

SECTION 02304 - AUGURED CAST-IN-PLACE PILES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 1. Pile load tests
 2. Reaction Piles
 3. Pile reinforcement
 4. Cutting of piles at elevations indicated drawings
 5. Field survey of installed piles
 6. Removal of spoil

1.2 SYSTEM DESCRIPTION

- A. Design Requirements:
 1. Compression: 4,000 psi.
 2. Minimum working load capacity: 41 tons.
 3. Minimum ultimate load capacity: 82 tons.
 4. Diameter: 16 inches.
 5. Minimum length: 35 feet, measured from the bottom of the pile cap or grade beam or as modified by load tests. An extra four inches is embedded in concrete pile cap.

1.3 SUBSURFACE INVESTIGATION REPORT

- A. The report is available for review in the Architect's office. The Owner and Architect assume no responsibility for accuracy, completeness, or interpretation of the data and conclusions.

1.4 SUBMITTALS

- A. Product Data: Include augering equipment, pumping equipment, test data on proposed mortar mix from an approved testing agency, and engineering data on proposed pile types.
- B. Shop Drawings: Indicating storage of materials, storage of equipment, a plan indicating sequence of pile installation, method of providing head of mortar during auger removal, reinforcing steel.
- C. Method of Mobilization Report.
- D. Quality Control Submittals including installer references and test reports on load test set-up and procedure.
- E. Installer shall submit evidence of successful installation of auger cast piles under similar job and subsurface conditions, including a job supervisor who shall have a minimum of three years of method specific experience.
- F. Contract Closeout Submittals including a field survey which shows a plan layout of all piles as installed and horizontal and vertical location of top of piles. Survey shall be performed by an in-state, registered surveyor.

1.5 QUALITY ASSURANCE

- A. Pre-Installation Conference: Schedule and attend conference with Owner, Architect, testing agency, subcontractors, and agencies affected by work of this section. Schedule meeting before any work is performed.
- B. All work and materials shall conform to the Augured Cast-in-Place Piles Manual published by the Deep Foundations Institute.

1.6 TESTING AGENCY QUALIFICATIONS:

- A. An Independent, Owner-employed testing agency whose service responsibilities are described under Field Quality Control in Part 3.
- B. Contractor shall provide testing agency with access to work and data.
- C. Contractor shall provide help for checking the progress and coordination.
- D. Contractor shall provide testing agency with 48 hours (minimum) advance notice before beginning of mortar placement operations.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: All materials shall be protected from damage by factory packing. Factory packing shall be clearly marked, indicating contents.
- B. Acceptance at Site: Reject any damaged materials upon arrival.
- C. Storage and Protection: Store all materials above grade and in a manner to prevent damage.

PART 2 - PRODUCTS

2.1 MORTAR

- A. Material Composition:
 1. Portland Cement: Conforming to ASTM C 150.
 2. Mineral filler: Finely powdered siliceous material capable of combining with the lime liberated during hydration of Portland cement.
 3. Fluidifier: Compound which increases flowability, assists in cement grain dispersal, reduces bleeding, and neutralizes setting shrinkage.
 4. Water: Potable.
 5. Fine aggregate: Conform to ASTM C 33.
 - a. Hard, dense, uncoated rock particles.
 - b. Well-graded from fine to coarse.
 - c. Fineness modules between 1.40 and 3.40.
- B. Proportion and mix components to provide mortar, which maintains the solids in suspension without appreciable water gain, is pumped easily, and penetrates laterally to fill subsurface voids.
 1. Minimum Ultimate Compressive Strength: 4000 psi at 28 days.
 2. Maximum Allowable Design Stress: 0.25 f_c.
 3. Mortar Test Cubes: Minimum of six 2-inch cubes required for each day piles are installed.
 - a. Test three cubes at 7 days.
 - b. Test three cubes at 28 days.
 - c. Produce test cubes in accordance with ASTM C 109.
 - d. Test the test cubes in accordance with ASTM C 109, except restrain mortar with a top plate.
- C. Reinforcement:
 1. Conform to requirements of Division 3.

2.2 EQUIPMENT:

- A. Augering Equipment conforming to the following:
 1. Mortar outlet shall be at the bottom of the auger head below the bar containing the cutting teeth.
 2. Maintain cutting teeth in serviceable condition.
 3. Do not use teeth, which are worn more than 50 percent.
 4. Auger flighting shall be continuous from auger head to the top of the auger. No gaps or breaks.
 5. Maximum Auger Pitch: 9 inches.

