verify that steel soldier pile materials have been released for construction by METS using [Form TL-0029](#), *Report of Inspection of Material*, and match with the orange tags collected in the field.
 - iv. Perform timely field verification that the materials delivered meet contract requirements, authorized submittal requirements, and were not damaged in shipping.
 - v. Discuss field welding requirements per AWS D1.1, *Structural Welding Code – Steel*, with the Contractor and METS Rep.
 1. Note that the methods to obtain the AWS D1.1 include requesting a copy from the BCE or the METS Rep, or accessing through the [Engineering Workbench](#) which requires an account login.
 - vi. Verify the certificates of compliance and mill certificates comply with contract requirements and file in Category 41, *Report of Inspection of Material*.
 - vii. Verify concrete mix design meet the requirements of the contract documents.
 - viii. Review the *Construction Manual*, [Section 6-107](#), *Materials Acceptance Sampling and Testing*, and [Table 6-1.17](#), *Materials Acceptance Sampling*

and Testing Requirements: Concrete, for steel soldier piling concrete backfill materials testing schedules.

- d. Prepare for steel soldier piling production work, as follows:
 - i. Review the project specific *Code of Safe Practices* for personal protective equipment requirements and safety hazards associated with steel soldier piling construction.
 - ii. Verify that SC staff have completed fall protection training and have a safety harness and lanyard for work near an open hole.
 1. Note that an SC Fall Protection Refresher Training can be found on the [SC Online Training](#) intranet site.
 - iii. Discuss the requirements of the pile installation plan with the Contractor, including:
 1. Drilling sequence when soldier piles are in close proximity per the requirements of the contract documents.
 2. Drilled hole alignment and required horizontal and vertical clearances around the steel soldier pile per the contract documents.
 3. Handling and disposal of drill cuttings, groundwater, and drilling slurry:
 - a. Coordinate environmental, water pollution control, and traffic control requirements with the RE.
 - b. Verify compliance with authorized project storm water pollution prevention plan (SWPPP) or water pollution control program (WPCP).
 4. Use of two tremie tubes when concrete is placed under slurry.
 - iv. If proposed for use, verify drilling slurry and any proposed additives are authorized for use as described in the contract documents.
 - v. Discuss with the RE and Contractor any existing facilities concerns and agency requirements, such as underground utilities and overhead power lines.
 - vi. Confirm primer coating on piles was not damaged during storage.
 - vii. Ensure that the Contractor provides suitable tools, such as a mirror or flashlight, to be used for inspecting the conditions of the drilled hole.
 - viii. Prepare steel soldier pile quantity record and layout sheet. Note that the following sheets can be used as templates:
 1. [Form SC-4804](#), *Pile Quantity and Drilling Record (CIDH Piles) Sheet*
 2. [Form SC-4806](#), *Pile Layout Sheet*
 - ix. Prepare the following forms:

1. [Form SC-3803](#), *Drilled Shaft Excavation Log*
 2. [Form SC-3805](#), *Drilled Shaft Bottom Inspection*
 3. [Form SC-3806](#), *Slurry Test Record*
- x. Place reference staking hubs and provide cut elevations for concrete backfill cutoff and lean concrete backfill cutoff.
4. During construction:
- a. Document and photograph all equipment and tooling on the job site.
 - b. 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*.
 - c. Verify the Contractor's pile layout of steel soldier piling. Verify the location of the drilled hole is within tolerance specified in the contract documents.
 - d. Inspect drilled holes per *Foundation Manual*, Chapter 14, *Specialty Piles and Special Considerations for Pile Foundations*.
 - e. Complete [Form SC-3803](#), *Drilled Shaft Excavation Log*. Record observations made during drilling.
 - f. Evaluate whether the material from the drilled hole is consistent with the material description in the contract documents.
 - i. Document deviations on [Form SC-3803](#) for potential identification of differing site conditions, as described below.
 - ii. Discuss deviations with the GS Geoprofessional and the SC Substructure Engineer.
 - iii. If the Contractor submits notification of a differing site condition, follow the procedures in the *Construction Manual*, [Section 3-404](#), *Differing Site Conditions*.
 - g. Verify plumbness of the drilled hole.
 - h. Verify drilled hole cleanliness and complete [Form SC-3805](#), *Drilled Shaft Bottom Inspection*, to document the condition of the bottom of the drilled hole.
 - i. Verify drilled depth reached contract plan tip elevation.
 - j. If caving holes or groundwater are encountered, verify the Contractor uses remedial methods that conform to the requirements of the contract documents.
 - k. If drilling slurry is introduced into the drilled hole, verify the Contractor's use of drilling slurry per the requirements of the contract documents.

- i. Verify that drilling slurry is tested at specified intervals. Verify the Contractor documents results of slurry testing on [Form SC-3806](#), *Slurry Test Record*.
 - 1. Ensure a slurry test kit is available for sampling and testing the drilling slurry.
- ii. Verify drilling slurry levels in the drilled hole are maintained as required in the contract documents.
- l. Verify steel soldier pile alignment and required horizontal and vertical clearances around the steel soldier pile per the contract documents.
- m. Ensure pile is secure in the hole prior to concrete backfill placement.
- n. Verify the concrete mix delivered is the authorized concrete mix design.
- o. Sample and test concrete materials per the requirements of the *Construction Manual*, [Section 6-107](#), *Materials Acceptance Sampling and Testing*, [Table 6-1.17](#), *Materials Acceptance Sampling and Testing Requirements: Concrete*, and as outlined in [BCM 90-1](#), *Concrete – General*.
- p. Verify the concrete placement method used by the Contractor will not cause segregation of the concrete.
- q. Verify the use of two tremie tubes when concrete is placed under slurry:
 - i. Verify the Contractor caps or plugs the concrete delivery tube prior to first discharge or concrete into the pile.
 - ii. Verify the Contractor recovers the cap or plug after concrete placement begins.
 - iii. Verify the Contractor maintains concrete delivery tube elevations and drilling slurry elevations as specified in the contract documents.
- r. Ensure concrete backfill cutoff elevation per the contract documents. Concrete backfill should not extend above the lowest lagging elevation on each pile.
- s. If temporary casing is used, verify the Contractor removes the temporary casing in accordance with the requirements of the contract documents.
- t. Document all inspection, construction, and quality assurance activities, pertinent to this BCM in the daily reports per [BCM C-7](#), *Daily and Weekly Reports*.
- u. Complete bid item payment and materials on hand payment for the applicable steel soldier piling bid items upon successful placement of the pile concrete, including receipt of all required forms from the Contractor.
- v. Document any a changes on the project plan as-builts per guidance in [BCM C-6](#), *Required Documents to be Submitted during Constructions*.

5. Following construction:
 - a. File all project documentation (correspondence, submittals, materials acceptance documentations, completed forms, 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. Authorized pile installation plan
2. Concrete backfill placement report
3. Completed Form TL-0029, *Report of Inspection of Material*, and matching orange tags
4. Completed Form SC-4101, *Materials Release Summary*, and Form SC-4102, *Material Inspected and Released on Job*
5. Completed Form SC-3803, *Drilled Shaft Excavation Log*, Form SC-3805, *Drilled Shaft Bottom Inspection*, Form SC-3806, *Slurry Test Record*, quantity record and pile layout sheet
6. Daily reports
7. Project plan as-builts

Attachments

None