

SECTION 02371

CAST-IN-PLACE SOIL DISPLACEMENT CONCRETE FUNDEX PILES

PART 1 - GENERAL

1.01 DESCRIPTION

A. General:

1. Furnish all labor, materials, casing, tools, equipment, and services, for all soil displacement drilled piles as indicated, in accordance with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. See Division 1 for General Requirements.

B. Definitions:

1. Soils consultant: Representative of soils and foundation consultant hired by Owner to inspect pile installation:
2. Obstruction: Unanticipated, unnatural, man-made object projecting within pile shaft, greater than 1 CU FT in size, which cannot be drilled by use of normal earth drilling techniques and tools; however, an obstruction shall not include cobbles, boulders, bedrock seams or any naturally deposited material which may require a rock auger for removal.

(Note: F-12 crowd = 75000 lb and 230,000 ft-lbs, but cannot rock drill as it is solely soil displacement. Could leave the definition however at your discretion.)

1.02 QUALITY ASSURANCE

A. Subsoil information: See Section 00220.

1. Additional test borings and other exploratory operations may be made, provided such operations are acceptable to Architect.

B. Installer qualifications: Minimum of 3 years experience in Fundex drilled pile work, including experience with similar work and similar sub-surface conditions.

C. Layout and measurement of piles, required for the work and for specified reports, shall be performed by a licensed surveyor employed by Contractor.

D. Facilitate inspection by soils consultant of pile excavation prior to concrete placement.

E. Prior to pile installation, the Contractor shall submit to Soils Consultant in writing for review and comment, Fundex pile shop drawings, including an outline indicating the methods, equipment, and procedures to be utilized for Fundex pile installation.

F. Testing:

1. Routine testing of concrete for compliance with Contract Documents will be performed at no cost to Contractor.
2. Pay for testing by independent testing agency necessary to secure initial materials and mix design approval.
3. Provide sufficient notification of concrete placement, access for testing agency, concrete for testing and adequate storage facilities for test cylinders.
4. Pay for additional testing required by Architect/Engineer in order to evaluate piles failing to meet requirements of Contract Documents.

G. Tolerances:

1. Plumbness: Measured from center of hole: Not more than 1 IN in 6 FT, for full depth.
2. Location of shaft at cut-off elevation: Not more than 3 IN (50 mm).
3. Diameter: Not less than specified.

1.03 SUBMITTALS (See Section 01340)

A. Project data:

1. Names of three (3) past successful installations under similar conditions.
2. Concrete: Comply with Section 03300.
3. Report for each pile:
 - a. Pile location by column grid lines.
 - b. Bottom elevation of pile.
 - c. Cut-off elevation of pile.
 - d. Torque and Crowd readings every 5 ft, and every 1 foot in bearing stratum
 - e. Total length of pile from bottom to cut-off elevation.
 - f. Diameter of pile shaft.
 - g. Signature of representative of soils consultant that excavation was inspected and approved for concrete placement.
4. Corresponding concrete test cylinder numbers (obtain from testing agency).
5. Any unusual conditions encountered.

1.04 BASE BID PRICE ADJUSTMENT

A. Adjustment of contract price will be made on basis of unit prices included on the proposal form times the variation between the total accumulated installed length and the base bid length of piles as scheduled on plans for each diameter and material. No adjustments will be made for variation in lengths of individual piles. Base bid shall anticipate and include any and all drilling required above the top of pile elevation. No adjustment of contract price will be made for variations in type or length of material encountered above top of pile. No adjustment of contract price will be made for frequency of auger and bit changes required for changes in material.

B. Measurement of length:

1. Measure lengths between bottom and top of pile as detailed and defined on plans.
2. Do not include volume resulting from overdrilling.
3. Do not include rejected piles.
4. Include obstructed piles and replacement piles for obstructed piles.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete: See Drawings. Conform to Section 03300, Concrete Materials and Proportioning.
 - 1. Maximum slump 12 IN.
 - 2. Do not use concrete which has had water added more than one hour before placement.
- B. Reinforcing steel: Conform to Section 03200, Concrete Reinforcement.
 - 1. Dimensions as indicated.
- C. Concrete admixtures: As permitted in Section 03300, Concrete Materials and Proportioning
- D. Boring Tips: Manufactured by Fundex, cast iron, detachable boring tips. Use watertight putty seal to engage to mandrel.
- E. Mandrel Casings (provided by Fundex): Steel cylinders.
 - 1. 14" diameter, wall thickness as required for installation loads.
 - 2. Weld section together as required, watertight.
 - 3.
 - 4. Extend to bottom of straight pile, unless otherwise approved.

PART 3 - EXECUTION

3.01 LAYOUT

- A. Locate piles as indicated.

