CIDH Concrete Piling – Contract Administration and Department Acceptance

The following provides information and instructions regarding how to administer construction of and accept Cast-in-Drilled-Hole (CIDH) concrete piling on behalf of the Department including a chronological outline of the contract administration process.

1 - CIDH Piling Contract Administration Chronological Outline

A chronological outline for contract administration of Cast-in-Drilled-Hole (CIDH) piling *without inspection pipes* is shown below (dry method):

1. Pile installation plan submittal:
   1.1. Review the plan.
   1.2. Respond to the Contractor.
2. CIDH pile preconstruction meeting:
   2.1. Conduct meeting per Attachment 1, *CIDH Concrete Piling – Preconstruction Meeting Instructions.*
3. Pile construction
4. Payment

A chronological outline for contract administration of CIDH piling *with inspection pipes* is shown below (wet method):

1. Pile installation plan submittal:
   1.1. Review the plan.
   1.2. Respond to the Contractor.
2. CIDH pile preconstruction meeting:
   2.1. Conduct meeting per Attachment 1, *CIDH Concrete Piling – Preconstruction Meeting Instructions*.
   2.2. Following the preconstruction meeting, authorize or reject the pile installation plan.
3. Concrete test batch:
   3.1. Witness the test batch.
   3.2. Review the results.
   3.3. Respond to the Contractor.

4. Pile construction:
   4.1. Complete required forms for each pile.
   4.2. The Contractor completes and submits forms for concrete placement, bar reinforcement coupler locations, and inspection pipe coupler locations.
   4.3. The Contractor makes safe access for testing in accordance with the contract documents.
   4.4. Witness the Contractor's probe of inspection pipes.
   4.5. Notify the Division of Engineering Services (DES) Pile Mitigation Committee of blocked inspection pipes and request guidance.

5. Track and maintain accurate timeline of all the following testing and mitigation activities.

6. Testing:
   6.1. Use the *CIDH Pile Acceptance Test Request Form* to schedule testing with Foundation Testing and Instrumentation (FTI) so that testing can be completed as soon as possible.

   FTI performs tests and sends a pile acceptance test report for each pile tested.

7. Pile acceptance or rejection:
   7.1. Send a letter to the Contractor either accepting or rejecting a pile based on the pile acceptance test report recommendations. For an example see Sample Letter 1.

8. Rejected piles – suspend future pile concrete placement:
   8.1. The Contractor submits a revised pile installation plan to correct methods that resulted in anomalies.
   8.2. Review revised pile installation plan.
   8.3. Notify the Contractor when the plan is authorized, and pile construction work can resume. For an example see Sample Letter 4.

9. Rejected piles – *Pile Design Data Form* (PDDF):
   9.1. Immediately contact the Bridge Design (BD) Structure Project Engineer, the Geotechnical Services (GS) Geoprofessional, and the Materials Engineering and Testing Services (METS) Corrosion Specialist (Corrosion Technology Branch) to ensure that they complete the PDDF included in the pile acceptance test report. For a sample PDDF see Figure 1.

9.2. Based on the completed PDDF (Sections 1 through 5), determine whether the rejected pile requires repair and if so, the feasibility of repairing the rejected pile. Consult with the DES Pile Mitigation Committee.

9.3. Send a copy of the completed PDDF to the members in the DES Pile Mitigation Committee and allow two working days for a cursory check.

9.4. Send appropriate letter and information to the Contractor. For an example see Sample Letters 2 and 3.

10. Rejected Piles – CIDH Pile Nonstandard Mitigation Meeting:

10.1. This meeting is necessary only when a nonstandard mitigation method is required.

10.2. Conduct the meeting per Attachment 4, *CIDH Pile Nonstandard Mitigation Meeting*.

11. Rejected piles – pile mitigation plan:

11.1. Contractor submits pile mitigation plan.

11.2. Directly review if it is for Basic Repair.

11.3. Coordinate review with the DES Pile Mitigation Committee for non-basic mitigation by sending a copy of the proposed pile mitigation plan to the DES Pile Mitigation Committee.

