PILE FOUNDATIONS, GENERAL

1. GENERAL

1.1 Work Included

.1 Coordinate delivery schedule of piles with the pile supplier (Lafarge Canada Inc.) and pick up and deliver piles from the pile supplier's yard to the Site to meet the Contractor's installation schedule. The Contract Administrator shall be the sole judge of the acceptability of supplied piles.

.2 Install precast concrete piles.

1.2 Storage, Handling, and Installation

.1 Protect piles from damage due to excessive bending stresses, impact, abrasion, or other causes from the point of pick-up, and during storage and handling. Install piles to stated driving tolerances.

.2 Replace rejected piles to satisfaction of Contract Administrator. Causes for pile rejection are as follows:

.1 Out of fabrication tolerances at time of installation

.2 Cracked, spalled, or broken piles

.3 Out of stated driving tolerances

1.3 Geotechnical Information

.1 Refer to Specification E2.2 for a list of test hole logs and reports available associated with the Site.

.2 The Contractor should be aware that the surface soil condition in the excavations performed by the Bulk Excavation Contract may be soft.

.3 Notify Contract Administrator in writing if subsurface conditions at Site differ materially from those indicated and await further instructions from Contract Administrator.

2. PRODUCTS

2.1 Materials

.1 Piles to be furnished under the Contract are full length piles as indicated, without cutting and splicing requirements. Contractor shall provide equipment to handle full length piles.

.2 The piles are fabricated and supplied as specified in **Section 02468 – Precast Concrete Piles.**

.3 In the event that Site conditions require pile extensions, the extensions shall be constructed in accordance with the detail shown on the Drawings. This Work is in addition to the Scope of Work.

.4 Grout Seal: ENVIROPLUG No. 16 (No. 20) or accepted alternate, mixed in accordance with the Manufacturer's instructions.

3. EXECUTION

3.1 Delivery, Storage, and Handling

.1 Protect piles from damage due to excessive bending stresses, impact, abrasion, or other causes during delivery, storage, and handling.

3.2 Equipment

.1 Prior to the commencement of pile installation, submit details of equipment for installation of piles to Contract Administrator for review.

.1 Impact hammers: provide to the Contract Administrator; Manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer, mass of driving cap and type and elastic properties of hammer and pile cushions.

.2 Hammer

.1 Hammers to be selected on the basis of driveability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.

.2 The driveability analysis shall include, but not be limited to, the following: hammer, cushion, and capblock details; static soil parameters; quake and damping factors, total soil resistance, blow count, pile stresses, and energy throughput at representative penetrations.

.3 Driveability analysis shall be submitted to the Contract Administrator for review of the hammer or hammers.

.4 When required criteria cannot be achieved with the proposed hammer, use larger hammer and take other measures as required.

.5 Drop hammers are not permitted.

.3 Leads

.1 Construct pile driver leads to provide free movement of hammer. Hold leads in position at top and bottom, with guys, stiff braces, or other means to ensure support to pile while being driven.

.2 Length: provide length of leads so that use of a follower is unnecessary.

.3 Swing leads: firmly guy top and bottom to hold pile in position during driving operation.

.4 Followers: when permitted, provide followers of such size, shape, length, and mass to permit driving pile in desired location to required depth and resistance. Provide followers with socket or hood carefully fitted to top of pile to minimize loss of energy and prevent damage to pile.

3.3 Preparation

.1 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation. Make provision for access and support of piling equipment during performance of work.

.2 Pre-bore with an auger bit to a depth no lower than elevation 224.375.

.3 Completely infill any air space between the wall of pre-bore hole and outside the pile for the full depth of pre-bore with grout seal. Application procedure for the grout seal shall be submitted to the Contract Administrator for review and acceptance prior to commencement of pile installation.

3.4 Field Measurement

.1 Contractor shall cooperate with the Contract Administrator and shall allow access during the pile installation operations so that all the field measurements can be performed expeditiously.

3.5 Driving

.1 Drive precast piles only when concrete has attained strength of 35 MPa as determined by related concrete compression testing in accordance with CSA A23.2-00. Use driving caps and cushions to protect piles. Reinforce pile heads as required by Contract Administrator. Piles with damaged heads as determined by Contract Administrator will be rejected.

.2 Hold piles securely and accurately in position while driving.

.3 Deliver hammer blows along axis of pile.

.4 Drive piles to practical refusal, as outlined in the geotechnical information. Blow count requirements shall be determined by the Contract Administrator. If followers are used, established criteria for refusal will be increased by 50%.

.5 When driving precast concrete piles, adjust hammer, as required, to deliver reduced impact so that reflected tensile stress in pile does not exceed allowable.

.6 Do not drive piles within 10 m of masonry or concrete which has been in place less than seven (7) days. Do not drive piles within 30 m of masonry or concrete which has been in place less than one (1) day.

.7 Plan pile driver setup elevation, pile length, and pile installation sequence so as to minimize pile rebound. Continuously check pile top elevations within a minimum 6 m radius of active driving. Re-strike driven piles lifted during driving of adjacent piles to confirm and assure pile set for all piles.

.8 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.

.9 Cutoff piles neatly and squarely at elevation ranges as indicated on the Drawings. Final cutoff elevations will be confirmed during construction. Provide sufficient length above cutoff elevation so that the part damaged during driving is cutoff. Do not cut tendons or other reinforcement which will be used to tie supported structure above to pile. A minimum of 450 mm of strands shall remain for this purpose. The cutoff surface of the piles shall be mechanically chipped to expose sound concrete.

.10 Remove cutoff lengths from Site on completion of Work.

3.6 Design Load Capacity

.1 Allowable design load capacity of piles at specified loads is:

.1 406 mm diameter hex – 800 kN

.2 Installation of each pile will be subject to the review of the Contract Administrator. Contract Administrator will be the sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration, or other criteria used to determine load capacity. Contractor shall allow Contract Administrator to review final driving of all piles prior to removal of pile driving rig from Site.

3.7 Driving Tolerances

.1 Pile heads shall be within ± 100 mm of locations as indicated.

.2 Piles shall not to be more than 2% of length out of vertical alignment.

3.8 Obstructions

.1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, proceed as directed by Contract Administrator.

3.9 Repair/Restoration

.1 The Contract Administrator may require one (1) or more of the following remedial measures:

.1 Pull out rejected piles and replace with new piles.

.2 Remove rejected pile and replace with a new, and if necessary, a longer pile.

.3 Remove rejected pile and fill hole as directed by Contract Administrator.

.4 Leave rejected pile in place and cut off as directed by Contract Administrator.

.5 Leave rejected pile in place, place adjacent pile(s), and modify pile cap as directed by Contract Administrator.

.2 No extra compensation will be made for removing and replacing or other Work made necessary through rejection of defective piles.

3.10 Protection

.1 Protect adjacent structures, services, and Work of other sections from hazards due to pile driving operations.

.2 Arrange sequencing of pile driving operations and methods such that no damage occurs to adjacent existing structures. If damaged, remedy damaged items to restore to original or better condition at own expense.

.3 Undertake review of all adjacent infrastructures with the Contract Administrator complete with a photographic record sufficient to establish pre-driving conditions of the existing adjacent infrastructure.

.4 Protection for pile strand ends:

.1 Highly visible protection safety caps shall be installed for all pile reinforcing strand ends immediately following strand exposure operations. One (1) protection cap may be used for each pile by grouping and securely tying the strands.

.2 The protection caps shall be highly visible and shall be made secure so that accidental contact will not easily dislodge the caps. Dislodged caps shall be re-installed immediately.

.3 Pile reinforcing strands shall be protected from severe bending. Kinked or broken strands shall be repaired to the satisfaction of the Contract Administrator.

END OF SECTION