

PART 1 GENERAL**1.1 RELATED DOCUMENTS**

- A. The drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes the following:
1. This work shall consist of constructing micropiles as shown on the Contract Drawings and approved working drawings and as specified herein. The Contractor is responsible for furnishing of all design, materials, products, accessories, tools, equipment, services, transportation, labor and supervision, and manufacturing techniques required for design.
 2. The Contractor shall select the micropile type, size, pile top attachment, and installation means and methods; estimate the ground-grout bond value; and determine the required grout bond length and final micropile diameter. The Contractor shall design and install micropiles that will develop the load capacities indicated on the Contract Documents. The micropile load capacities shall be confirmed by verification and proof load testing as required and must meet the test acceptance criteria specified herein.
- B. Related Sections:
1. 01 33 00 – Submittal Procedures
 2. 01 45 00 – Structural Testing, Inspection, and Quality Assurance
 - * 3. Division 1 Section “Sustainable Design Requirements” for all materials
 4. 03 20 00 – Concrete Reinforcing
 5. 03 30 00 – Cast-in-Place Concrete
 6. 31 00 00 – Earthwork
- C. Existing Conditions:
1. Underground Utilities: All underground utilities, basements, and footings of all buildings and other structures shall be identified and located before drilling operations and shall be protected from harm as required to prevent damage. The outside diameter of the micropiles shall clear utilities by a minimum of 5 feet.
 2. Existing Adjacent Facilities: The Contractor shall assume all responsibility for the premises and loss or damage to the property, adjoining property, public ways and utilities, shoring, bracing, and barricades protecting adjacent property. All costs for protecting, repairing, and replacing adjacent property shall be borne by the Contractor.

1.3 UNIT PRICES

- A. Basis of Bids: Base bids on indicated number of micropiles.
- B. Basis for Payment: The quantities accepted for payment will be paid at the contract unit prices for the items listed below, complete in place and accepted, which price shall include all materials, equipment, tools, proper disposal of drilling spoil, and labor incidental thereto.
1. Pay Item: Micropiles, Pay Unit: Each
 2. Pay Item: Verification Test for Micropiles, Pay Unit: Each
 3. Pay Item: Proof Test for Micropiles, Pay Unit: Each
 4. Pay Item: Micropile Length Adjustment, Pay Unit: Linear Feet

1.4 REFERENCE STANDARDS

- A. General: Comply with the provisions of the latest version of the publications listed below except as otherwise shown or specified.
- B. Geotechnical Reports prepared by Arup North America as follows:
1. “Transbay Tower Geotechnical Data Report,” dated June 17, 2013.
 2. “Transbay Tower Geotechnical Interpretive Report,” dated July 31, 2013.
- C. American Concrete Institute (ACI):
1. ACI 318: Building Code Requirements for Structural Concrete
- D. International Building Code (IBC)

- E. American Welding Society (AWS):
 - 1. AWS D1.1: Structural Welding Code – Steel
 - 2. AWS D1.4: Structural Welding Code – Reinforcing Steel
- F. American Society for Testing and Materials (ASTM):
 - 1. ASTM D 3689: Standard Test Method for Individual Piles under Static Axial Tensile Load

1.5 MICROPILE DESIGN REQUIREMENTS

- A. Design, furnish, install, and test micropiles capable of supporting loads specified in the Contract Documents. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer. Specific design requirements are as follows:
 - 1. Micropiles shall be designed in accordance with the IBC, the Contract Specifications, and the Contract Drawings.
 - 2. The Contractor shall design the connection of the pile top to the footing.

1.6 SUBMITTALS

- A. General: Submit the following in accordance with Section 01 33 00, "Submittal Procedures".
- B. Deferred-Design Submittal: The Contractor shall prepare and submit complete design calculations and working drawings. Include all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the micropile system. The working drawings and design submission shall be signed and sealed by the qualified professional engineer responsible for their preparation. This submittal shall include the following information:
 - 1. Design Calculations:
 - a. A written summary report which describes the overall micropile design.
 - b. Applicable code requirements and design references.
 - c. Micropile structure critical design cross-section(s) geometry including soil/rock strata and piezometric levels and locations, magnitude and direction of applied design loadings, including slope or external surcharge loads.
 - d. Design criteria including ground-grout bond values, including safety factors or load and resistance factors.
 - e. Seismic design acceleration coefficient.
 - f. Calculations for pile-to-footing connection.
 - 2. Working Drawings:
 - a. A plan view identifying location of all micropiles.
 - b. An elevation view identifying locations and elevations of all micropiles.
 - c. Design parameters and applicable codes.
 - d. General notes for constructing the micropile structure including construction sequencing or special construction requirements.
 - e. Micropile typical sections including micropile spacing, minimum drillhole diameter, pipe casing and reinforcing bar details, splice types and locations, centralizers and spacers, grout bond zone and casing plunge lengths (if used), corrosion protection details, and connection details to the footing.
 - f. A typical detail of verification and production proof test micropiles defining the micropile length, minimum drillhole diameter, and load test bonded and unbonded test lengths.
 - g. Details, dimensions, and schedules for all micropiles, casing and reinforcing steel, including reinforcing bar bending details.
- * C. LEED Submittals:
 - * 1. MR4.1 and 4.2 – List of Proposed materials with recycled content: Indicate projected materials cost, projected post-industrial (pre-consumer) recycled content, and projected post-consumer recycled content for each product projected to have recycled content.
 - * 2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
- D. Informational-Only Submittals: To be submitted for record only and will not be reviewed.
 - 1. Detailed step-by-step description of the proposed micropile construction procedure including personnel, testing and equipment to assure quality control. Include the following information:
 - a. Proposed micropile installation schedule.

- b. Verification of headroom and space requirements for installation.
 - c. Proposed grouting plan.
 - d. Plan for control and disposal of surface water, drill flush, and excess waste grout.
2. Certified mill test reports for steel micropiles with ultimate strength, yield strength, elongation, and material properties composition.
 3. Detailed plans for the proposed micropile load testing method. Include drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements.
- E. Drilling Logs: The Contractor shall review, approve, and submit the drilling logs prepared by the Owner's Testing Agency for each micropile on a daily basis. Logs shall include identification, micropile diameter, bottom elevation, top elevation, nature and location of obstructions, and grout placement.
- F. Reports: The Contractor shall submit to the Architect within 14 calendar days after the completion of the micropile work a report containing the following:
1. As-built drawings showing the locations of the micropiles and the pile lengths.
 2. Reinforcing steel mill test reports for the steel components incorporated into the installation.
 3. Micropile test results and graphs.
 4. Remarks, unusual conditions encountered, any deviations from requirements.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A minimum of 5 years' experience and not less than three successfully completed projects with similar soil and groundwater conditions, micropile size, depths, and volume of work contained in the project.
- B. Professional Engineer Qualifications: A professional engineer who is registered in the jurisdiction where the project is located and who is experienced in providing engineering services of the kind indicated.
- C. Survey Work: Engage a surveyor who is registered in the jurisdiction where the project is located, to perform surveys, layout, and measurements. Conduct layout work for each micropile to lines and levels required before installation. Record actual measurements of installation of micropile foundation support systems.
1. Record and maintain information pertinent to each micropile, and cooperate with the Owner's Geotechnical Engineer and Owner's Testing Agency to provide data required for reports.
- D. Pre-construction Conference: A minimum two weeks prior to scheduled commencement of micropile installation and associated work, meet at project site with installer of micropiles, installers of related work, the Owner's Structural Engineer, Owner's Representative, Owner's Testing Agency, Owner's Geotechnical Engineer, and other representatives directly concerned with performance of the work. Review foreseeable methods and procedures related to micropile work. Record discussion of conference and decisions reached, and furnish copy of record to each party attending.
- E. Construction Monitoring: The Contractor shall establish a construction monitoring program that includes a monitoring schedule, reviewing and interpreting data, and reporting to the Owner and Architect as required to ensure safety of the existing adjacent structures, roads, sidewalks, buried utilities, and all other structures.

1.8 PROJECT CONDITIONS

- A. Site Information: A geotechnical report has been prepared for this Project and is available for information only. The report is not part of the Contract Documents and is not guaranteed to represent conditions that will be encountered. Opinions expressed in this report are those of the geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by the geotechnical engineer. The Owner will not be responsible for interpretations or conclusions drawn from this data by the Contractor.
1. Additional test borings and other exploratory operations may be made by the Contractor at no additional cost to the Owner.
 2. The geotechnical report is referenced elsewhere in the Project Manual.