11.4. DES Pile Mitigation Committee must provide a consensus of the recommendations to the SR.

11.5. Respond to the Contractor authorizing or rejecting the pile mitigation plan.

11.6. If rejected, schedule Pile Mitigation Review Meeting to resolve comments.

12. Rejected piles – pile mitigation:

12.1. The Contractor performs pile mitigation in accordance with the authorized pile mitigation plan.

12.2. The Contractor submits the mitigation report. Send a copy of this report to the members of the DES Pile Mitigation Committee.

12.3. Determine whether rejected pile can now be accepted.

13. CIDH pile information:

13.1. Verify that all final data has been submitted on the CIDH pile information memo per BCM C-6, *Required Documents to be Submitted During Construction*, to the DES Pile Mitigation Committee Chair.

The following contains information, instructions, and a narrative description of CIDH concrete pile acceptance testing, evaluation of rejected piles, and pile mitigation.

2 - Acceptance Testing

Concrete that is placed under slurry or placed using temporary casing to control groundwater must be tested for quality. If there is soil contamination, slurry mixed with concrete, or zones of low-density concrete, repairs might be required. Concrete placed in dry conditions is assumed to be structurally sound because it can be visually inspected during placement.

The *Contract Specifications* (*CS*) requires Gamma-Gamma Logging (GGL) under California Test (CT) 233, *Method of Ascertaining the Homogeneity of Concrete in Cast-In-Drilled-Hole (CIDH) Piles Using the Gamma-Gamma Test Method*, for CIDH piles 24 inches in diameter or larger and placed under slurry or when a temporary casing is used to control groundwater. Piles less than 24 inches in diameter are designed assuming that the concrete will be placed in a dry or a dewatered hole. For these small diameter CIDH piles, if water is encountered and dewatering does not work, immediately contact the BD Structure Project Engineer, GS Geoprofessional, and DES Pile Mitigation Committee Chair. The pile type or size may be inappropriate for the site conditions.

The DES Pile Mitigation Committee provides technical support for CIDH pile acceptance activities. Committee membership and responsibilities are included in BCM 49-3, *Piling – Cast-in-Place Concrete Piling*, Attachment 3, *DES Pile Mitigation Committee*.

Foundation Testing and Instrumentation (FTI) provides statewide foundation testing services. FTI's workload fluctuates widely throughout the year; therefore, to provide timely services, advance notice will be required for scheduling GGL, especially at the beginning of a new contract. Notify FTI fifteen (15) days before testing is needed, or as early as possible. Obtain the current version of the CIDH Pile Acceptance Test Request form from FTI's website.

Complete the form, providing an estimated date for testing, and email the form to FTI using the email address provided on the form. FTI will assign an engineer who will contact you for further scheduling and foundation testing on your project.

Coordinate the Contractor's pile construction operations with FTI. Notify FTI so piling can be tested as soon as possible. Remember, GGL can be performed even before the concrete is cured. It is important to inform FTI as soon as possible so the Contractor does not construct numerous CIDH piles before FTI can perform testing. The goal is to avoid having to reject several piles with the same problem.

For FTI to perform GGL, inspection pipes must be completely accessible for the Gamma-Gamma probe and either completely filled with water or completely dry. Contractors will typically fill the inspection pipes with water during construction. If the

Contractor elects testing in dry inspection pipes, the inspection pipes must be completely purged of water prior to testing. However, testing can be performed in inspection pipes completely filled with water. The Contractor checks the inspection pipes for accessibility by passing a probe (a 1 1/4-inch diameter by 4-1/2 feet long rigid cylinder) through the length of the pipe. The Engineer must witness the entire probe check of the inspection pipes and complete Form SC-3801, *GGL Inspection Pipe Verification*. When the inspection pipes are confirmed to be clear, immediately notify FTI using the *CIDH Pile Acceptance Test Request Form* so that testing can be performed. Verify that the Contractor has provided access to the pile for the FTI Engineer.

FTI will perform testing and submit a pile acceptance test report. FTI will transmit the report to the Structure Representative (SR), Structure Construction Headquarters (SC HQ), Structure Design, Geotechnical Services, and the Corrosion Engineer.

