Part 1 General

1.01 REFERENCES

.1 ASTM International

.1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 The Contractor will be responsible for all costs associated with generating and stockpiling the granular materials.

.2 The Contractor is responsible for all permits, licenses and royalties for any other excavated material.

.3 Source of materials to be incorporated into work or stockpiled require approval.

.4 If, in the opinion of the Departmental Representative, materials from the proposed source do not meet, or cannot reasonably be processed to meet specified requirements, procure an alternative source of demonstrate that material source in questions can be processed to meet specified requirements.

1.03 DELIVERY, STORAGE AND HANDLING

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

.2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

.3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

Part 2 Products

2.01 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.

2.02 GRADATION DESIGNATIONS

.1 Compact Select Granular Backfill

.1 Compact Select Granular Backfill shall be maximum size 75 mm natural material, not manufactured, complying closely to the following gradation from a location approved by the Departmental Representative.

Sieve Size	Percent Passing
75 mm	100
25 mm	80 - 100
4.75 mm	40 - 70

75 micro m	0 - 15

.2 Bedding Sand (Class B)

.1 Sand shall be dry, unfrozen, fine granular material, maximum size 9.5 mm complying with the following gradation:

Sieve Size	Percent Passing
9.5 mm	100
75 micro m	8 max.

.3 Granular Base Course – “A” Base

.1 “A” Base shall be maximum size 19 mm granular material complying with the following gradation:

Sieve Size	Percent Passing
19 mm	100
12.5 mm	75 - 90
4.75 mm	40 - 70
425 um	10 - 30
75 um	8 – 15

.2 Min. crush count shall be 35% and is defined as the percentage by weight of aggregate particles retained on a 4.75 mm sieve which have at least one freshly fractured face.

.3 Max. Los Angeles abrasion loss shall be 45% to ASTM test procedures.

.4 Max. shale content shall be 12% and is defined as the percent by weight of the particles retained on a 4.75 mm sieve that are shale particles.

.4 Granular Sub-Base Material

.1 Granular sub-base material shall be well graded granular material complying with the following gradation:

Sieve Size	Percent Passing
50 mm	100
4.75 mm	25 - 60
75 um	4 – 15

.2 Other properties as follows:

.1 Los Angeles degradation maximum loss by mass of 40 % for 50mm sub-base tested in accordance with grading A of ASTM C131.

2.03 SOURCE QUALITY CONTROL

.1 Provide Departmental Representative sieve analysis and Standard Proctor test results of all aggregate gradations identified in this specification to be used for the Works in accordance with Section 01 45 00 – Quality Control.

.2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.

.3 Advise Departmental Representative 4 weeks minimum in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.01 PREPARATION

.1 Aggregate source preparation:

- .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials.
- .2 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
- .3 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
- .4 Trim off and dress slopes of waste material piles and leave site in neat condition.
- .5 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.

.2 Processing:

- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.3 Stockpiling:

- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
  - .1 Maximum 1.5 m for coarse aggregate and base course materials.
  - .2 Maximum 2.0 m for fine aggregate and sub-base materials.
  - .3 Maximum 1.5 m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.02 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

3.03 PLACEMENT AND COMPACTION

.1 Granular Sub-base and Base Course shall be placed and compacted in lifts not exceeding 150 mm and shall be compacted using pneumatic tired rollers or other equipment approved by the Departmental Representative.

.2 Water shall be added as required to ensure aggregate compaction is at the optimum moisture content.

.3 Each layer shall be compacted to a minimum density of 98% standard proctor density. The Contractor shall not place additional material on a compacted layer until the moisture content of the layer is at or below optimum.

.4 Placement and compaction of aggregate material for trench backfill shall be in accordance with Section 31 23 33.01 Excavating, Trenching and Backfilling.

END OF SECTION

Part 1 General

1.01 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.5 ASTM D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.02 WASTE MANAGEMENT AND DISPOSAL

.1 Dispose of surplus excavated material as directed by the Departmental Representative.

.2 Drill cuttings and/or spent drilling fluids must be collected and removed from site and properly disposed of at the cost of the Contractor.

1.03 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 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.4 Prior to beginning excavation Work, notify applicable Departmental Representative and authorities having jurisdiction to establish location and state of use of buried utilities and structures.

.5 Confirm locations of buried utilities by careful soft digging or soil hydrovac methods.

.6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.7 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative.

.8 Record location of maintained, re-routed and abandoned underground lines.

.9 Confirm locations of recent excavations adjacent to area of excavation.

.2 Existing buildings and surface features:

.1 Conduct, with Departmental Representative, 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 event of damage, immediately make repair as directed by Departmental Representative.