- B. Existing Utility Lines and Foundations: Any existing underground utility lines and foundations shown on the Drawings are shown from the best possible information available and shall be verified prior to any excavation or grading work.
1. Known utilities and foundations have been shown only where their existence has been determined by survey, investigation, or record drawings. The precise location of these lines, as well as careful reconnaissance of all areas for both above- and below-ground utilities as well as protection of same, shall be the sole responsibility of the Contractor.
 2. Existing utility lines to be retained and shown on the Civil Drawings, or the location of which are made known to the Contractor prior to excavation operations, shall be protected from damage during excavation drilling, filling, and backfilling, and if damaged, shall be repaired by the Contractor, at his expense, and in a manner as directed by the Architect.
 3. New Utility Lines: New utility lines shown on the Civil Drawings, or the location of which are made known to the Contractor prior to concrete pier construction, shall be protected from damage during excavation, drilling, filling, and backfilling, and if damaged, shall be repaired by the Contractor, at his expense, and in a manner as directed by the Architect.
- C. The Contractor shall assume all responsibility for the premises and loss or damage to the property, adjoining property, public ways and utilities, shoring, bracing, and barricades and protecting adjacent property. All work shall conform to the requirements of the local jurisdiction. All costs for protecting, repairing, and replacing adjacent property shall be borne by the Contractor.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Reinforcing Bars: Steel core reinforcement as a minimum shall consist of deformed reinforcing bars in accordance with ASTM A722 Grade 150.
- * C. Recycled Content: Materials shall contain post-industrial (pre-consumer) recycled content and/or post-consumer recycled content. Contractor shall document the cost and percentage (by weight) of each material broken out by post-industrial (pre-consumer) and post-consumer recycled content.
- * D. Regional Content: Materials shall contain content that is extracted, harvested, recovered, or manufactured within 500 miles of the project site. Contractor shall document the cost and percentage (by weight) of each material that is regional.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate the work and the excavation so the micropile structures are safely constructed. Perform the micropile construction and related excavation in accordance with the Construction Documents and Specifications.

3.2 PILE INSTALLATION

- A. Micropile allowable construction tolerances are as follows:
1. Centerline of piling shall not be more than 3 inches from indicated plan location.
 2. Pile shall be plumb or battered within 2 percent of total-length plan alignment.
 3. Top elevation of pile shall be plus 1 inch or minus 2 inches maximum from vertical elevation indicated.
 4. Centerline of reinforcing steel shall not be more than 0.5 inches from indicated location.
- B. Abandon and cut off rejected piles as directed by the Architect. Leave rejected piles in place and installed new piles in locations as directed by the Architect.

3.3 PERFORMANCE AND PROOF TESTING

- A. The contractor shall conduct performance tests and proof tests consisting of tension load testing on micropiles. The tests are to be done on piles installed from the bottom of the excavation.
- B. Performance Testing:
1. Performing testing will be used at two locations to verify the design of the micropile load transfer bond zone, and the construction method proposed by the Contractor including drilling, installing, and grouting of the micropiles. The drilling-and-grouting method, casing length and outside diameter,