If the pile is free of anomalies, FTI will recommend pile acceptance. If the pile has an anomaly, the location and details will be provided, and FTI will recommend rejection. Follow the recommendation in the pile acceptance test report and immediately notify the Contractor of either pile acceptance or rejection. Refer to Sample Letter 1. for a sample rejection letter.

3 - Piles with Blocked Inspection Pipes

If an inspection pipe is blocked, and the Contractor was not able to clear the blockage, the *CS* require the Contractor to core through the entire length of the pile for each blocked inspection pipe. The Contractor logs the coring operation and provides the cored materials to the Engineer per the requirements of the contract documents. Send a copy of the coring report to FTI for review and evaluation of the portion of the pile represented by coring. No GGL is performed in the cored holes.

Although the *CS* require coring to mitigate a blocked pipe, there are cases where coring may not be necessary. For example, if the blockage is within one pile diameter of the pile tip, the pile does not require end bearing, and corrosion is not an issue, then it is likely that the pile is adequate from a structural, geotechnical, and corrosion standpoint without verification of the concrete condition below the blocked zone. In this case the concrete, represented by the blocked pipe, from the top of the blockage to the tip of the pile, can be considered an anomaly that does not require mitigation and treated as such. Therefore, it is recommended to contact FTI and the DES Pile Mitigation Committee Chair for guidance prior to coring for blocked pipes.

4 - Evaluation of Rejected Piles

If an anomaly is found, the pile is rejected. An anomaly may be due to soil contamination, a zone of low-density concrete, or slurry mixed with concrete. An

anomaly may or may not represent a defect in the CIDH pile. Therefore, each anomaly must be investigated separately.

When a pile is rejected, suspend all depositing of concrete for CIDH piles that require GGL testing until the Contractor submits a revised pile mitigation plan. The revised plan must explain how the anomaly occurred and what changes are made to avoid the same problem. Immediately notify the Contractor when a revised pile mitigation plan has been reviewed, the new plan is acceptable, and the work may resume.

In some cases, FTI will release a pile acceptance test report and then might choose to do additional testing (such as cross-hole sonic logging) to better define the type and limits of an anomaly. When FTI plans to do additional testing, do not wait on these results; send the rejection letter. The FTI decision whether to perform additional tests will be evaluated and presented in the pile acceptance test report.

In the pile acceptance test report, FTI will include the *Pile Design Data Form* (PDDF). Refer to Figure 1 for a sample PDDF. Completion of this form requires input from the BD Structure Project Engineer, GS Geoprofessional, and METS Corrosion Specialist Do not allow excessive delays to occur in completing this form. If one or more of the responsible persons are unable or unwilling to provide the data needed to complete this form in a timely manner, immediately elevate this to the DES Pile Mitigation Committee Chair. After completing this form, submit it to the DES Pile Mitigation Committee and allow at least two working days for review. Discuss the pile design requirements with the DES Pile Mitigation Committee to determine whether the rejected pile requires mitigation, and if so, to determine viable mitigation methods.

Based on the completed PDDF information and the discussion with the DES Pile Mitigation Committee of whether the rejected pile requires mitigation, proceed with one of the following actions:

1. Determine that the anomaly does not affect the necessary design performance and that the anomaly does not affect the necessary corrosion resistance, so mitigation is not required (consensus with the DES Pile Mitigation Committee is required). The Contractor can forego mitigation that is not required and accept an administrative deduction or mitigate the pile for full payment. Notify the Contractor in writing. For an example see Sample Letter 2.
2. Determine that the anomaly must be mitigated and evaluate viable mitigation methods (see Section 5, *Mitigation*, below). Notify the Contractor in writing. For an example see Sample Letter 3.
3. Determine that a Basic Repair can be used. Notify the Contractor in writing. For an example see Sample Letter 4.

4. For anomalies that require a nonstandard mitigation plan, as defined in Section 5, *Mitigation*, below, the Contractor is required to hold a CIDH Pile Nonstandard Mitigation Meeting per Attachment 4, and the requirements of the contract documents. Notify the Contractor in writing. For an example see Sample Letter 4.

