

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-In-Place Concrete.
- .2 Section 07 13 00 – Sheet Waterproofing.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C117-04, Standard Test Method for Material Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ – (600 kN-m/m³).
 - .5 ASTM D1557-07, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ – (2,700 kN-m/m³).
 - .6 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian Standards Association (CSA).
 - .1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-8.1-88, Sieves, testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven, Wire, Metric.

1.3 DEFINITIONS

- .1 Unclassified Excavation: excavation of deposits of whatever character encountered in work.
- .2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .3 Waste Material: excavated material unsuitable for use in work or surplus to requirements.

- .4 Borrow Material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .5 Unsuitable Materials.
 - .1 Weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost Susceptible Materials.
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

<u>Sieve Designation</u>	<u>% Passing</u>
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45
 - .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
- .6 Unshrinkable Fill: very weak mixture of Portland Cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 PROTECTION OF EXISTING FEATURES

- .1 Refer to Sections 01 52 00 for protection of existing features, structures and property.
- .2 Existing Buried Utilities and Structures.
 - .1 Prior to commencing any excavation work, notify applicable Contract Administrator or Authorities Having Jurisdiction, establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during work.
 - .2 Confirm locations of buried utilities by careful test excavations.
 - .3 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .4 Where utility lines or structures exist in area of excavation, obtain direction of utility company.
 - .5 Record location of maintained, re-routed and abandoned underground lines.
 - .6 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing Buildings and Surface Features.
 - .1 Conduct condition survey of existing buildings, trees, fencing, service poles, wires, pavement, survey bench marks, etc. which may be affected by work.

- .2 Protect existing buildings and surface features from damage while work is in progress. In the event of damage, immediately make repair to approval of Contract Administrator.

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-8.1.

<u>Sieve Designation</u>	<u>% Passing</u>	
	<u>Type 1</u>	<u>Type 2</u>
75.00 mm (max size)	-	100
50.00 mm	-	-
37.50 mm	-	-
25.00 mm	100	100
19.00 mm	75-100	-
12.50 mm	-	-
9.50 mm	50-100	-
4.75 mm	40-75	40-80
2.00 mm	20-55	-
0.425 mm	10-35	5-30
0.180 mm	-	-
0.075 mm	5-15	5-20

- .2 Type 3 Fill: selected material from excavation or other sources, approved by Contract Administrator for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Type 4 Fill: clean, natural sand and gravel material, free from silt, clay, loam, friable or soluble materials and vegetable matter and graded within following limits:

<u>Sieve Designation</u>	<u>% Passing</u>
75 mm	100
4.75 mm	40-80
0.75 mm	5-20

- .4 Unshrinkable Fill: proportioned and mixed to provide:
 - .1 Maximum compressible 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 CSA-A23.1/A23.2.
 - .5 Portland cement: Type GU.

- .6 Slump: 150 mm to 200 mm

- .5 Shearmat: honeycomb type bio-degradable cardboard 150 mm, treated to provide sufficient structural support for poured concrete until concrete cured.

- .6 Sheet Waterproofing: in accordance with Section 07 13 00.

- .7 Foundation Drainage Filter Aggregate: in accordance with Section 33 46 13.

Part 3 Execution

3.1 PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

- .3 Strip existing granular fill materials from within limits of excavation and stockpile as directed by Contract Administrator. Avoid mixing fill materials with subsoil.

3.2 DEWATERING

- .1 Refer to Section 01 52 00

- .2 Protect open excavations against flooding and damage due to surface run-off.

3.3 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions indicated. Use calcium/water spray for dust control.

- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and any other obstructions encountered during excavation.

- .3 Excavation must not interfere with normal 45 degree splay of bearing from bottom of any footing.

- .4 For trench excavation, unless otherwise authorized by Contract Administrator in writing, do not excavate more than 30 metres of trench in advance of installation operations and do not leave open more than 15 metres at end of day's operation.

- .5 Dispose of surplus and unsuitable excavated material in approved location of site.
- .6 Do not obstruct flow of surface drainage or natural watercourses.
- .7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .8 Notify Contract Administrator when soil at bottom of excavation appears unsuitable and proceed as directed by Contract Administrator.
- .9 Obtain Contract Administrator approval of complete excavation.
- .10 Remove unsuitable material from trench bottom to extent and depth as directed by Contract Administrator.
- .11 Where required due to unauthorized over-excavation, correct as follows:
 - .1 Fill under bearing surfaces and footings with fill concrete.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95% Corrected Maximum Dry Density.
- .12 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete to approval of Contract Administrator.