6. Auger hollow shaft shall allow placement of #9 reinforcing bar.
7. Provide an auger guide for augers over 40 feet long.
8. Prevent piling leads from twisting with a stabilizing arm.
9. Pumping Equipment: Positive displacement pump, piston type with a minimum head capacity of 350 psi. Provide pressure gauges at pump discharge to ensure proper grout pressures.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine job site conditions and write method of mobilization report.

3.2 INSTALLATION

- A. Do not proceed until the load tests have been evaluated and the Architect has issued written authorization.
- B. Verify (by excavation if necessary) that piles clear all existing underground utilities or other existing construction.
- C. Advise Architect of any interferences before commencing work.
- D. Contractor shall repair, at no cost to the Owner, any damage to existing utilities or other existing construction.
- E. Install piles by rotating a continuous flight, hollow shaft auger into the ground to the required depth.
- F. Remove all oils and rust inhibitors from mixing drums and mortar pumps.
- G. Pump mortar under pressure through the hollow shaft as the auger is withdrawn.
- H. Fill the hole completely.
- I. Provide a minimum 10-foot head of mortar above the injection point or above the water level, whichever is higher, during the raising of the auger.
- J. Maximum auger withdrawal rate: 10 feet per minute. Contractor shall use whatever rate is necessary to obtain a sound pile.
- K. Install only materials that produce a homogeneous mortar of the desired consistency. A single addition of water made upon arrival at the job site to adjust fluidity is permissible. Subsequent additions of water will not be allowed.
- L. The minimum volume of mortar placed in the pile shall equal 115% of the theoretical volume of the augered hole. This minimum is not to be construed as a maximum. The Contractor shall be solely responsible for producing a quality pile of the size, strength and length as shown on the plans.
 1. Provide an in-line flow meter or a mechanical pump stroke counter to verify volume.
- M. Recirculate mortar through pump during any lapse in operation.
- N. Do not use mortar that is more than 2-1/2 hours old from the time of batching.
- O. Do not use mortar whose temperature exceeds 90 degrees F.
- P. Provide metal sleeves (of the proper diameter and length) for piles with cutoffs near or above the bottom of excavation.
 1. Minimum sleeve length: 18 inches.
- Q. Inform Architect immediately if any obstruction prevents placement of piles as indicated on the drawings. Refer

to design drawings for instructions for locating existing electrical service.

- R. For closely set piles (within 12 feet center to center), allow 12 hours to pass before installing adjacent piles.
 - 1. The Architect reserves the right to increase this time or distance if there are indications of mortar bridging between piles at no increase in cost to the Owner.

3.3 INSTALLING REINFORCEMENT

- A. Place reinforcement while piles are still fluid.
- B. Place singular bar, full-length reinforcement throughout the hollow shaft auger prior to pumping or auger removal.
- C. Tolerances:
 - 1. Install piles in locations indicated on the drawings.
 - 2. Pile centers shall be within plus or minus 3-inches at the cut-off elevation measured radially from the locations indicated on the drawings.
 - 3. Pile cutoff: Plus or minus 1 inch.
 - 4. Reinforcing bars shall be placed within plus or minus 2 inch relative to center of installed pile.

3.4 FIELD QUALITY CONTROL

- A. Conduct load tests as follows:
 - 1. Conduct compression load test on two (2) test piles in accordance with ASTM D 1143. See design drawings for test pile locations.
 - 2. Testing Agency: shall direct loading procedures.
 - 3. Grout shall reach its 28 day strength prior to testing.
 - 4. Test piles without overburden.
- B. Test piles, which fail load tests, shall be replaced with new test piles and tested at no additional cost to the Owner.
- C. Advise the Architect and the test agency at least 48 hours prior to conducting load tests.
- D. The Architect may authorize additional load tests as deemed necessary.
- E. Testing Agency's Service shall include the following:
 - 1. Observation of all work of this section.
 - 2. Monitoring installation of test piles.
 - 3. Direct loading procedures.
 - 4. Monitoring load tests of test piles.
 - 5. Evaluate load tests.
 - 6. Prepare pile installation operations report.
 - 7. Confirm production pile installation criteria.

3.5 CLEANING, REPAIR, AND PROTECTION

- A. Remove all excess material, equipment, spoil, and debris resulting from pile installation.
- B. Replace all abandoned or rejected piles with additional piles as directed by the Architect.
- C. Cut off rejected or abandoned piles one foot below the bottom elevation of the pile cap.

END OF SECTION 02304