

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 01 14 00 – Work Restrictions
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 45 00 – Quality Control
- .4 Section 31 00 99 – Earthworks for Minor Works

1.2 MEASUREMENT PROCEDURES

- .1 Costs for helical pile supply and installation shall be included in the per linear metre unit price for boardwalk construction.
- .2 For bidding purposes, assume galvanized helical piles are 3.0m long each.
- .3 Include all costs for quality control, geotechnical, as-built surveys and load testing in the linear metre price

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to PCA Representative and await further instructions. See Geotechnical investigation report provided by Thurber Engineering Ltd., and appended to these documents.
- .4 Submit schedule of planned sequence of driving to PCA Representative for review, as specified.
- .5 Spliced piles: when authorized, submit design details of splice complete with signature and stamp of qualified professional engineer registered or licensed in Ontario, Canada.
- .6 Equipment:
 - .1 Submit prior to pile installation for review and approval by PCA Representative, list and details of equipment for use in installation of piles.
 - .2 Impact hammers: submit manufacturer's written data as specified.
 - .3 Non-impact methods; submit characteristics to evaluate performance.
- .7 Submit driveability analysis as specified, to PCA Representative for approval of hammers.
- .8 Quality assurance submittals:

- .1 Test reports: submit 3 copies of certified test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions.
- .2 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .3 Replace damaged piles as directed by PCA Representative.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Divert unused, or cut off concrete materials from landfill to local facility as approved by PCA Representative.

1.6 EXISTING CONDITIONS

- .1 Sub-surface investigation report is appended to these documents.
- .2 Notify PCA Representative immediately if the subsurface conditions encountered vary greatly from the information provided in the sub-surface investigation report.

1.7 SCHEDULING

- .1 Drive piles in accordance with the contract drawings.
- .2 Provide schedule of planned sequence of driving to PCA Representative for review, not less than 2 weeks prior to commencement of pile driving.

Part 2 Products

2.1 MATERIALS

- .1 Steel helical piles: to CSA-G40.20/G40.21, Grade 400.
 - .1 Size and weight [as indicated] [as specified].
 - .2 For bidding purposes, assume each pile to be 3m long
- .2 Welding materials: to [CSA W48].
- .3 Steel plates and pile caps: to CSA-G40.20/G40.21, Grade 400.
- .4 Exterior protective coating: inorganic zinc to CAN/CGSB-1.171M

- .5 Supply or fabricate full length piles as indicated and provide equipment to handle full length piles without cutting and splicing.
- .6 Splice piles only with written approval of PCA Representative.
 - .1 When permitted, provide details for PCA Representative's review.
 - .2 Design details of splice to bear dated signature stamp of professional engineer registered or licensed in Ontario, Canada.

2.2 EQUIPMENT

- .1 Non-impact methods of installation such as augering, jacking, vibratory hammers or other means: provide full details of characteristics necessary to evaluate performance.

Part 3 Execution

3.1 PREPARATION

- .1 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 to avoid damages to adjacent existing structures.
 - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
- .2 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation.
 - .1 Make provision for access and support of piling equipment during performance of Work.
- .3 Pre-boring of holes may be acceptable to facilitate pile alignment control.

3.2 INSTALLATION

- .1 Leads: construct pile driver leads to provide free movement of hammer.
 - .1 Hold leads in position at top and bottom, with guys, stiff braces, or other means as approved by PCA Representative to ensure support to pile while being driven.
 - .2 Swing leads:
 - .1 Firmly guy top and bottom to hold pile in position during driving operation.
- .2 Followers:
 - .1 Obtain approval from PCA Representative prior to using followers.
 - .2 Provide followers of such size, shape, length and mass to permit driving pile in desired location to required depth and resistance.

- .3 Provide followers with socket or hood carefully fitted to top of pile to minimize loss of energy and prevent damage to pile.
- .4 Drive applicable load test piles using similar follower.
- .3 Allowable design load capacity of pile at Ultimate Limits States shall be 35 kN vertical and 5 kN lateral.
- .4 Installation of each pile will be subject to PCA Representative review and approval.
 - .1 The PCA Representative will be sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration or other criteria used to determine load capacity].
 - .2 PCA Representative to approve final driving of all piles prior to removal of pile driving rig from site.
 - .3 Piles shall be tested for a vertical capacity of 60 kN

3.3 APPLICATION/DRIVING

- .1 Hold piles securely and accurately in position while driving.
- .2 Remove loose and displaced material from around piles after completion of driving, and leave surfaces flat.
- .3 Cut off piles neatly and squarely at elevations as required.
 - .1 Provide sufficient length above cut-off elevation so that any part damaged during driving may be cut off.
- .4 Remove cut-off lengths from site on completion of work.

3.4 AS-BUILT SURVEY

- .1 Complete an as-built survey of driven pile locations and elevations and provide to fibreglass beam supplier prior to the start of fabrication.

3.5 OBSTRUCTIONS

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

3.6 REPAIR AND RESTORATION

- .1 Remove rejected pile and replace with new, and if necessary, longer pile.
- .2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

3.7 FIELD QUALITY CONTROL

- .1 Perform pile capacity tests **for static compression load** on a minimum of 5% of piles driven, per boardwalk location
- .2 Measurement:

- .1 Maintain accurate records of driving for each pile, including:
 - .1 Type and make of hammer, stroke or related energy.
 - .2 Other driving equipment including water jet, driving cap, cushion.
 - .3 Pile size and length, location of pile in pile group, location or designation of pile group.
 - .4 Sequence of driving piles in group.
 - .5 Final tip and cut-off elevations.
 - .6 Other pertinent information such as interruption of continuous driving, pile damage.
 - .7 Record elevation taken on adjacent piles [during] before and after driving of each pile.
- .2 Provide PCA Representative with three copies of records.

3.8 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION