
Part 1 General

1.1 RELATED SECTIONS

- .1 Section 02 41 13 – Selective Site Demolition
- .2 Section 32 11 23 – Aggregate Base
- .3 Section 32 12 16 – Asphalt Paving

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D698-91(1998), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m;).

1.3 EXISTING CONDITIONS

- .1 Known underground and surface utility lines and buried objects are as indicated on site plan. The Contractor shall be responsible for confirming all utilities with utility providers prior to commencing grading operations.
- .2 Report discrepancies to the Contract Administrator if they impact proposed work.
- .3 Any damage to utilities during construction are the responsibility of the Contractor and shall be repaired at no additional cost to the Contract Administrator.

1.4 PROTECTION

- .1 Protect natural features designated to remain, bench marks, buildings, pavement, surface or underground utility lines which are to remain as indicated on the drawings and as directed by the 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.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate metal, plastic, wood and corrugated cardboard packing and place in area designated for disposal and recycling.
- .2 In accordance with Section 01 74 19 – Waste Management And Disposal and Section 01 35 20 - LEED Sustainability Requirements.

Part 2 Products

2.1 MATERIALS

- .1 Fill Material:
 - .1 Common fill: selected material obtained from excavation, grading, or other sources approved by the Contract Administrator for use intended, unfrozen and free from rocks larger than 75mm, cinders, ashes, sod, refuse or other deleterious materials.
 - .2 Subgrade fill: gravel, Class 'C' as per the latest edition of the *City of Winnipeg Standard Construction Specifications*.

Part 3 Execution

3.1 ROUGH GRADING AND SHAPING

- .1 Inspect subgrade exposed by excavation activities with the Contract Administrator (as required) and identify any problem areas that will require remediation.
- .2 Sub-excavate and repair any silt pockets or soft spots encountered on site as directed by the Contract Administrator.
- .3 Remove any areas found to be contaminated with fossil fuels or chemicals.
- .4 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated on the drawings.
- .5 Prior to placing fill over existing ground, scarify surface to depth of 150mm (6"). Maintain fill and existing surface at approximately the same moisture content to facilitate bonding.
- .6 Place and compact fill in maximum lifts of 150mm (6").
- .7 Compact filled and disturbed areas with a sheepsfoot roller to correct maximum dry density to ASTM D698, as follows:
 - .1 95% under landscaped areas.
 - .2 98% under and to distance of 1m beyond edge of paved areas.
- .8 Where areas are too small to be compacted with a large, self propelled machinery, use hand-held, vibratory compaction equipment or hand rollers to achieve required compaction. Obtain Contract Administrator's approval of alternate equipment prior to use.
- .9 Coordinate rough grading with Mechanical, Civil and Structural work.

3.2 TESTING

- .1 Test compacted subgrade at locations selected by the Contract Administrator.

3.3 SURPLUS MATERIAL

- .1 Recycle surplus material and material unsuitable for fill, grading or landscaping to a local facility as directed by the Contract Administrator.

3.4 CLEANING

- .1 Perform cleaning after rough grading to remove construction and accumulated environmental dirt. Remove surplus materials, excess materials, rubbish, tools and equipment.

3.5 ACCEPTANCE

- .1 Obtain final approval of rough grading via site inspection with the Contract Administrator or designated representative.
- .2 Produce final test results for deficient areas prior to proceeding with subsequent works or finished surface treatment.

END OF SECTION

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.
- .5 Canada Green Building Council (CaGBC)
 - .1 LEED Canada Reference Guide for Green Building Design and Construction 2009

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.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away for public.
- .4 Use chemical hardeners that are non-toxic, biodegradable and have zero or low VOC's.
- .5 Dispose of surplus chemical and finishing materials in accordance with Federal, Provincial and Municipal regulations.

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 RELATED SECTIONS

- .1 Section 32 91 19 - Topsoil & Finish Grading

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management And Disposal and Section 01 35 20 - LEED Sustainability Requirements.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Section 01 74 19 – Waste Management And Disposal.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Fold-up metal banding, flatten and place in designated area for recycling.
- .5 Divert left over materials from landfill to local facility for reuse as approved by Contract Administrator.