5 - Mitigation

A rejected pile is only required to be mitigated to the extent needed for the pile to perform as intended by the design requirements. The DES Pile Mitigation Committee will provide technical support to the Structure Representative and assist in the review of submittals for repair so that mitigation work is appropriate for the design and administered consistently statewide. Common anomalies and mitigation measures are included in the *Foundation Manual*, Chapter 9, *Slurry Displacement Piles*. If the Contractor proposes to do the anomaly investigation, immediately consult with the DES Pile Mitigation Committee.

As indicated above, the PDDF will indicate whether the rejected pile requires mitigation and facilitates determining the appropriate mitigation method.

6 - Basic Repair of CIDH Piling

Basic Repair is allowed for piling under the following conditions:

- There are no other repairs in the same pile
- The repair area can be made completely visible

Prior to starting Basic Repairs, the Contractor is required to submit the pile mitigation plan.

Basic Repairs consist of excavation of soils and then removal and replacement of defective concrete. Excavation of soils below five feet will reduce the geotechnical capacity of the pile and is generally not allowed. If the Contractor wants to excavate more than five feet from the top of the pile, then the mitigation plan must be reviewed by the DES Pile Mitigation Committee.

If permanent casing is within five feet of the top of the pile, it might not be feasible to make the defective concrete completely visible, and this is not a Basic Repair. The DES Pile Mitigation Committee must be consulted when an anomaly is inside the permanent casing.

7 - Basic Repair of CIDH Piling for Defects Within 5 Feet of Pile Cutoff

The Contractor is required to submit the pile mitigation plan. Although the DES Pile Mitigation Committee is available for consultation on Basic Repairs within 5 feet of pile cutoff, it is not required to send the pile mitigation plan to the DES Pile Mitigation Committee for review and consensus.

8 - Standard and Nonstandard Repair of CIDH Piling:

Mitigation of a defective CIDH pile can be grouped into four methodologies:

1. Standard Repair Methodology:
    a. Unearth and Recast (Basic Repair)
    b. Pressure Grout (Grouting Repair)

2. Nonstandard Repair Methodology:
    a. Structural Bridging
    b. Replacement/Supplement

The first two methods are considered standard repair methods and are covered by the Association of Drilled Shaft Contractors – International Association of Foundation Drilling (ADSC) Standard Mitigation Plan. The Standard Mitigation Plan is a set of established procedures used to perform standard repairs; it does not endorse any method to address a particular anomaly repair.

If it is feasible, as determined by the DES Pile Mitigation Committee, an anomaly can be mitigated with standard repairs. If it is not feasible to repair the anomaly, then the pile must be replaced or supplemented with additional piling. The repair strategy is at the option of the Contractor, and subject to the DES Pile Mitigation Committee approval. No additional payment is made for any type of mitigation of rejected piling.

For anomalies that require a nonstandard mitigation plan (i.e. Basic Repair or Grouting Repair are not feasible/acceptable), the Contractor is required to schedule a CIDH Pile Nonstandard Mitigation Meeting per Attachment 4, *CIDH Pile Nonstandard Mitigation Meeting*, to address a viable nonstandard mitigation plan (structural bridging and replacement/supplement) in a timely manner. A general CIDH Pile Nonstandard Mitigation Meeting agenda to assist with understanding the steps involved is included in Attachment 4.

The Contractor must have a pile mitigation plan submitted to the Structure Representative, and the Structure Representative must authorize it before the mitigation work begins. When a Contractor selects the ADSC Standard Mitigation Plan, all

applicable contractual elements of the pile mitigation plan, as presented in the *CS*, need to accompany the ADSC Standard Mitigation Plan.

Review the pile mitigation plan to verify it is complete. Call the DES Pile Mitigation Committee Chair if there are questions. Send copies of the plan to the DES Pile Mitigation Committee for technical review. Concurrently, FTI performs a technical review of the pile mitigation plan and issues a review memo to the chair person. Upon receipt of FTI's review memo, the DES Pile Mitigation Committee reviews and issues recommendations to authorize or reject the pile mitigation plan to the Structure Representative.

Notify the Contractor of authorization or rejection as soon as you receive the DES Pile Mitigation Committee memo. For an example to inform the Contractor that the pile mitigation plan is authorized, see Sample Letter 4.