- reinforcing bar lengths, and depth of embedment for the performance test micropile shall be identical to those specified for the production micropiles at the given location. The performance test micropile structural steel sections shall be sized to safely resist the maximum test load that is equal to 2.8 times the Design Load indicated on the drawings, where 2.8 is the factor of safety (2.0) times a factor of 1.4, which is to account for intermediate state of effective stress due to dewatering system.
2. The Owner's Representative will observe performance testing at each testing location. Performance test results must be reviewed and approved by the Owner's Representative prior to installing any production micropiles.
 3. If a micropile that is performance tested fails to meet any of the acceptance criteria for testing as determined by the Owner's Representative, that micropile will be rejected and Contractor shall modify the design or construction procedures and submit revised working drawings. The Contractor shall install and conduct performance test for another micropile. Micropile installation operations shall not continue until the Owner's Representative has approved the revised working drawings in writing. No extensions of time or compensation will be made for installing and testing additional micropiles.
- C. Proof Testing:
1. All micropiles shall be proof tested before mat slab concrete is cast. The test load shall be equal to 1.54 times the Design Load indicated on the Contract Drawings.
 2. If any production micropile that is proof tested fails to meet any of the acceptance criteria for proof testing specified herein, that pile will be rejected. Rejected micropiles shall be replaced at locations approved by the Owner's Representative. The Contractor shall submit to the Owner's Representative for approval a remedy plan for replacing rejected micropiles. The remedy plan shall consist of details for replacement of micropiles including additional micropiles to be installed on the Contract Drawings. No extension of time or compensation will be made for the review of a remedy plan for replacing or installing additional micropiles.
- D. Proof and Performance Testing shall be performed under the direction of the Contractor's Pile Test Engineer, who is experienced and competent in pile load testing. Static axial pile load testing shall include all equipment necessary to conduct pile testing, interpret the data, and prepare an engineering report documenting this work.
- E. The Pile Test Engineer shall complete the Daily Field Report Form for each day in which pile load test activities occur at the test site. Each day, the Pile Testing Engineer shall supply to the Owner's Representative a completed Daily Field Report Form Describing the day's activities.
- F. All equipment necessary to perform the pile load test shall be furnished by the Contractor and shall conform to the requirements of ASTM D 3689.
- G. At least 4 working days prior to performance testing, and before mobilizing any testing equipment, the Pile Testing Engineer shall submit to the Owner's Representative two copies of the following:
1. A diagram of the load test frame, including reference beams, location and identification of instrumentation.
 2. Load cell calibration(s).
 3. Hydraulic jack calibration(s).
 4. Displacement gauge and transducer calibrations.
 5. Any proposed deviation from the testing methods specified herein.
 6. Records of all calibrations that have been conducted within 1 year prior to testing. The records shall be traceable to a NIST standard.
- H. Proof and Performance Testing shall be performed in accordance with ASTM D 3689, modified as follows:
1. A load test frame shall be provided that is designed to carry at least twice the maximum test load required for the pile in direction of loading.
 2. All pile load tests shall be conducted until the test load is reached.
 3. Primary and secondary measurement systems shall be utilized for measuring load and displacement. Displacement gauges shall have sufficient travel to determine pile displacement up to 1.5 times the calculated expected displacement of the test pile. Said displacement gauges shall read to an accuracy of 0.001 in. (primary) and 0.01 in. or 0.001 ft. (secondary). These displacement gauges shall be mounted to reference beams whose supports allow a clear distance of not less than 8 ft. from the test pile. Reference beams shall be made of steel or aluminum, shall not be crossed braced, and be sufficiently stiff. The connection between the displacement gauges and the reference beam shall be sufficiently stiff. Displacement gauges shall bear on glass plates.
 4. The testing shall begin with a zero reading taken on all the primary and secondary systems.

5. For performance tension load tests, the load applied and the corresponding durations shall be as shown in Table A. During Initial Loading, at least three readings of the primary and secondary systems shall be taken for each load increment. The first reading shall be taken immediately after the load is attained. The second and the third reading shall be taken 1 and 5 minutes, respectively, after the load is attained. After the five-minute reading is taken, the next load increment shall be applied to the test pile. Once the maximum load for the initial cycle has been reached, the full load shall be held constant for 10 minutes. During the load hold, the reading shall be taken at 1, 2, 3, 4, 5, 6, and 10 minutes. If the total recorded movement between 1 minute and 10 minutes exceeds 0.04 inch, the test load shall be held for an additional 50 minutes. Total movement shall be measured at 15, 20, 25, 30, 45, and 60 minutes. If the load is held for 60 minutes, a creep curve showing the creep movement between 1 minute and 60 minutes shall be plotted as a function of the logarithm of time. After this initial maximum load hold is complete, the pile shall be unloaded by reducing the load as described in Table A. During the unloading, at least two readings of the primary and secondary system taken immediately after the load is attained; the second reading shall be taken 1 minute after the load is attained. After this one minute reading is taken, the load may be decreased to the next load. At the end of the initial cycle, the load shall be a zero, and an initial and 1-minute reading shall be taken. Upon reloading, all loads that have been previously attained shall be held for 1 minute and at least on initial and 1-minute reading shall be taken. At 1.0F load increments, readings of the primary and secondary systems shall be taken when the load is attained, and at 1, 2, 3, 4, 5, 6, 10, 15, 20, 25, and 30 minutes, until the head of the pile is not more than 0.01 inches in 30 minutes.