Part 2 Products

2.1 STONE RIP RAP

- .1 Hard, clean, durable fieldstone granite boulders, rounded form, free from seams, sharp edges, points, cracks or other structural defects, to meet the following size distribution for use intended:
 - .1 Fieldstone Boulders:
 - .1 Ranging from 300 mm to 1200 mm in diameter as indicated on drawings.
 - .2 Not less than 50% with a diameter of less than 800 mm.
 - .3 Limestone boulders will NOT be accepted.

Part 3 Execution

3.1 PLACING

- .1 Place boulders in locations and arrangements as indicated on drawings.
- .2 Place boulders in manner so to have most attractive side of stone facing prominent viewing area.
- .3 Place boulders so that they are stable and not prone to movement or shifting if climbed upon.
- .4 Use equipment suited to the application. Do not damage adjacent structures, finishes, natural features, services or completed work. Contractor is responsible for making good all damage at no cost to the Contract Administrator.
- .5 Contractor is responsible for repair of all access routes, should damages occur.

END OF SECTION

PART 1 - General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 - Cast-In-Place Concrete.
- .2 Section 31 22 13 - Rough Grading.
- .3 Section 31 23 00 - Excavation and Fill.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C88-05, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - .2 ASTM C131-06, Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .4 ASTM D1248-05, Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable.
 - .5 ASTM E11-09e1, Standard Specification for Wire Cloth and Sieves for Testing Purposes.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB 8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 American Association of State Highway and Transportation Officials (AASHTO).
 - .1 AASHTO M92-05, Standard Specification for Wire-Cloth Sieves for Testing Purposes.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver all material to site in manufacturer's original unopened packaging with labels clearly identifying product name and manufacturer.
- .2 Store materials in a dry, enclosed area protected from exposure to moisture, construction activity, and direct sunlight in strict accordance with manufacturer's recommendations.
- .3 Handle all products with appropriate precautions and care as stated manufacturer's instructions.
- .4 Cleaning and Waste Management in accordance with Section 01 74 00.

1.4 SITE CONDITIONS

- .1 Locate all irrigation system lines and any other underground utilities that may interfere with the works. Ensure the location of all irrigation lines, sprinkler heads and other utilities are staked prior to the start of construction.

1.5 PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, existing cart paths, surface or underground utilities which are to remain. Make good any damage.
- .2 The Contract Administrator or designated representative will designate the area or areas in which the Contractor's activities may take place. The Contractor shall make good any damage caused by their activities within the construction area or areas. The Contract Administrator or designated representative will designate access routes to the designated

work areas. The Contractor shall make good any damage caused by their activities along the access routes.

1.6 SUPERVISION AND INSPECTION

- .1 The Contractor shall provide preliminary staking for all drainage works for approval by the Contract Administrator. The Contractor will stake all modifications approved by the Contract Administrator as works are in progress.
- .2 The Contract Administrator or designated representative will provide periodic review of subgrade drainage installation as they are being undertaken and will provide direction to the Contractor.

PART 2 - Products

2.1 MATERIALS

- .1 Plastic (HDPE) corrugated pipe and fittings: to ASTM D1248, Big "0", Prinsco (or approved alternate) Internal Snap Coupling System pipe perforated all around complete with polyester geotextile fabric 'sock' filter, nominal inside diameter 4" (100mm), non-perforated couplings (insert type), sleeves, reducers, connectors, T's, Wye's, elbows and end caps (insert type). Refer to Drawings for applicable pipe size and location.
- .2 Riverwash Drainage Stone: Non-calcareous, 19mm (3/4") diameter, rounded, smooth (not crushed) and washed, free from clay and silt fines. Soft limestones, sandstones or shale are not acceptable. Drainage material to consist of clean natural stone of similar characteristics having hard, strong, durable, uncoated particles free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter.
- .3 Coarse Drainage Sand: washed, (ASTM C-33).

Sieve Size	Particle Size	% Passing
3/8"	9.5mm	100%
No. 4	4.75mm	95%-100%
No. 8	2.36mm	80%-100%
No. 16	1.18mm	50%-85%
No. 30	0.6mm	25%-60%
No. 50	0.3mm	5%-30%
No. 100	0.15mm	0%-10%
No. 200	0.075	0%-5%

Percolation rate: 28 – 40 m per day. As supplied by Kachur Sand & Gravel, ph. 222-0953 or approved equal.