3.4 FILL TYPES AND COMPACTION

- .1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698 and ASTM D1557.
 - .1 Exterior Side of Basement Wall: use compacted free draining pit run granular material (max. size 75 mm, max. 8% passing no. 200 sieve).
 - .2 Within Building Area: use Type 2 to underside of base course for floor slabs. Compact to 98%.
 - .3 Under Concrete Slabs: provide 150 mm compacted thickness base course of Type 1 fill topped with shearmat filler as indicated to underside of slab. Compact base course to 100%.
 - .4

3.5 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as specified in Mechanical and Electrical Sections. Responsibility for excavating, bedding and surround for mechanical and electrical underground services by Section requiring work.
- .2 Place bedding and surround material in unfrozen condition.

3.6 BACKFILLING

- .1 Do not proceed with backfilling operations until Contract Administrator has inspected and approved foundation drainage system installation.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen, or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around Installations.
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing.
 - .3 Place layers simultaneously on both sides of installed work to equalize loading.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 calendar days or until it has sufficient strength to withstand earth and compaction pressure.
 - .2 Erect bracing or shoring to counteract unbalance as noted on the drawings, and leave in place until removal is approved by Contract Administrator.

3.7 FIELD QUALITY CONTROL

- .1 Independent specialist, examining and testing company, as appointed by Contract Administrator, to perform testing of materials and compaction.
 - .1 Cost of inspections and tests will be paid for by section 012113
- .2 Examining and testing company to conduct and interpret tests, and state in each report test if specimens comply with requirements, noting any deviations.
- .3 Perform one optimum moisture-maximum density curve for each type of soil encountered in subgrade, fill under paved areas and backfills. Determine maximum densities in accordance with ASTM D1557 and D698.
- .4 Soil examining and testing laboratory to determine suitability of materials used for fill.

- .5 Subgrade and Fill Layers: approved by soil examining and testing laboratory before construction of further work.
- .6 Sieve Analysis: Test proposed fill materials to confirm suitability for intended use, conformity with specifications.
- .7 Density Tests: Perform test on compacted backfill, excavated surfaces, existing surfaces and fill under floor slabs on grade.
- .8 Frequency of Tests.
 - .1 Fill under slabs for mechanical equipment: Make 3 tests for every two lifts compacted fill for each concrete slab area.
 - .2 Backfill structural walls: test each different material for approximately each 60 m of grade beam being backfilled, at depth increments of 600 mm
- .9 Co-operate with soil examining and testing laboratory in performance of required tests.
- .10 Re-compact, test if, based on reports of soil examining and testing laboratory, examination of subgrade, backfills are below specified density.

3.8 CLEANING

- .1 Upon Completion of work, remove surplus materials and debris, trim slopes, and correct defects noted by Contract Administrator.
- .2 Dispose of material unsuitable for fill, grading or landscaping from site.
- .3 Clean and reinstate areas affected by work as directed by Contract Administrator.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Design and installation of temporary earth shoring.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 Submittals
- .2 Section 03 30 00 Cast-in-Place Concrete
- .3 Section 05 12 23 Structural Steel for Buildings
- .4 Section 31 23 00 Excavations and Fill
- .5 Section 31 63 23 Bored Concrete Piles

1.3 REFERENCES

- .1 CAN/CSA-G40.21-04, General Requirements for Structural Quality Steels.
- .2 CAN3-O86-01, Engineering Design in Wood.
- .3 CAN/CSA S16-09, Limit States Design of Steel Structures.
- .4 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

1.4 SUBSURFACE INFORMATION

- .1 Refer to Geotechnical report available from the Contract Administrator.

1.5 SITE CONDITIONS

- .1 Visit site to determine existing conditions and requirements for protection of adjacent work and accept site and existing work as it exists at time of commencement of work. Verify all dimensions at the site.

1.6 DESIGN

- .1 Design and construct shoring and bracing in accordance with national and local building codes and recommendations of the geotechnical report as a minimum. Include surcharge loading from adjacent roadways, including truck and construction traffic.
- .2 Limit overall deflection as to not cause damage to adjacent structures, underground services or roadways.
- .3 Design all soldiers and "deadman" anchors with concrete plugs of sufficient diameter to resist lateral forces.
- .4 Shoring deeper than 4.0 metres shall incorporate steel soldiers, rakers, and timber lagging and shall have sufficient strength and stiffness to meet the requirements of this section. Shoring less than 4.0 metres in depth shall be of sufficient strength and stiffness to meet the requirements of this specification.
- .5 Coordinate location of all soldiers, rakers, concrete plugs, and concrete dead men with the location of all new and existing piling.

1.7 PROFESSIONAL LIABILITY

- .1 The Registered Professional Engineer responsible for design and construction of all temporary shoring shall submit proof of insurance coverage for professional liability of a minimum of \$1,000,000.00. Where the engineer is an employee of the Contractor, the Contractor shall submit proof that any design carried out by his Registered Professional Engineer for any part of this Contract, is included in the Contractor's insurance coverage.

1.7 SHOP DRAWINGS

- .1 Submit shop drawings for record **prior** to installation of shoring in accordance with Section 01 33 00 Submittals.
- .2 Submit drawings of shoring and bracing required in connection with excavation. Drawings to show shoring location with respect to property lines and building grids. Drawings to show clearly procedural sequence to be followed.
- .3 Drawings shall bear signature and seal of a Professional Engineer registered or licensed to practise in the Province of Manitoba and with a demonstrated competence in this type of work.

1.8 RECORDS

- .1 Establish and record precise as-built position of shoring related to property line or building grid and monitor horizontal and vertical movement weekly during the length of the contract. Submit three copies of survey results to the Contract Administrator on a weekly basis within one day of taking measurements. If excessive movement is detected, increase frequency of monitoring to daily until appropriate remedial measures can be implemented.

Part 2 Products

2.1 MINIMUM MATERIAL GRADE

- .1 Wood members: Poplar or better.
- .2 Structural steel members: to CAN/CSA G40.20, and G40.21 grade.
- .3 Wood connections: Poplar plywood to CSA O153 sheathing grade.
- .4 Steel connections: steel gusset plates or angles to CAN/CSA G40.21, grade 300.
- .5 Nails: to CSA B111.
- .6 Bolts: lag screws, nuts and washers to CAN3-O86.
- .7 High-tensile bolts: to ASTM A325M.
- .8 Welding materials: CSA W59.
- .9 Concrete: in accordance with CAN3-A23.1.
- .10 Grout: weak mix concrete, pumpable, 2 MPa.

Part 3 Execution

3.1 INSPECTION

- .1 Carefully examine the site including access to the site.
- .2 Check dimensions at the site before commencing shoring work. Report discrepancies to the Contract Administrator.

- .3 Consult utilities to ascertain location of services. Promptly notify the Contract Administrator if uncharted services are uncovered.

3.2 SHORING AND BRACING

- .1 Prevent movement or settlement, safeguard and maintain integrity of adjacent structures, earth bench marks, services, walks, paving, trees, bearing piles, curbs, landscaping, adjacent grades. Provide bracing, tie-backs and shoring, etc. as required.
- .2 Shore and brace excavations to prevent failure in accordance with Canadian Construction Safety Code and applicable local regulations.
- .3 Make good and pay for any damage and be liable for any injury resulting from failure or movement of shoring, bracing or underpinning.
- .4 Backfill between shoring and soil immediately after installation of lagging to provide full contact between shoring and soil. Backfill with sand or tremie grout. Consideration and preference should be given to backfilling with pumpable grout. If backfill is sand, place and compact in lifts of 150 mm max. Backfilling to be done immediately after installation of lagging.
- .5 Upon completion and curing of the concrete structure through the main floor and in the basement including the slab-on-grade, rakers and shoring members may be removed as backfilling continues. As a minimum, all rakers shall be removed, and soldiers and lagging shall be removed to a depth of 1200 mm below final grade.
- .6 Removal of rakers and shoring to be coordinated with basement wall backfilling to minimize movement of shored soil.

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 20 00 – Reinforcing Steel
- .2 Section 03 30 00 – Cast-In-Place Concrete.
- .3 Section 01 74 19 - Waste Management and Disposal.
- .4 General Notes on Structural Drawings

1.2 MEASUREMENT PROCEDURES

- .1 Work of this section includes drilled cast-in-place concrete piles as indicated, and installed in accordance with the Geotechnical Investigation Report prepared by AMEC Earth & Environmental Limited.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-04(July 2005), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-G30.18-M92(2002), Billet Steel Bars for Concrete Reinforcement.
 - .3 CSA-G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .1 CAN/CSA-S16.1-01, Limit States Design of Steel Structures.
 - .4 CSA W48-01(R2006), Filler Metals and Allied Materials for Metal Arc Welding.

1.4 QUALITY ASSURANCE

- .1 Qualifications: Contractor to be experienced in the related type of work and having at his disposal all necessary equipment to perform all work.
 - .1 Allowable Tolerances.
 - .1 Piles cannot be more than 2% out of plumb, and no more than 50 mm out of alignment.
 - .2 Pile to be installed at elevations indicated plus or minus 25 mm.
 - .3 All units to be installed to develop the loads as indicated on the drawings
 - .4 All work to comply with all local and provincial safety regulations.

1.5 DELIVERY, STORAGE & HANDLING

- .1 All reinforcement and concrete for the foundation units delivered to the site that do not conform to the terms of this specification may be rejected by the Contract Administrator
- .2 Store all materials at the site in such way as to avoid undue damage to material before installation.
- .3 Cleaning and Waste Management in accordance with Section 01 74 19

1.6 SITE CONDITIONS

- .1 Refer to Section 00 31 00 for available project information including Geotechnical Investigation Report.
- .2 Examine existing conditions and requirements for protection of existing foundation and concrete work.
- .3 Notify Contract Administrator in writing if subsurface conditions at the site differ from those indicated and await further instructions from Contract Administrator.
- .4 Confirm with Authorities, location of all utilities prior to commencing with work.

Part 2 Products

2.1 MATERIALS

- .1 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Reinforcing steel: to CAN/CSA-G30.18 and in accordance with Section 03 20 00 - Concrete Reinforcing weldable, 400 MPa.

Part 3 Execution

3.1 INSTALLATION

- .1 Construct a test pile to evaluate risks associated with water infiltration.
- .2 Bore holes to diameters and depths as indicated.
- .3 Contract Administrator to inspect bore holes.
- .4 Protective steel casing:
 - .1 Where required, use steel protective casing approved by Contract Administrator
 - .1 Ensure penetration of casing to required depths either by self mass or driving.
- .5 Supply and install pile caps as indicated on drawings.
- .6 Check each bored shaft for toxic and explosive gases and provide appropriate protective measures for personnel working in shaft.
- .7 Dispose of excavated materials as directed by Contract Administrator off site as indicated.
- .8 Contract Administrator to inspect pile excavation prior to placing of concrete.
 - .1 Remove loose material, foreign matter and water as directed by Contract Administrator
- .9 Install steel reinforcement in accordance with Section 03 20 00 - Concrete Reinforcing and as indicated.

- .10 Fill pile excavations with concrete to elevations as indicated.
 - .1 Place concrete in one continuous pour in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .11 Steel protective casing is to be removed on all piles.
- .12 Where steel protective casing is to be removed, provide concrete with minimum slump of 125 mm and with retarder to prevent arching or setting of concrete.
 - .1 Withdraw casing in conjunction with concrete placing, keeping bottom of casing 600 mm below level of concrete.
 - .2 Do not vibrate concrete internally.
- .13 Use tremie pipe or concrete pumping with approval of Contract Administrator.

3.2 DEFECTIVE PILES

- .1 Cased concrete shaft piles rejected where:
 - .1 Soil has entered casing.
 - .2 Water has entered casing.
 - .3 Casing is damaged, out of tolerance or alignment.
- .2 Defective pile, as directed by Contract Administrator, may be left in place to be cut off at elevation specified by Contract Administrator and filled with sand.
- .3 Where pile has encountered obstruction during driving before reaching its specified bearing stature: considered unsuitable dealt with in conformance with Contract Administrator instructions.

3.3 FIELD QUALITY CONTROL

- .1 Notify Contract Administrator and secure approval before placing reinforcing steel and concrete. Issue at least 48 hours notice to Contract Administrator when inspections will be required
- .2 Concrete tests will be required in accordance with CSA A23.1/A23.2. If concrete at 28 days is less than required strength, provide whatever additional foundation as required and directed to satisfactorily support same load at the same point as called for on drawings without additional cost to the Contract Administrator.
- .3 Keep a log of all piles drilled stating locations, diameter, depth and date placed. Forward triplicate copies of log records, in neat and legible form to Contract Administrator on completion of piling work.

3.4 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