Generally, the pile can be accepted if the mitigation work is performed in accordance with the provisions of the authorized pile mitigation plan. However, there are circumstances when the pile must be retested. Acceptance criteria of a mitigated pile (i.e., retesting, coring) will be provided in the DES Pile Mitigation Committee memo. The acceptance criteria must be included in the letter authorizing the pile mitigation plan.

After the repair, supplemental, or replacement work is complete, the Contractor submits a pile mitigation report. Send a copy of the mitigation report to the DES Pile Mitigation Committee.

Sample Letter 1: Letter to the Contractor Rejecting a Pile

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY GAVIN NEWSOM., Governor

DEPARTMENT OF TRANSPORTATION

<Your Office Address>
<Your Office Phone>

Making Conservation
a California Way of Life.

<Month Date, Year>

File: <Project Name>
<CO/Rte/PM>
<Project EA>

<Contractor Name >
<Contractor Address>

Dear <Responsible Person>,

The attached CIDH pile acceptance test report for piles, <pile numbers>, dated <report date>, has indicated the presence of anomalies in pile <pile number>, located at Bridge No. xx-xxxx, <Bridge Name>, Pile <rejected pile number> is hereby rejected in accordance with Section 5-1.30, *Control of Work – Noncompliant and Unauthorized Work,* of the *Contract Specifications*.

You are reminded of your responsibilities specified in Section 49-3.02A(4)(d)(iii), which states:

If a pile is rejected:
1. Suspend concrete placement in the remaining piles
2. Submit a revised pile installation plan
3. Do not resume concrete placement until the revised pile installation plan is authorized

An investigation is being performed to determine whether mitigation of pile <pile number> is required, and if so, whether pile <pile number> can be repaired or must be supplemented or replaced. You will be notified of the results of this investigation as soon as it has been completed.