- .4 Filter fabric: permeable, commercial grade, woven landscape fabric approved by Contract Administrator, to required widths x full lengths.
- .5 Root Barrier: For drainage trench/drain line protection. 46 x 61cm panels. Models: 18" (46cm) Universal Guide – UB 18-2. As manufactured by Deep Root (or approved alternate).

PART 3 - Execution

3.1 INSPECTION

- .1 Ensure graded subgrade conforms with required drainage pattern before placing drainage material.

- .2 Ensure improper slopes, unstable areas, areas requiring additional compaction of other unsatisfactory conditions are corrected to approval of Contract Administrator. Do not begin installation of foundation drainage until deficiencies have been corrected.
- .3 Ensure that foundation repairs have been completed and approved by the Contract Administrator before commencing with drainage installation.

3.2 INSTALLATION

- .1 Pipe trench and bedding:
 - .1 Drainlines: Cut trenches in subgrade, compact trench bottom. Excavation must not interfere with the normal 45° bearing splay of foundations.
 - .2 Remove boulders, old construction rubble, and other obstructions encountered in course of excavation.
 - .3 Shape trench and bed true to grade and to provide continuous, uniform bearing surface for pipe.
 - .4 Smooth to grade as indicated on grading plans, providing continuous grade without low or high spots.
 - .5 Pipe bedding not required.
- .2 Pipe laying:
 - .1 Ensure pipe interior and coupling surfaces are clean before laying.
 - .2 Lay pipe to minimum slope, as indicated on drawings, to discharge site.
 - .3 Do not use shims to establish pipe slope.
 - .4 Use manufacturer's recommended fittings.
 - .5 Protect pipe ends and risers from damage and ingress of foreign material.
 - .6 Connect pipe to catchbasins, sump pit or outlets by appropriate adapters manufactured for this purpose.
 - .7 Secure all joints and fittings with woven, commercial grade duct tape prior to backfilling.
- .3 Drainage Trench Backfill:
 - .1 Protect catch basin and other inlet structures from contamination of backfill and other material by placing a piece of filter fabric of rim and place lid in to secure fabric. Remove fabric after construction is complete.
 - .2 Place backfill material after pipe installation is approved by the Contract Administrator.
 - .3 Perforated Drainlines: Place coarse sand backfill by hand to finish grade, allowing for 75mm soil and sod over trench. Place layers uniformly and simultaneously on each side of pipe. Consolidate by hand, tamping lightly to design grade. Use appropriate devices or methods to ensure and prevent displacement of pipe during backfilling.
 - .4 Place backfill material above pipe surround in uniform lifts not to exceed 150mm compacted thickness up to grades as indicated.
 - .5 The Contractor is responsible to make good any settlement that may occur in pipe trenches.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 63 23 – Bored Concrete Piles.

1.2 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 Contract Administrator and await further instructions.
- .4 Submit schedule of planned sequence of pile installation to Contract Administrator for review.
- .5 Spliced piles: when authorized, submit design details of splice complete with signature and stamp of qualified professional engineer registered or licensed in the Province of Manitoba, Canada.
- .6 Equipment:
 - .1 Submit prior to pile installation for review by Contract Administrator, list and details of equipment for use in installation of piles.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions and Section 01 61 00 - Common Product Requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Divert unused, or cut off concrete materials from landfill to local quarry or facility in accordance with Section 01 74 19 – Waste Management and Disposal and Section 01 35 20 – LEED Sustainable Requirements.

1.5 EXISTING CONDITIONS

- .1 Sub-surface investigation report is attached to the specifications.

1.6 SCHEDULING

- .1 Provide schedule of planned sequence of installation to Contract Administrator for review, not less than two weeks prior to commencement of pile installation.

Part 2 Products

2.1 MATERIALS

- .1 Material requirements for piles are specified in Section 31 63 23 – Bored Concrete Piles.

Part 3 Execution

3.1 PREPARATION

- .1 Protection:
 - .1 Protect adjacent structures, services and work of other sections from hazards due to pile installation operations.
 - .2 Arrange sequencing of pile installation 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 installation operations.
 - .1 Make provision for access and support of piling equipment during performance of Work.
- .3 Install piles only when excavation has been completed.

