

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-95, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-98, Standard Test Method for Particle Size Analysis of Soils.
 - .4 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³)
 - .5 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A3000-98-A5-98, Portland Cement.
 - .2 CAN/CSA-A23.1-00, Concrete Materials and Methods of Concrete Construction.
- .4 City of Winnipeg Standard Construction Specification CW 2030 – Excavation, Bedding and Backfill.

1.2 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized: common excavation and rock excavation.
 - .1 Rock: any solid material in excess of 0.25 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
 - .2 Common: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil: Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 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-8.2.
 - .2 Table

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45
 - .4 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
- .7 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.

1.3 SUBMITTALS

- .1 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Inform Contract Administrator at least 4 weeks prior to commencing Work, of proposed source of fill materials and provide access for sampling.
 - .3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.

1.4 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where Contract Administrator is employee of Contractor, submit proof that Work by Contract Administrator is included in Contractor's insurance coverage.
- .3 Submit design and supporting data at least 2 weeks prior to commencing Work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified Professional Engineer registered or licensed in the Province of Manitoba, Canada.
- .5 Keep design and supporting data on site.
- .6 Engage services of qualified Professional Engineer who is registered or licensed in the Province in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

1.5 PROTECTION OF EXISTING FEATURES

- .1 Protect existing features in accordance with applicable local regulations.
- .2 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 The City or Authorities Having Jurisdiction, establish location and state of use of buried utilities and

- structures. The City or 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 Construction Manager before removing/re-routing.
 - .6 Record location of maintained, re-routed and abandoned underground lines.
 - .7 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
- .1 Conduct, with Contract Administrator, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, 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 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: shall conform to properties of the following requirements:

- .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.
- .3 Table

Sieve Designation	% Passing Type 1	% Passing 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 Contract Administrator for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

Part 3 Execution

3.1 SITE PREPARATION

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

3.2 STRIPPING OF TOPSOIL

- .1 Commence topsoil stripping of areas as directed by Contract Administrator after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as directed by Contract Administrator. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Contract Administrator. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil as directed by Contract Administrator.

3.3 STOCKPILING

- .1 Stockpile fill materials in areas designated by Contract Administrator. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

3.4 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
- .2 Submit for Contract Administrator review details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in a manner not detrimental to public and private property, or any portion of work completed or under construction.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.

3.5 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Excavation must not interfere with bearing capacity of adjacent foundations.

- .3 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .4 For trench excavation, unless otherwise authorized by Contract Administrator in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .5 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Contract Administrator.
- .6 Restrict vehicle operations directly adjacent to open trenches.
- .7 Dispose of surplus and unsuitable excavated material in approved location on site or off site as directed by Contract Administrator.
- .8 Do not obstruct flow of surface drainage or natural watercourses.
- .9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .10 Notify Contract Administrator when bottom of excavation is reached.
- .11 Obtain Contract Administrator approval of completed excavation.
- .12 Remove unsuitable material from trench bottom to extent and depth as directed by Contract Administrator.
- .13 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with fill concrete.
 - .2 Fill under other areas with fill compacted to not less than 95% of standard maximum dry density. 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 mortar or grout to approval of Contract Administrator.

3.6 FILL TYPES AND BACKFILL

- .1 A minimum thickness of 150 bedding sand shall be placed prior to the layout of the utilities. Once the utilities have been placed, the pipes should be covered with a minimum 300 mm thickness of said prior to applying compaction effort.
- .2 Native sand materials are considered to be acceptable as backfill. The remainder of the trench to sub-grade elevation to be backfilled and compacted with Type 1 fill. Backfill under slab pavements and sidewalks to be compacted to 98% Standard Proctor Density, in landscaped area to be 90% Standard Proctor Density.

3.7 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

3.8 BACKFILLING

- .1 Do not proceed with backfilling operations until Contract Administrator has inspected and approved installations.
- .2 Areas to be backfilled to be free of 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 of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Where temporary unbalances earth pressures are liable to develop on walls or other structures:
 - .4 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval is obtained from Contract Administrator, or:
 - .5 If approved by Contract Administrator, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Contract Administrator.

