SECTION 316300 - BORED PILES

This section includes cast-in-place concrete footings, compacted in place to form an expanded bulbular base, with or without shaft liner, end bearing type.

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting the requirements of this specification.

This section includes performance, proprietary, and descriptive type specifications. Edit to avoid conflicting requirements.

1. GENERAL
	* + 1. SUMMARY
				1. Section includes machine drilled shaft [**and placement of shaft liner**]; and placing concrete and compacting to achieve bulbular base to support design loads.
			2. UNIT PRICE - MEASUREMENT AND PAYMENT

Use this article only when work of this section is performed under unit price payment method. Delete this article when payment is by stipulated sum/price.

* + - * 1. Designed Footings:

Design Footing Quantity: Determined by number of footings indicated in Contract Documents.

Design Footing Length: By the linear [**foot**] measured from point to cut-off elevation [**of <\_\_\_> feet**] [**as indicated on Drawings**].

Test Footings: **[5]** feet longer than design length footings.

* + - * 1. Actual Footings:

Actual Footing Quantity: Determined by number of footings identified in Project Record Documents.

Actual Footing Length: Determined by length of footings identified in Project Record Documents.

* + - * 1. Adjustments in Contract Price will be made due to changes in number and length of footings, based on unit prices established in the Agreement as follows:

Actual footing quantity.

Contract unit price per unit length including test footings, multiplied by Actual Footing Length. Base measurement on total linear measurement of footing from base to top of footing elevation, [**except for test footings calculated at [5] feet longer.**]

Determination of Unit Measurements: [**Identified by site measurements and verified by Director’s Representative**].

* + - 1. SYSTEM DESCRIPTION

Use this article carefully; restrict statements to describe components used to assemble system. Do not repeat statements made in summary article, "Section includes" paragraph.

* + - * 1. End bearing cast-in-place concrete footing, compacted in place to form an expanded bulbular base.
			1. PERFORMANCE REQUIREMENTS

Use this article carefully; restrict statements to identify system performance requirements or function criteria only.

* + - * 1. Place footings to [**defined**] load supporting capacity. Avoid damaging footings by over compacting.
				2. Load Supporting Capacity: [**<Insert Weight> lb**] [**as indicated on Drawings.**]
			1. SUBMITTALS

Only request submittals needed to verify compliance with project requirements.

* + - * 1. Submittals for this Section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Section 013300 - Submittals Electronic Version: Submittal procedures.
				5. Indicate schedule of footing installation, identify recommended footing lengths and diameters to suit design requirements, [**reinforcing requirements,**] [**and**].
				6. Product Data:

Submit concrete mix design indicating cured properties and mix components.

Submit data for liner, reinforcement, admixtures, and <**\_\_\_\_\_\_\_\_**>.

USE PARAGRAPH BELOW WITH EPD REQUIREMENT WHEN PROJECT ESTIMATE IS $1M OR MORE.

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for each concrete mix and steel reinforcement bar within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

* + - * 1. Pile and Driving Equipment Data: Three weeks prior to delivery of pile driving equipment to the site, complete and submit the Pile and Driving Equipment Data form BD 138 (in the APPENDIX) to the Director’s Representative. The submitted information on this form will be used to determine a driving blow count. Each separate combination of pile and pile driving equipment proposed by the Contractor will require the submission of a corresponding form BD 138.
			1. CLOSEOUT SUBMITTALS
				1. Project Record Document: Accurately record the following:

Sizes, lengths, and locations of footings [**and footing groups**].

Sequence of placement.

Drilling: Hole diameters.

For footings closer than **[nine]** shaft diameters, record elevations of adjacent footings before and after placement, to determine when movement has occurred.

Final shaft base elevations.

Deviation from indicated locations.

Ramming force and number of blows required to form expanded bases.

Other pertinent information including interruption of continuous placement, or footing damage.

* + - 1. QUALITY CONTROL SUBMITTALS

Verify with the soils designer that the contractor is to compile the driving records. Modify subparagraph below if state personnel will compile the records.

* + - * 1. Driving Records: Within 2 days after driving, submit 2 copies of the driving record for each pile installed. Include in driving record project name and number, name of contractor, pile identification, pile size and weight, date of driving, type and size of hammer used, type of driving cap, rate of operation of pile driving equipment, pile length(s) placed in leads, number and location of splices (if any), continuous record of number of blows for each foot penetration, measured set for last 5 blows, pile uplift and other unusual occurrences during driving.
			1. QUALITY ASSURANCE

Use this article to specify compliance with overall reference standards affecting all products and installation included in this section.

* + - * 1. Perform Work in accordance with [**[State] [Municipality] of <Insert Organization> [Highways] [Public Work's] standard.**]

Include the following paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain [**one copy**] [**<\_\_> copies**] of [**each**] document on site.
			1. QUALIFICATIONS
				1. Installer’s Qualifications: The firm performing the Work of this Section shall have been regularly engaged in bored pile work for a period of not less than 5 years and shall be properly equipped to execute the Work. If directed, furnish a list of projects of a similar type and magnitude executed by the firm.

Include the following paragraph when detailed pile design is to be performed by contractor.

* + - * 1. Design and select footing components under direct supervision of a Professional Engineer, licensed in the State of New York, experienced in design of this Work.
			1. PRE-INSTALLATION MEETINGS
				1. Section 013000 - Administrative Requirements: Pre-installation meeting.
				2. Convene minimum one week prior to commencing Work of this section.
			2. SCHEDULING
				1. Schedule Work to perform ramming during <**\_\_\_\_\_\_\_\_**> and <**\_\_\_\_\_\_\_\_**> hours.
				2. Schedule [**test**] [**indicator**] piles.
1. PRODUCTS
	* + 1. MATERIALS

Design and performance criteria usually determine materials used. Select first paragraph for performance specifying or edit subsequent paragraphs as appropriate.

* + - * 1. Concrete Materials, Mix, Reinforcement, Shaft Liner: As required to achieve design and performance criteria.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Concrete Materials and Mix: Specified in Section [**033000**] using Type <**Insert Type**> cement, maximum <**\_\_\_\_\_\_\_\_**> aggregate size, <**\_\_\_\_\_\_\_\_**> psi 28 day strength, <**\_\_\_\_\_\_\_\_**> inch slump.
				2. Reinforcement: Specified in Section [**032000**], [**spiral wound.**] <**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**>
				3. Liner: [**Corrugated steel.**] <**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**>
1. EXECUTION
	* + 1. EXAMINATION
				1. Section 013000 - Administrative Requirements: Coordination and project conditions.
				2. Verification of Conditions: Verify that site conditions will support bored piling equipment.
			2. PREPARATION
				1. Use ramming method which will not cause damage to nearby structures.
				2. Notify adjacent and affected landowners and building occupants with 5 working days’ notice before proceeding with the Work.
				3. Provide temporary site improvement, such as grillage, as necessary to protect property and safely perform the Work.
				4. Protect structures near the Work from damage.
				5. Prepare to place piles from [**existing site elevations.**] [**excavated working elevation.**]
			3. INSTALLATION
				1. Drill concentric and vertical footing shafts.
				2. Obstructions: If obstructions are encountered in the driving operation which cannot be displaced, break up the obstructions to permit further drilling.
				3. [**Place steel liners immediately [after] [during] drilling. Set firmly in place.**]
				4. Clean shaft and bottom of loose material.
				5. Allow inspection of shaft [**and liner**] prior to placement of [**reinforcement and**] concrete.
				6. Place reinforcing steel in accordance with Section [**032000.**]
				7. Place concrete in accordance with Section [**033000**] with equipment designed for vertical placement of concrete and in conjunction with ramming operations.
				8. Deposit concrete in bottom of shaft, and ram into subsoil with hammer blows.
				9. Do not place adjacent footings less than 24 hours after previous footings have been formed unless footings are more than [**[five] shaft diameters**] **[apart, measured center to center**], [**based on larger adjacent shaft**].
				10. Install footings to required elevations and load capacities.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Install concrete to refusal, not less than <**\_\_\_\_\_\_\_\_**> blows [**required to inject last batch of concrete**] [**per unit length**].
				2. Successively repeat ramming and expelling of concrete into underlying soil until expanded bulbular base is formed. Develop maximum surface friction with subsoil.
				3. [**Progressively raise shaft liner.**]
				4. Replace [**or supplement**] footings which have lifted or moved due to placing and ramming adjacent footings, or by soil uplift.
				5. [**Extend reinforcement**] [**Provide dowels**] for connection of [**caps**] [**grade beams**].
			1. ERECTION TOLERANCES
				1. Variation From Plan Location: Center of pile at cutoff elevation shall be not more than 3 inches from its designed position.
				2. Variation From Vertical (or Batter Shown on the Drawings): Pile shall be not more than 2 degrees from the vertical or indicated batter. Maximum Out-of-Position: **[2]** inches.

