## Part 1 General

### 1.1 GENERAL CONDITIONS

.1 The General Conditions of the Contract, Supplementary General Conditions and General Requirements are hereby made part of the Section.

### 1.2 WORK INCLUDED

.1 Bored friction piles with reinforcing steel as detailed.

.2 Establish and/or verify required cut-off elevations.

.3 Correct as directed all piles not meeting requirements of this specification at no expense to Owner.

.4 Leave site neat, tidy, free of plant and/or equipment and in safe condition. Remove excavation material from site or deposit on site as directed.

### 1.3 RELATED WORK

| | | |
|---|---|---|
| .1 | Excavation to Working Level | Section 31 23 00 |
| .2 | Concrete Reinforcing | Section 03 20 00 |
| .3 | Cast-in-Place Concrete | Section 03 30 00 |

### 1.4 REFERENCE STANDARDS

.1 CAN/CSA A23.1-09 - "Concrete Materials and Methods of Concrete Construction".
.2 CAN/CSA A23.2-09 - "Methods of Test for Concrete".
.3 CAN/CSA G30.18-09 - "Billet Steel Bars for Concrete Reinforcement".

### 1.5 CONCRETE TESTING

.1 Testing of concrete is to be performed by an independent Inspection and Testing Firm approved by the Consultant and paid for by the Contractor. Required retesting will be paid for by the Contractor. Unless approved otherwise, the testing agency must perform all aspects of testing including cylinder preparation.

.2 Provide free access to all portions of work and co-operate with appointed firm.

.3 Submit proposed mix design to Inspection and Testing Firm and Consultant two weeks prior to commencement of work.

.4 Tests for cement and aggregate may be performed to ensure conformance with requirements stated herein.

.5 One set of three (3) concrete test cylinders will be taken for each day's pour, or for each 50 cubic metres, whichever is lesser. One cylinder shall be tested at 7 days, the remaining two cylinders shall be tested at 28 days.

.6 One (1) additional test cylinder shall be taken during cold weather concreting, and be cured on job site under same conditions of concrete it represents.

.7 One slump test and one air content test will be taken for each set of test cylinders taken.

.8 Testing of concrete will be performed in accordance with CAN/CSA A23.2-09.

**1.6 FIELD RECORDS/DRAWINGS**

.1 Maintain accurate records of all piles poured. Records are to include the following incorporated on the Contractor's record drawings:

.1 Date and time of casting.
.2 Sizes, depths and location of piles.
.3 Sequence of placing.
.4 Final cut-off elevation.
.5 Reinforcement, size and length.

.2 Submit three (3) copies of record drawings to the Consultant.

.3 Drawing to be the same scale and line reference as the contract drawings.

**Part 2 Products**

**2.1 REINFORCING STEEL**

.1 Reinforcing Steel: deformed steel bars conforming to requirements of CAN/CSA G30.18-09; 400 MPa yield strength.

.2 Reinforcement to conform to standards specified under Section 03 20 00 Concrete Reinforcement. Submit shop drawings of reinforcing steel to Consultant in accordance with the requirements of Section 03 20 00.

.3 Length of reinforcement to be as shown on drawings.

.4 No splicing in reinforcement permitted unless specifically shown on drawings or approved by Consultant. Where splices permitted length = 36 bar diameters minimum; adjacent splices staggered minimum full lap length.

.5 Welding ties to main reinforcement not permitted.

**2.2 CONCRETE MATERIALS**

.1 *Cement*: Sulphate Resistant Symbol 50 Portland, conforming to CSA A3000-08.

.2 *Coarse and Fine Aggregates:* Standard concrete type, conforming to CSA A23.1-09.

.3 *Water:* Clean and free of injurious amounts of oil, alkali, organic matter of other deleterious material.

**2.3 ADMIXTURES**

.1 *Air Entrainment:* to ASTM C260-06 "Air Entraining Admixtures for Concrete."

.2 *Chemicals:* to ASTM C494-08a - M78 "Chemical Admixtures for Concrete"; water reducing, strength increasing Type WN -normal setting.