3.9 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes and correct defects as directed by Contract Administrator.
- .2 Replace topsoil as directed by Contract Administrator.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Contract Administrator.

END OF SECTION

Part 1 General

1.1 REFERENCES

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

1.2 EXISTING CONDITIONS

- .1 Examine subsurface investigation report which is available for inspection at Contract Administrator's Office.
- .2 Known underground and surface utility lines and buried objects are as indicated on site plan.
- .3 Refer to dewatering in Section 31 23 10 – Excavating, Trenching and Backfilling.

1.3 PROTECTION

- .1 Protect and/or transplant existing fencing, tree, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by Contract Administrator. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads to prevent accumulation of construction related debris on roads. This will be strictly enforced by the Contract Administrator.

Part 2 Products

2.1 MATERIALS

- .1 Fill material: Engineered fill in accordance with Paragraph 2.1, Section 31 23 10 – Excavating, Trenching and Backfilling.
- .2 Excavated or graded material existing on site may be suitable to use as fill for grading work, if approved by Contract Administrator.

Part 3 Execution

3.1 GRADING

- .1 Rough grade to levels, profiles and contours allowing for surface treatment as indicated.
- .2 Rough grade to following depths below finished grades:
 - .1 135 mm for sodded areas.
 - .2 300 mm for flowerbeds.
 - .3 500 mm for shrub beds.
 - .4 600 mm for concrete paving, walks and precast paving units.
- .3 Slope rough grade away from building 1:50 minimum and as indicated or as directed by Contract Administrator.
- .4 Grade ditches to depth as indicated and as directed.

- .5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .6 Compact filled and disturbed areas to standard maximum dry density as follows:
 - .1 85% under landscaped areas, 90% under non-landscaped areas.
 - .2 95% under paved and walk areas.
- .7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.2 TESTING

- .1 Inspection and testing of soil compaction will be carried out by testing laboratory approved by the Contract Administrator.
- .2 Submit testing procedure, frequency of tests, testing laboratory as designated by ULC or certified testing personnel to Contract Administrator for approval.

3.3 SURPLUS MATERIAL

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping off site as directed by Contract Administrator.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 00 – Cleaning and Waste Management.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .2 Replace damaged piles as directed by Contract Administrator.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .2 Collect and separate plastic, paper packaging, corrugated cardboard, in accordance with Waste Management Plan.

1.4 EXISTING CONDITIONS

- .1 Sub-surface investigation report is available for inspection at the offices of the Contract Administrator upon request.
- .2 Notify Contract Administrator in writing if subsurface conditions at site differ from those indicated and await further instructions from Contract Administrator.

Part 2 Products

2.1 MATERIALS

- .1 Supply or fabricate full length piles as indicated and provide equipment to handle full length piles without cutting and splicing.
- .2 Do not splice piles without written approval of Contract Administrator. When permitted, provide details for Contract Administrator review. Design details of splice to bear dated signature stamp of professional engineer registered or licensed in Province of Manitoba.

Part 3 Execution

3.1 EQUIPMENT

- .1 Prior to pile installation, submit to Contract Administrator for review, details of equipment for installation of piles.
 - .1 Impact hammers: provide 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 basis of driveability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.
 - .2 Driveability analysis to include, but not be limited to, 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 When required criteria can not be achieved with the proposed hammer, use larger hammer and take other measures as required.
- .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 sufficient length of leads to ensure that use of follower is unnecessary.
- .4 Followers:
- .1 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.

3.2 PREPARATION

- .1 Ensure that ground conditions at pile locations are adequate to support pile driving operation. Make provision for access and support of piling equipment during performance of Work.
- .2 Pre-bore holes to facilitate pile alignment control and to penetrate frost layer.

3.3 FIELD 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 Number of blows per metre for entire length of pile and for final set criteria in accordance with project Geotechnical report.
 - .6 Final tip and cut-off elevations.
 - .7 Other pertinent information such as interruption of continuous driving, pile damage.
 - .8 Record elevation taken on adjacent piles before and after driving of each pile.
- .2 Provide Contract Administrator with detailed pile driving summary at completion of pile installation.

3.4 DRIVING

- .1 Use driving caps and cushions to protect piles. 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 When driving precast concrete piles, adjust hammer, especially when driving is easy, to deliver reduced impact to minimize reflected tensile stress in pile.
- .5 Do not drive piles within 10 m of masonry or concrete which has been in place less than 7 days.
- .6 Restrike already driven piles lifted during driving of adjacent piles to assure set.
- .7 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.
- .8 Cut off piles neatly and squarely at elevations as indicated. Provide sufficient length above cut-off elevation so that part damaged during driving is cut off. Do not cut tendons or other reinforcement which will be used to tie pile caps to pile.
- .9 Remove cut-off lengths from site on completion of work.

3.5 DESIGN LOAD CAPACITY

- .1 Allowable design load capacity of pile at specified load shall be in accordance with project Geotechnical Report requirements.
- .2 Installation of each pile will be subject to full time review by a qualified Geotechnical Engineer, or their duly appointed representative, registered in the Province of Manitoba.
 - .1 Contract Administrator 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 Contract Administrator to approve final driving of all piles prior to removal of pile driving rig from site.
- .3 Refer to project Geotechnical Report for pile driving criteria, final set requirements and driving tolerances.

3.6 OBSTRUCTIONS

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

3.7 REPAIR/ RESTORATION

- .1 At the Contract Administrators discretion, the following methods may be used to repair or remediate pile installations where piles are rejected or deemed to be defective:
 - .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 Leave rejected pile in place and cut off as directed by Contract Administrator.
 - .4 Leave rejected pile in place, place adjacent pile 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.

3.8 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. When damages occur, remedy damaged items to restore to original or better condition at own expense.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 00 – Cleaning and Waste Management
- .3 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CAN/CSA-A3000, Cementitious Materials Compendium (consists of A5; A8, A23.5; A362; A456.1; A363; A456.2; A456.3

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Each drawing submitted shall bear the signature and stamp of qualified professional engineer registered or licensed in Province of Manitoba.
- .3 Indicate the following items:
 - .1 Lifting point details and locations.
 - .2 Storage support point locations.
 - .3 Connector details [complete with calculations].
 - .4 Rock points.
 - .5 Concrete strength.
 - .6 Steel grades.
 - .7 Reinforcing details.
 - .8 Type and grade of steel.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 00 – Cleaning and Waste Management
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

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 CSA-A23.1 / CSA-A23.2

2.2 CONCRETE MIXES

- .1 Concrete mix to Section 03 30 00 – Cast-in-Place Concrete
- .2 Refer to requirements of Geotechnical Report for sulphate resistance, minimum compressive strength, max water/cement ratio, minimum cement content, entrained air content, and slump.

Part 3 Execution

3.1 FABRICATION

- .1 Fabricate piles to following finish tolerances:
 - .1 Length: plus or minus 3 mm/m of length.
 - .2 Cross section: Solid sections: minus 5 to plus 10 mm.
 - .3 Deviation from straight line: not more than 3 mm/m of length, 10 mm in full length.
 - .4 Pile head: 10 mm/m from true right angle plane. Surface irregularities 3 mm.
 - .5 Location of reinforcing steel main reinforcing cover: minus 3 to plus 5 mm; spiral: 10 mm.
- .2 Prestress piles. Measure strand elongation to determine stressing force and measure hydraulic pressure at jack. Stressing force as measured by both methods to be within 5%.
- .3 De-tension in manner to keep eccentricity to minimum. Release prestress prior to cutting prestress strands.
- .4 Quality and dimensions of piles will be determined by Contract Administrator. Remove rejected piles from site.

3.2 HANDLING

- .1 Ensure handling and installation stresses are within safe limits.

3.3 INSTALLATION

- .1 Install piles in accordance with Section 31 61 13 - Pile Foundations, General Requirements.
- .2 Cut off piles at required elevation. Prevent spalling of pile concrete below cut-off elevation.

END OF SECTION