Table A

Performance Tension Load Test Schedule	
Load	Duration
0	1 minute
0.10F	5 minutes
0.20F	5 minutes
0.30F	5 minutes
0.40F	5 minutes
0.50F	10 minutes for Creep Test
0.60F	5 minutes
0.70F	5 minutes
0.80F	5 minutes
0.90F	5 minutes
1.00F	10 minutes or 60 minutes for Creep Test
0.75F	1 minute
0.50F	1 minute
0.25F	1 minute
0	1 minute
0.10F	1 minute
0.20F	1 minute
0.30F	1 minute
0.40F	1 minute
0.50F	1 minute
0.60F	1 minute
0.70F	1 minute
0.80F	1 minute
0.90F	1 minute
1.00F*	10 minutes or 30 minutes for Creep Test
F = Performance Test Load = 1.4 × FS × Design Load, where FS = 2.0 (1.4 is the factor to account for the immediate state of effective stress due dewatering) *After a 30-minute interval, remove the full load from the pile in four approximately equal decrements with 5-minute intervals between each decrement.	

6. For proof tension load tests, the loads applied and the corresponding durations shall be as shown in Table B. During initial loading, at least three readings of the primary and secondary systems shall be taken for each load increment. The first readings shall be taken immediately after the load is attained. The second and the third readings shall be taken 1 and 5 minutes, respectively, after the load is

attained. After the five-minute reading is taken, the next load increment shall be applied to the test pile. The final test load (1.00T) shall be held constant for 10 minutes. During the load hold, the reading shall be taken at 1, 2, 3, 4, 5, 6 and 10 minutes. If the total recorded movement between 1 minute and 10 minutes exceeds 0.04 inch, the test load shall be held for an additional 50 minutes. Total movement shall be measured at 15, 20, 25, 30, 45 and 60 minutes. If the load is held for 60 minutes, a creep curve showing the creep movement between 1 minute and 60 minutes shall be plotted as a function of the logarithm of time.

Table B

Proof Tension Load Test Schedule	
Load	Duration
0	1 minute
0.25T	5 minutes
0.50T	5 minutes
0.75T	5 minutes
1.00T*	10 minutes or 60 minutes for Creep Test
T = Proof Test Load = 1.4 × FS × Design Load, where FS = 1.1 (1.4 is the factor to account for the immediate state of effective stress due dewatering) *After a 10- or 60-minute interval, remove the full load from the pile in four approximately equal decrements with 5-minute intervals between each decrement.	

7. "Load applied to the pile by hydraulic jacks acting between supported test beams and a reaction frame anchored to the pile" as specified in Paragraph 4.3 of ASTM D 3689 shall be used for performance test piles.
8. Proof tensile load testing shall be performed against reaction piles or cribbing in accordance with ASTM D 3689. Existing footings, piles, or other structures shall not be used as reaction points for load testing. An adjacent production micropile in a group may be used as reaction pile. If cribbing is used, the contractor's attention is drawn to the presence of poor bearing soils and underground utilities, which may require special measures to protect against settlement and damage.

- I. Within three working days after the piles are ready for testing, a preliminary report shall be transmitted to the Owner's Representative. Said Preliminary report shall include: a completed Daily Field Report, indication the Pile Test Engineer's assessment of the pile capacity load test data sheets, and a load displacement plot.