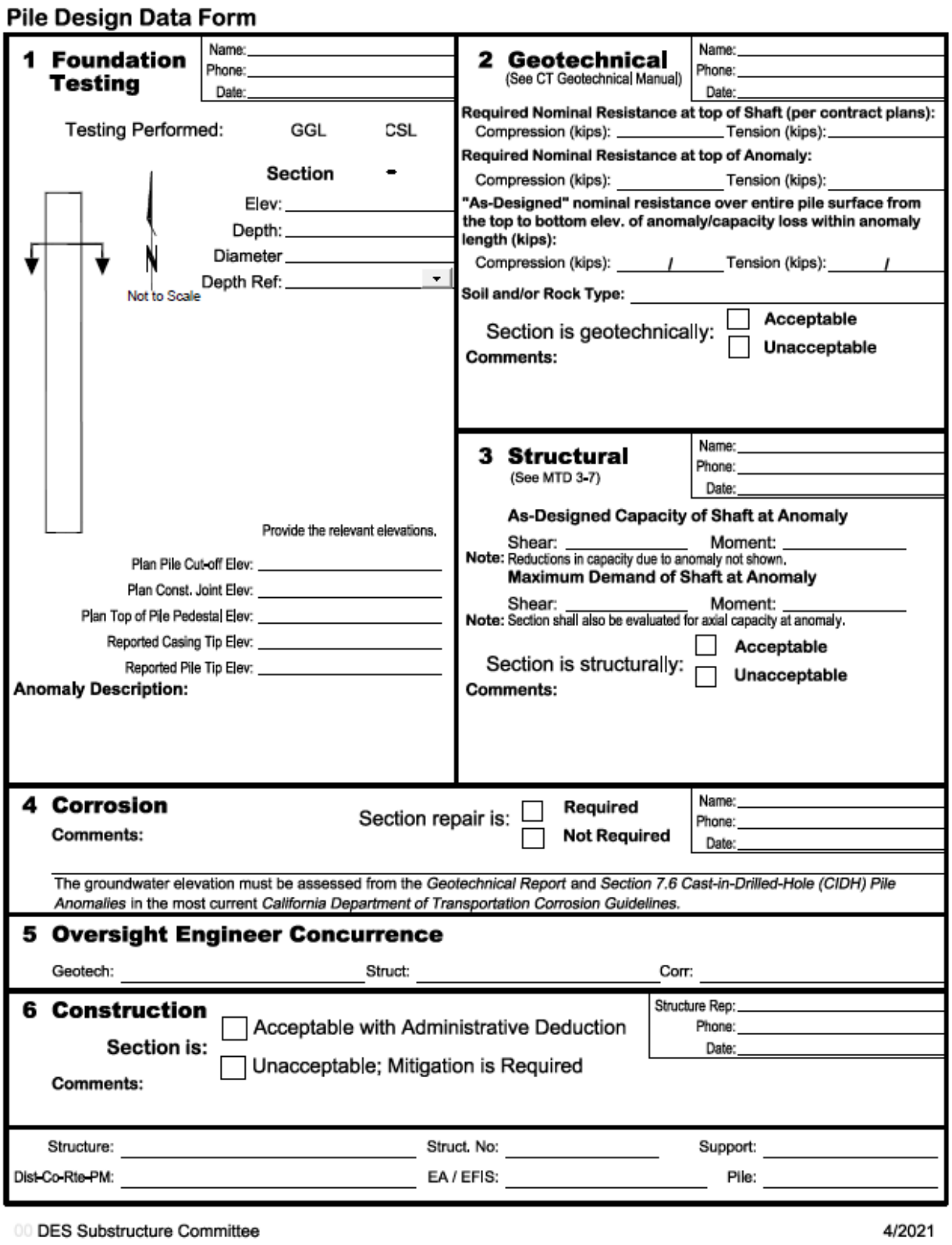
Edit as Appropriate

As indicated in the Gamma-Gamma Logging Acceptance Test Report, the Foundation Testing Branch will (will not) perform additional testing to further evaluate the rejected pile. You may perform your own testing on the rejected pile.

Sincerely,

Resident Engineer

Attachments <Pile Acceptance Test Report>



Pile Design Data Form

1 Foundation Testing

Name:
Phone:
Date:

Testing Performed: GGL CSL

Section -

Elev:
Depth:
Diameter
Depth Ref:

Not to Scale

Provide the relevant elevations.

Plan Pile Cut-off Elev:
Plan Const. Joint Elev:
Plan Top of Pile Pedestal Elev:
Reported Casing Tip Elev:
Reported Pile Tip Elev:

Anomaly Description:

2 Geotechnical
(See CT Geotechnical Manual)

Name:
Phone:
Date:

Required Nominal Resistance at top of Shaft (per contract plans):
Compression (kips): Tension (kips):

Required Nominal Resistance at top of Anomaly:
Compression (kips): Tension (kips):

"As-Designed" nominal resistance over entire pile surface from the top to bottom elev. of anomaly/capacity loss within anomaly length (kips):
Compression (kips): / Tension (kips): /

Soil and/or Rock Type:

Section is geotechnically: ☐ Acceptable ☐ Unacceptable

Comments:

3 Structural
(See MTD 3-7)

Name:
Phone:
Date:

As-Designed Capacity of Shaft at Anomaly
Shear: Moment:
Note: Reductions in capacity due to anomaly not shown.

Maximum Demand of Shaft at Anomaly
Shear: Moment:
Note: Section shall also be evaluated for axial capacity at anomaly.

Section is structurally: ☐ Acceptable ☐ Unacceptable

Comments:

4 Corrosion

Comments:

Section repair is: ☐ Required ☐ Not Required

Name:
Phone:
Date:

The groundwater elevation must be assessed from the *Geotechnical Report* and *Section 7.6 Cast-in-Drilled-Hole (CIDH) Pile Anomalies* in the most current *California Department of Transportation Corrosion Guidelines*.

5 Oversight Engineer Concurrence

Geotech: Struct: Corr:

6 Construction

Section is: ☐ Acceptable with Administrative Deduction ☐ Unacceptable; Mitigation is Required

Comments:

Structure Rep:
Phone:
Date:

Structure: Struct. No: Support:
Dist-Co-Rte-PM: EA / EFIS: Pile:

00 DES Substructure Committee 4/2021

Figure 1. Sample *Pile Design Data Form*

Sample Letter 2: Letter Informing the Contractor the Mitigation for the Pile is not Required.

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY GAVIN NEWSOM., Governor

DEPARTMENT OF TRANSPORTATION

<Your Office Address>
<Your Office Phone>

Making Conservation
a California Way of Life.

<Month Date, Year>

File: <Project Name>
<CO/Rte/PM>
<Project EA>

<Contractor Name >
<Contractor Address>

Dear <Responsible Person>,

Please refer to my letter dated <letter date> regarding the rejection of pile <pile number>, located at Bridge No. xx-xxxx,

An investigation of anomaly(ies) was performed by the Engineer and it was determined that mitigation work is not required. If you elect not to mitigate the anomaly(ies), payment will be reduced for the anomaly(ies) in conformance with Section 49-3.02A(4)(d)(iii), *Piling – Cast-In-Drilled-Hole Concrete Piling – Department Acceptance – Rejected Piles*, of the *Contract Specifications*. Full payment will be made if mitigation is completed and accepted.

Please inform me of your decision to either mitigate or take a reduction in payment.

Sincerely,

Resident Engineer

Sample Letter 3: Letter Informing the Contractor that Mitigation for the Pile is Required.

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY GAVIN NEWSOM., Governor

DEPARTMENT OF TRANSPORTATION
<Your Office Address>
<Your Office Phone>

Making Conservation
a California Way of Life.

<Month Date, Year>

File: <Project Name>
<CO/Rte/PM>
<Project EA>

<Contractor Name >
<Contractor Address>

Dear <Responsible Person>,

Please refer to my letter dated <letter date> regarding the rejection of pile <pile number>, located at Bridge No. xx-xxxx.

An investigation of the rejected pile performed by the Engineer has determined that mitigation work is required.

Edit As Appropriate

Action 3:
You are reminded of your responsibilities in Section 49-3.02A(4)(d)(iii), *Piling – Cast-in-Drilled-Hole Concrete Piling – Department Acceptance - Rejected Piles,* of the *Contract Specifications*, which require "…a plan for repair, removal, or replacement of the rejected piling" before the rejected pile can be accepted.

Action 4:
You are reminded of our responsibilities in Section 49-3.02A(4)(d)(iii), *Piling – Cast-in-Drilled-Hole Concrete Piling – Department Acceptance - Rejected Piles,* of the *Contract Specifications*, which require "…schedule and hold a CIDH Pile Nonstandard Mitigation Meeting within five business days after the Engineer's determination whether the rejected pile requires mitigation."

Attached is a copy of the original pile acceptance test report, <the cross-hole sonic pile test report if available>, and the pile design requirements to aid you in the preparation of the mitigation plan.

Please submit a pile mitigation plan to this office for review and approval as soon as possible.

Sincerely,

Resident Engineer

Attachments <Pile Acceptance Test Report, Pile Design Data form>

Sample Letter 4: Letter Informing the Contractor that the Mitigation Plan is Satisfactory.

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY GAVIN NEWSOM., Governor

DEPARTMENT OF TRANSPORTATION
<Your Office Address>
<Your Office Phone>

Making Conservation
a California Way of Life.

<Month Date, Year>

File: <Project Name>
<CO/Rte/PM>
<Project EA>

<Contractor Name >
<Contractor Address>

Dear <Responsible Person>,

The CIDH pile mitigation plan, dated <date>, submitted for pile <abutment/bent number, pile number > at the <bridge name, bridge number> has been reviewed and is satisfactory.

<*CONTINGENCIES PARAGRAPH-If the mitigation plan is authorized contingent upon anything, list it here.>*

<CRITERIA FOR PILE ACCEPTANCE PARAGRAPH- Certain criteria might be required after the mitigation work is completed to show the mitigation was successful (i.e., additional Gamma-Gamma testing. Cross-hole Sonic Logging or coring). List it here.>

You are reminded of your responsibilities under Section 49-3.02A(3)(g), *Piling – Cast-in-Drilled-Hole Concrete Piling – Submittals - Mitigation Plans,* of the *Contract Specifications*, which require: *For each rejected pile, submit a mitigation plan for repair, supplementation, or replacement. The mitigation plan must…*

Sincerely,

Resident Engineer