3.02 INSTALLATION

- A. Pile installation shall be performed under continuous observation by Soil Consultant to confirm that the recommended soils are penetrated, that the dimensions of the installed piles are at least as large as that indicated on the plan, and that pile installation has been performed as specified herein. The Contractor shall provide access and necessary facilities, including drop lights, at his expense to accommodate pile observations.
- B. Perform work with Fundex F12 or equivalent heavy-duty pile drilling rig, maintained in satisfactory working condition, operated by competent and experienced person.
 - 1. Provide qualified, experienced, and direct supervision in field for all pile drilling, and concrete filling of piles.
 - 2. (n/a)
- C. Provide piles with straight shaft.
 - 1. Pile installation shall be performed such that compliance with all safety rules and requirements is achieved. Drilling equipment, casting, reinforcement, and

other items required for installation shall be kept a safe distance from all overhead power lines and utilities.

2. Pile shafts shall be machine drilled. The pile excavation shall be plumb to a tolerance of not more than 1 IN in 6 FT.
 3. Concrete placement shall begin within 1 hour after completion of drilling.
 4. Concrete shall not be allowed to fall freely more than 5 feet unless flow is directed to the center of the casing. Concrete shall not be tailgated. Concrete pumps, concrete buckets or other such devices shall be used.
 5. Concrete shall be placed in water-free cased holes. If water is encountered, it shall be pumped out. Residual water in the boring tip may be allowed prior to placing concrete
 6. The casing shall be removed after placing the required concrete volume in the mandrel. The casing mandrel shall be removed but steady upward force and oscillation method. Use care to monitor the head on concrete in the mandrel. Recharge mandrel with additional concrete as necessary to construct full pile section.
 - 7.
 8. Concrete placement shall be continuous without interruption, and at such a rate that fresh concrete will not be deposited on concrete hardened sufficiently to form seams and planes of weakness.
 9. Mechanical vibrators shall be used in the top 15 ft of the pile to density the concrete.
- D. Piles spaced closer than 3 pile diameters, center-to-center shall be drilled and concreted alternately, allowing at least 8 hours between concrete placement in one pile and drilling of an adjacent pile.
- E. Report underground obstructions to Architect/Engineer.
1. When directed by Architect/Engineer, remove obstruction as extra work.
 2. Fill shaft with concrete when Architect/Engineer determines obstruction cannot be removed.
 3. Provide replacement pile or piles as directed by Architect/Engineer.

(All piles installed w/cased mandrel method).

- F. Maintain excavations in essentially dry condition, using pumps where necessary.
- G. Have pile inspected by soils prior to placing concrete.

- H. In the event that pile installation procedures specified above are not adhered to, the Owner may require the Contractor to core the pile to confirm that a continuous concrete pile has been installed. The cost of such coring will be borne by the Contractor.

3.03 REINFORCEMENT

- A. Place steel reinforcing cage in pile hole after inspection and approval of mandrel.
- B. Adequately support reinforcement to assure concentric alignment and adequate concrete cover over reinforcing, during concrete placement and casing withdrawal.
- C. Place all dowels and/or anchor bolts extending from top of pile before concrete is placed. Anchor adequately to prevent any displacement during concreting operations.

3.04 CONCRETE PLACEMENT

- A. After approval and placement of reinforcing steel, place concrete as soon as possible.

Place in manner that will preclude segregation, infiltration of water, or any other occurrence that would tend to decrease strength of concrete or supporting capacity of finished foundation.

Place concrete immediately after inspection of mandrel, and placement of cage. Full charge mandrel with concrete prior to mandrel extraction. Concrete top feed pump or bucket methods shall be used.

- B. If excavation contains more than 6 inches of water, remove water by pump, or add sack dry cement.

- 1. Provide positive control to insure that the bottom of mandrel pipe is at all times below concrete surface.

3.05 WITHDRAWAL OF CASING

- A. When pulling casing, maintain a level of concrete above bottom of casing greater or equal to the level of ground water.

- 1. Keep bottom of mandrel at least 5 FT below top of concrete.
- 2. Prevent in-site materials from falling into and mixing with concrete.

- B. Pull casing in short slow vertical lifts (essentially continuous), while oscillating the casing, maintaining plumb, and sufficient head of concrete. Allow continuous observation of interior level of concrete.

3.06 REJECTED PILES

- A. Any piles deemed by the Owner to be defective, shall be replaced with substitute piles as directed by the Owner. The cost of installation of such substitute piles will be borne by the Contractor. Costs associated with analysis and design of substitute piles shall also be borne by the Contractor.

- B. Piles may be rejected for following reasons:

- 1. Concrete not reaching minimum 28-day design strength.
- 2. Piles out of horizontal and vertical alignment, in excess of tolerances indicated.
- 3. Piles of improper size and depth.
- 4. Installation not complying with specifications.

- C. Pay for additional engineering work required for redesign due to rejected piles.