- J. Within 10 working days of the completion of a pile load test, the Pile Test Engineer shall provide to the Owner's Representative an engineering report documenting the pile load testing and findings. The report shall follow the outline stated in ASTM D 3689 and including the following:
 1. Project identification and location, Project Name, and test site location, including the pile numbering system used by the Structural Representative.
 2. Discussion of the installation dates for the test and reaction piles. Drilling equipment and method of drilling, including make and model, drilling records for test and reaction piles. Names of the pile installation personnel and pile test operator, and other key personnel. Discussion of drilling including depth and diameter, use of casing, footing excavation description, grouting procedure, quantities and pressures.
 3. Discussion of as-built tip elevation, bottom of footing elevation, ground surface elevation, pile to elevation, for all test and reaction piles. Discussion of pile type, including grade of steel, splicing grouting, dates of drilling and grouting, and dimensions. Condition of test and reaction piles. Discussion of the sub-service condition, including location, date, and description of nearest soil boring, ground-water elevation, and date determined.
 4. Discussion of the deviation from the testing method specified herein (said deviation shall be approved by Owner's Representative prior to testing). Description of the load test set-up including (primary and secondary) instrumentation used to measure load and displacement.
 5. Attachments shall include the following:
 - a. Vicinity Map with Test Location labeled.
 - b. General Plan with test location labeled.
 - c. Foundation Plan with test locations labeled.
 - d. Footing details, with test and reaction pile location labeled.
 - e. Grouting records.

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- f. Plot of load vs. displacement (kips and inches) with the elastic tension/line (PL/AE).
 - g. Sketch of load test set-up, including all instrumentation.
 - h. Load cell calibration(s).
 - i. Hydraulic jack calibration(s).
 - j. Displacement gauge or transducer calibration(s).
 - k. Relevant sheets from the Log-of-Test Borings.
 - l. Two copies of the Load Testing Report shall be made and transmitted to the Owner's Representative.
- K. A performance-tested micropile shall conform to the following acceptance criteria:
- 1. The micropile shall sustain the test load of 0.5 F, with a total axial movement at the top of the pile, measured relative to the top of the pile prior to the start of load testing, not exceeding 0.6 inches. Furthermore, the micropile shall sustain the test load 0.8 F, with a total axial movement at the top of the pile, measured relative to the top of the pile prior to the start of load testing, not exceeding 1.4 inches.
 - 2. The creep movement of the end of the micropile at the maximum test load F, between 1 and 10 minutes, is less than 0.04 inch. If this creep movement exceeds 0.04 inch, the micropile will be accepted if it meets the creep requirements specified in Article 3.3 M below.
 - 3. Failure does not occur at the 1.00xF maximum test load. Failure is defined as load at which attempts to further increase the test load simply results in continued pile movement.
- L. A proof-tested micropile shall conform to the following acceptance criteria:
- 1. The micropile shall sustain the test load of 1.0T, with a total axial movement at the top of the pile, measured relative to the top of the pile prior to the start of load testing, not exceeding 0.825 inches.
 - 2. The creep movement of the end of the micropile at the maximum test load T, between 1 and 10 minutes, is less than 0.04 inch. If this creep movement exceeds 0.04 inch, the micropile will be accepted if it meets the creep requirements specified in Article 3.3 M below.
 - 3. Failure does not occur at the 1.00xT maximum test load. Failure is defined as load at which attempts to further increase the test load simply results in continued pile movement.
- M. If the creep curve plotted from the movement data for micropiles indicates a creep rate of 0.08 inch or less for the last log cycle of time between 6 and 60 minutes, the micropile will be accepted.
- N. If a performance-tested or proof-tested micropile is not accepted, micropile operation shall not continue until the Contractor has modified the design or construction procedures or both for the remaining micropile to comply with the specified acceptance criteria. The modifications shall be as agreed to by the Owner's Representative.

3.4 FIELD QUALITY CONTROL

- A. General: Work under this Section shall be subject to special inspection and testing by the Owner's Testing Agency and the Owner's Geotechnical Engineer. Refer to Section 01 45 00, "Structural Testing, Inspection, and Quality Assurance," for additional requirements.
- B. Continuous Inspection: The Owner's Geotechnical Engineer and the Owner's Testing Agency shall provide continuous inspection during all pile installation and testing and will inspect each micropile for the following conditions:
- 1. Observe drilling operations, and maintain complete and accurate records for each micropile.
 - 2. Verify placement locations, plumbness, and confirm micropile diameters, lengths, and embedment into rock (if applicable).
 - 3. Record grout volumes.
 - 4. Verify reinforcing details and depth to which reinforcement was placed.
 - 5. Identify any pile deviations or unusual occurrences during pile installation.

3.5 DISPOSAL OF MATERIALS

- A. Remove surplus excavated material and slurry or grout and legally dispose of it off the Owner's property.

END OF SECTION