.3 *Pozzolanic Mineral:* to CSA A3000-08 "Supplementary Cementing Materials and Their Use in Concrete Construction." Type "C" or Type "F" fly ash permitted to a maximum to 15% by weight of cementitious materials.

.4 Use of calcium chloride in concrete permitted only as approved by Consultant.

**2.4 CONCRETE MIX**

.1 Mix concrete in accordance with Section 03 30 00 Cast-In-Place Concrete.

**2.5 CASING**

.1 Removable steel protective casing adequate for its function.

**Part 3 INSTALLATION**

**3.1 LAYOUT**

.1 Place piles accurately in locations as called for on drawings. Registered Land Surveyor of the Province of Saskatchewan to carry out pile location survey.

.2 Maximum permissible error in location 40 mm in any direction. Place piles not more than 2% of their lengths out of plumb or batter called for on drawings. Elevation of top of piles to be within 25 mm of elevation called for on drawings. Reinforcing steel clearances within 15 mm of dimension called for on drawings.

.3 Minimum pile diameter as per drawings.

.4 Piles placed outside above tolerances may be rejected by the Consultant. Place additional piles and pile caps as directed by the Consultant to replace rejected piles entirely at the Contractor's expense.

**3.2 PROCEDURE FOR BORING PILES**

.1 Bore piles using power augers to suit diameters and lengths of piles indicated on drawings. Where called for on drawings, enlarge bottom of shaft using only personnel well experienced in this Trade. Provide to the Consultant on request experience record of personnel actually engaged in the work.

.2 Boulders encountered in drilling shall be removed and pile continued to full depth. Should removal of boulders be impractical, consult with Consultant.

.3 Casings shall be installed in shafts as required to prevent sloughing during drilling and for the retention of ground water. If casing is required, advise Engineer prior to placing concrete in shaft.

.4 Clean out by machine bottom of belled piles with shafts 660 mm diameter or larger. (*Bottom of piles will not be deemed clean until a qualified geotechnical engineer using camera inspection techniques deems that all soil larger than 75 mm has been removed from excavation).*

.5 Provide de-watering as necessary before any concrete is placed.

.6 Remove all tailings and debris from area of bore holes prior to casting concrete. Cover bore hole to prevent loose materials falling in during removal.

.7 After hole drilled, place reinforcing steel and concrete. Do not drill any holes which cannot be reinforced and filled with concrete the same day as drilled.

## 3.3 PLACING REINFORCING STEEL

.1 Place reinforcing steel in such a manner to prevent loose earth and debris from falling into the hole.

.2 Place reinforcing at proper elevation and hold during course of placing concrete. Placing of steel will not be allowed after concrete poured.

## 3.4 PLACING CONCRETE

.1 De-water holes, sleeves or not, before any concrete is placed.

.2 Before commencing placing concrete obtain Consultant's approval of proposed method of transporting and placing concrete.

.3 Form piles projecting above grade with removable steel sleeves or wax coated cardboard fibre forms.

.4 Place concrete continuously to final cut-off elevation as soon as possible after hole drilled, cleaned out and reinforcing steel secured in position. Take every care to ensure that hole is completely filled with concrete. *CONCRETE MUST BE PLACED IN THE DRY. UNDER NO CIRCUMSTANCES WILL TREMIE CONCRETE BE PERMITTED.*

.5 Where steel casings are used they shall be withdrawn as the concrete is deposited, keeping the concrete at a level above bottom of the sleeve.

.6 Vibrate top 3 M of concrete in shaft.

.7 Protect tops of piles against loss of moisture.

.8 Cold weather provisions of CAN/CSA A23.1-09 shall apply. Protect tops of piles against freezing during curing period with adequate insulation and covering. Provide supplementary heat as temperatures dictate.

.9 When concrete is being placed through a frozen ground surface, the diameter of the portion of the pile surface passing through the frozen ground shall be increased by 100 mm.

## 3.5 CUTOFF AND LENGTH

.1 Length of friction piles indicated on drawings to be from cutoff elevation.

**END OF SECTION**