Change “2 inches” below to “one inch” if a full contact surface for a welded cap or bearing plate is required.

* + - * 1. Variation From Cutoff Elevation: Top of pile shall be not more than **[2]** inches from its designed cutoff elevation.
			1. FIELD QUALITY CONTROL
				1. [**Perform**] [**Request**] inspection of foundations in accordance with [**applicable**] code.
				2. Perform load tests to requirements:

Dynamic Pile Load Tests: Dynamically load test the test piles during the driving operation with instrumentation furnished by the State. The test shall consist of intermittent pile driving while pile bearing capacity is electronically evaluated. Record load test data and furnish a copy to the Director’s Representative. After pile capacity has been obtained from the dynamic load test, instructions will be given by the Director’s Representative relative to penetration.

* + - * 1. Test Piles: Required test piles are indicated on the Drawings. Test piles shall be the first piles driven in the group. Keep the Director’s Representative informed of the schedule for driving test piles. Drive test piles with the same equipment to be used for the remainder of the group. Accepted test piles may [**not**] be used in the Work.
				2. Unacceptable Footings: Footings that fail tests, are placed out of position, are below top of shaft elevations, or are damaged.
				3. Provide additional footings or replace footings failing to conform to specified requirements.

Verify with the Soils Designer that the contractor is to compile the driving records. Modify paragraph below if state personnel will compile the records.

* + - * 1. Driving Records: Obtain and record the data (required under Quality Control Submittals) on the Driving Records.
			1. ADJUSTING
				1. Remove improperly located piles and piles found defective after driving. In lieu of removing a pile, at the option of the Director, an additional pile may be driven adjacent to the deficient pile providing that this can be done without injury to the structure. Such additional piles shall be at the expense of the Contractor.
			2. CLEANING
				1. Subsequent to casting, clean the top section of each pile which will be embedded in concrete free of adhering soil, loose rust and scale, and other deleterious substances.
			3. REMOVING MATERIALS
				1. Remove from State property cutoff lengths of piles and excess piles.

END OF SECTION 316300

The remainder of this document is for information only; not to be included in project specifications.

instructions for this section

Remove the attached Form BDC 138 and place it at the end of the project manual (as an appendix document). List this form in the table of contents under appendix as follows:

Pile and driving equipment data Form BD 138.

Insert the following in project record documents article of Section 01770. If a single contract project, delete “construction work contract”.

Construction work contract; bored pile record drawings: employ a Land Surveyor licensed by New York state to accurately locate each pile and to record the following data on reproducible drawings as the bored pile work progresses:

1. Identification and length (from driving records) for each pile.

2. Elevation of each pile cutoff.

3. Length of cutoff.

4. Elevation of each pile tip.

5. Length of pile from cutoff to tip.

6. Plan location of each pile. Locate center of each pile as driven in relation to its designed coordinates to the nearest 1/2 inch.

7. Correction data, if any.

Delete subparagraph below for small projects.

8. Furnish one set of prints of the updated drawings at intervals not exceeding one week, or as requested, as the micro-pile work progresses.

9. Upon completion of the work, deliver the reproducible drawings and one set of prints to the Director’s Representative.

END OF INSTRUCTIONS