3.2 INSTALLATION

- .1 Bored concrete piles have been design for skin friction based on Ultimate Limit States in accordance with Part 4 of the National Building Code of Canada. Allowable design load capacity of pile at factored load is indicated on the drawings.
- .2 Installation of each pile will be subject to review of Contract Administrator.
 - .1 Contract Administrator will be sole judge of acceptability of each pile with respect to criteria used to determine load capacity.
 - .2 Contract Administrator to review final installation of all piles prior to removal of pile equipment from site.

3.3 OBSTRUCTIONS

- .1 Where obstruction is encountered that prevents the installation of the pile or deviation from specified tolerances, proceed as directed by the Contract Administrator.

3.4 REPAIR AND RESTORATION

- .1 Proceed to remove, repair, replace or augment rejected 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.

3.5 FIELD QUALITY CONTROL

- .1 Measurement:
 - .1 Maintain accurate records of the installation for each pile, including:
 - .1 Pile size and length, location of pile in pile group, location or designation of pile group.
 - .2 Sequence of installation of piles.
 - .3 As-built survey of centerline of piles and top of pile elevations.
 - .2 Provide Contract Administrator with two copies of records.

- .3 Contractor to provide full time review of pile foundation installation by a qualified Geotechnical Engineer. Pay the costs as per 01 29 83 – Payment Procedures for Testing Laboratory Services.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 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 RELATED REQUIREMENTS

- .1 Section 31 61 13 – Pile Foundations, General Requirements.

1.2 REFERENCES

- .1 All references to be the latest edition as of the date indicated on the specifications.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-G30.18, Billet Steel Bars for Concrete Reinforcement.

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 Shop Drawings:
 - .1 Indicate: pile type, reinforcing size and spacing, pile cap type and reinforcing size and spacing.
 - .2 Submit each drawing complete with signature and stamp of qualified Professional Engineer registered in the Province of Manitoba, Canada.
- .4 Quality assurance submittals:
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .3 Records and reports: submit Mill report and concrete tests as described in PART 2 - SOURCE QUALITY CONTROL.
 - .4 Submit for review by Contract Administrator two copies of pile installation records as described in PART 3 - FIELD QUALITY CONTROL.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal and Section 01 35 20 – LEED Sustainable Requirements.
- .2 Divert unused metal materials from landfill to metal recycling facility in accordance with Section 01 74 19 - Waste Management and Disposal and Section 01 35 20 – LEED Sustainable Requirements.
- .3 Divert unused concrete materials from landfill to local quarry or facility in accordance with Section 01 74 19 - Waste Management and Disposal and Section 01 35 20 – LEED Sustainable Requirements.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 35 20 – LEED Sustainable Requirements.

2.2 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.

2.3 SOURCE QUALITY CONTROL

- .1 Mill report to CAN/CSA-S16.
- .2 Concrete tests: to CSA-A23.1/A23.2.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Bore holes to diameters and lengths as indicated on the drawings. Pile length is calculated from the top of pile elevations and not from the top of grade elevation.
- .2 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.
- .3 Dispose of excavated materials off site.
- .4 Contract Administrator to inspect pile excavation prior to placing of concrete.
 - .1 Remove loose material, foreign matter and water as directed by Contract Administrator.
- .5 Install steel reinforcement in accordance with Section 03 20 00 - Concrete Reinforcing and as indicated.
- .6 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.
 - .2 Place concrete immediate upon completion of pile boring. Do not wait for multiple bore holes to be completed prior to placing concrete.
- .7 Steel protective casing may be removed at option of Contractor, unless otherwise specified.

- .8 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.
- .9 Where steel protective casing is left in place, fill void space between casing and shaft excavation with concrete.
- .10 Use tremie pipe or concrete pumping with approval of Contract Administrator.
- .11 Contractor to provide steel casing as required to prevent sloughing and squeezing of the bored hole.
- .12 Contractor to remove water from bored hole prior to placing concrete.

3.3 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 to be removed, repaired, replaced or augmented as directed by Contract Administrator.

3.4 FIELD QUALITY CONTROL

- .1 Field Records: maintain pile installation record for each pile.
- .2 Complete concrete testing in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Provide as-built drawing of final center of pile locations and final top of pile elevations.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION