
Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).

1.2 QUALITY ASSURANCE/REGULATORY REQUIREMENTS

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations whichever is more stringent.

1.3 TESTS AND INSPECTIONS

- .1 Testing of materials and compaction of backfill will be carried out by testing laboratory in accordance with Division 01- General Requirements. The cost of the testing shall be borne by the Contractor.
- .2 Not later than one week before backfilling or filling, provide to designated testing agency, 23 kg sample of material proposed for use.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Departmental Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, coordinate required compaction tests with designated testing agency.
- .5 Before commencing work, conduct with Departmental Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires and paving, survey bench marks and monuments which may be affected by work.

1.4 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

1.5 PROTECTION

- .1 Protect excavations from freezing.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.

- .4 Protect natural and man-made features required to remain undisturbed.
- .5 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing excavation Work, notify applicable authorities having jurisdiction, establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .3 Confirm locations of buried utilities by careful test excavations.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .5 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing.
 - .6 Record location of maintained, re-routed and abandoned underground lines.
- .6 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair to approval of Departmental Representative.
- .7 Protect existing projections from buildings such as window wells, steps and stairs. Temporarily support as required and reinstate to original detail if removal is unavoidable.

1.6 UNDERGROUND FUEL STORAGE TANK REMOVAL

- .1 An existing obsolete underground fuel storage tank will be removed as per drawings and Section 02 65 00 - Underground Storage Tank Removal. Provide required backfilling where underground storage tank and granular tan bed fill is removed.
- .2 If additional excavation is required due to contamination of soils over and above that described on the drawings and specifications, undertake additional backfilling on a unit rate by volume of backfilling required.
- .3 Provide unit rate per cubic metre of required backfill for work over and above that described on the drawings and specifications.

Part 2 Products

2.1 MATERIALS

- .1 Type 1 and Type 2 fill:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2.

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|----|-------------------|-----------|--------|
| .3 | Table | | |
| | Sieve Designation | % Passing | |
| | | Type 1 | Type 2 |
| | 75 mm | - | 100 |
| | 50 mm | - | - |
| | 37.5 mm | - | - |
| | 25 mm | 100 | - |
| | 19 mm | 75-100 | - |
| | 12.5 mm | - | - |
| | 9.5 mm | 50-100 | - |
| | 4.75 mm | 30-70 | 22-85 |
| | 2.00 mm | 20-45 | - |
| | 0.425 mm | 10-25 | 5-30 |
| | 0.180 mm | - | - |
| | 0.075 mm | 3-8 | 0-10 |
- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Unshrinkable fill: proportioned and mixed to provide:
- .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum Portland cement content of 25 kg/m³.
 - .3 Minimum strength of 0.07 MPa at 24 h.
 - .4 Concrete aggregates: to CAN/CSA-A23.1/A23.2.
 - .5 Cement: to CAN/CSA-A3001, Type GU Portland cement: Type 10.
 - .6 Slump: 160 to 200 mm.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 EXCAVATION

- .1 Saw cut in a straight line and remove area of existing asphalt and concrete as indicated on drawings for new construction and underground tank removal.
 - .1 Remove and dispose of all removed asphalt and concrete materials.
- .2 Excavate as required to carry out work.
 - .1 Do not disturb soil or rock below bearing surfaces.
 - .2 Notify Departmental Representative when excavations are complete.
 - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.

- .4 Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .3 Excavate for slabs to subgrade levels.
- .4 Remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.3 BACKFILLING

- .1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Departmental Representative.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill.
- .5 Placing:
 - .1 Place backfill, fill and base course material in 150 mm lifts: moisture condition as required to achieve specified density.
- .6 Upper 500mm of backfill to be local compacted soil where not covered with impermeable material
- .7 Compaction: compact each layer of material to following densities for material to ASTM D698:
 - .1 Below Slabs on grade: compact all granular to 98% of standard Proctor density at optimum moisture content.
 - .2 Building subgrade: 96% of standard Proctor density at optimum moisture content.
 - .3 Subgrade fill: 96% of standard Proctor density at optimum moisture content.
 - .4 Landscape subgrade: 90% of standard Proctor density at optimum moisture content.
- .8 In trenches:
 - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
 - .2 Over 300 mm above pipe or conduit: native material approved by Departmental Representative.
- .9 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.

3.4 GRADING

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Departmental Representative.

- .1 Grade to be gradual.

3.5 SHORTAGE AND SURPLUS

- .1 Supply necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.

- .2 Dispose of surplus material off site.

3.6 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

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

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|----|------------------------|------------------|
| .1 | Concrete Reinforcing | Section 03 20 00 |
| .2 | 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 Submittal Procedures Section 01 33 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 *Pozzolanitic 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 Provide de-watering as necessary before any concrete is placed.
- .5 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.
- .6 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