.3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

1.04 DEFINITIONS

.1 Excavation will include trenches and shafts.

.2 Shafts means a vertical or inclined opening excavated below ground level.

.3 Trench means an excavation having a depth width measured at the bottom.

.4 Shoring will include bracing, sheeting, planking, circular steel sleeves and trench cages.

.5 Trenchless installation methods are methods of installing pipe inside a hole that has been made between shafts by coring, horizontal drilling, jacking, tunneling or similar methods with minimal excavation and surface disruption.

Part 2 Products

2.01 MATERIALS

.1 For granular bedding and backfill material requirements, refer to Section 31 05 16 - Aggregate Materials.

.2 Compacted common backfill shall consist of unfrozen in-situ material excavated from the trench with no stones or lumps exceeding 150 mm in diameter. Organic material, Silty material or other unsuitable material as determined by the Departmental Representative shall not be used for compacted common backfill material.

.3 Compacted clay fill shall consist of unfrozen in-situ clay material excavated from the trench with no stones or lumps exceeding 150 mm in diameter. Compacted clay fill shall be free of deleterious materials such as roots, organic material, ice, snow, or other unsuitable materials. In the event that suitable or sufficient quantity of clay material is not available from proposed excavations, Contractor shall import suitable clay fill material as approved by the Departmental Representative where clay fill is required.

Part 3 Execution

3.01 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures in accordance with approved Erosion and Sediment Control Plan to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction.

3.02 SITE 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.

3.03 PREPARATION/PROTECTION

.1 Keep excavations clean, free of standing water, and loose soil.

.2 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.3 Protect buried services that are required to remain undisturbed.

3.04 STRIPPING OF TOPSOIL

.1 All areas to be excavated to be stripped in accordance with Section 31 14 13 - Soil Stripping and Stockpiling.

3.05 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative.

.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

.4 Implement ground protection underneath stripped, excavated or stockpiled materials.

3.06 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated on the design drawings.

.2 Install underground infrastructure by trenchless installation methods where specified. Where field conditions are such that underground infrastructure cannot be installed using trenchless methods, install underground infrastructure in a trench using the class of backfill specified for the installation location after receiving written approval from the Departmental Representative.

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 Excavation of shafts to be kept to a minimum as pipe installation shall be installed by trenchless methods.

.5 Do not disturb soil within branch spread of trees or shrubs that are to remain.

.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.

.1 Implement ground protection underneath striped, excavator or stockpiled materials.

.2 Excavations shall be excavated with walls as nearly vertical as possible, and with shoring or bracing, where required. Bracing and shoring shall be constructed at the Contractor’s expense and in accordance with current standards. Placing and removal of shoring, bracing, sheet piling or cages shall be undertaken in a manner that permits proper backfilling.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material off site or as directed by the Departmental Representative.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Notify Departmental Representative when bottom of excavation is reached.

.12 Obtain Departmental Representative approval of completed excavation.

.13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.14 Correct unauthorized over-excavation as follows:

.1 Fill areas with compacted select granular backfill material as defined in section 31 05 16 – Aggregate Materials.

.15 Hand trim, make firm and remove loose material and debris from excavations.

.16 Were required, saw cut and removed existing pavement to allow for excavations.

.1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.07 SHORING

.1 Use suitable type of shoring for soil conditions.

.2 Provide shoring design stamped, signed and dated by a Professional Engineer experienced in shoring design and licensed to practice in the Province of Manitoba when shoring is required.

.3 Install shoring in a matter to support sides of excavation and prevent ground movement that may damage pipes and structures being constructed and cause damage to existing adjacent pavements, buildings and other structures.

.4 Use type or method of shoring that will not disturb the compacted foundation and bedding when being removed.

.5 Arrange with the Professional Engineer who designed the shoring system to inspect the shoring system during construction and certify, in writing to the Departmental Representative, that construction is in conformance with the approved design.

.6 Leave the shoring system in place until such time as the Professional Engineer who designed the shoring system has provided written approval to remove. Provide a copy of the written approval to the Departmental Representative before removal.

.7 Remove shoring from excavations as backfilling proceeds unless otherwise indicated in the Specifications, or directed by the Departmental Representative to leave shoring permanently in place. Cut-off shoring permanently left in place 1.2 metres below grade unless otherwise indicated in the Specifications or directed by the Departmental Representative.

.8 Repair shoring, boulevards, pipes, utilities and structures as directed by the Departmental Representative that are damaged or disturbed by shoring failure or when removing shoring.

3.08 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below:

.1 Compact Select Granular Backfill – Where this class of backfill is specified, the trench shall be backfilled entirely with select granular backfill, in accordance with Section 31 05 16 – Aggregate Material, in layers no greater than 150 mm thick. Compact each later with a vibratory compactor to at least 98% of Standard Proctor Density. Obtain approval from the Departmental Representative before proceeding with the next layer.

.2 Compacted Common Backfill – Backfill the excavation with suitable excavated material in maximum 300 mm thick layers to the grade required for backfill in accordance with the drawings and specifications or as directed by the Departmental Representative. Compact each later by mechanical means to a density equivalent to that of the surrounding unexcavated material. Obtain approval from the Departmental Representative before proceeding with the next layer.

.3 Compacted clay fill – fill with suitable excavated clay material, or imported clay material, in maximum 300 mm thick layers to the required grades in accordance with the drawings and specifications or as directed by the Departmental Representative. Compact each later by mechanical means to a minimum 85 % of Standard Proctor Density. Obtain approval from the Departmental Representative before proceeding with the next layer.

3.09 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place compacted sand bedding a minimum of 100 mm below the invert of the pipe being installed and pipe surround sand a minimum of 200 mm above the top of the pipe for the entire trench width.

3.10 BACKFILLING

.1 Do not proceed with backfilling operations until completion of following:

.1 Departmental Representative has inspected and approved installations.

.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 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 Compacted Select Granular Backfill shall be used in all excavations under or within 1.0 m of any existing or proposed paved or granular surface.

.4 Compacted Common Backfill shall be used in all excavations in a landscaped area.

3.11 DEWATERING

.1 The bottom of the excavation shall be maintained in a condition to permit the proper installation of the pipe or underground structures. Installed pipes shall not be used as a drain. The Contractor shall provide, at his own expense, all portable dewatering equipment (including power, pumps and discharge hose) to drain the excavations as required to install the proposed works.

.2 If required, the Contractor shall construct, supply, maintain and operate all necessary dykes, cofferdams, drains, sumps, well points, pumps and any other equipment that may

be required to keep the work area free from all sources of water damage which may affect the Work.

.3 Contractor to prepare a dewatering plan to be submitted to the Departmental Representative for review a minimum of seven (7) days prior to construction.

.4 Dewatering equipment discharge to be into well vegetated areas away from any water body and approved by the Departmental Representative.

3.12 RESTORATION

.1 Upon completion of Work, place topsoil in accordance with Section 32 91 19.13 – Topsoil Placement and Grading. Topsoil placement to disturbed areas shall be incidental to the work and no measurement for payment will be made.

.2 Upon completion of Work disturbed areas to be seeded in accordance with Section 32 92 19.13 – Mechanical Seeding. Seeding of topsoiled areas shall be incidental to the work and no measurement for payment will be made.

.3 Upon completion of Work, areas where asphalt pavement was removed to be replaced in accordance with Section 32 12 16 – Asphalt Paving.

END OF SECTION

Part 1 General

1.01 SITE CONDITIONS

.1 Inspect site and note characteristics and features affecting the work of this section.

.2 Allowances will not be made for difficulties encountered due to site conditions visible and known to exist at the time tenders for work are submitted.

1.02 QUALIFICATIONS

.1 Use fully experienced and qualified workmen for piling work.

.2 Submit proof of qualifications, and history of successfully completed, similar projects, when so requested.

Part 2 Products

2.01 MATERIALS

.1 Reinforcing Steel: As specified in Section 03 20 00 - Concrete Reinforcing. Refer to structural drawings for sizes.

.2 Cement: To CAN/CSA-A5, Type HS.

.3 Aggregates: To CAN/CSA-A23.1.

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

.5 Air entraining admixture: To ASTM C 260.

2.02 CONCRETE MIX

.1 Mix concrete in accordance with Section 03 30 00 - Cast-In-Place Concrete to achieve design strengths and mixes as indicated on Structural drawings.

Part 3 Execution

3.01 PREPARATION

.1 Notify Departmental Representative at least 48 hours prior to piling and arrange for full time inspection by a Geotechnical Engineer who holds a current “Certificate of Authorizations” of EGM, inspection services to paid for by the Contractor.

.2 Locate and fix position of piles from established reference points indicated on drawings. The Contractor is to assume responsibility for the accuracy of locating such positions.

3.02 INSTALLATION

.1 Install piles in proper locations to diameters and depths indicated on the Electrical drawings.

.2 If bedrock is encountered, use large diameter pier, sleeve, and install dowels to bedrock as indicated on electrical drawings. Dewater as required.

.3 Keep drilled holes free of water and foreign materials.

.4 Arrange for and allow inspection of pile shafts by the Geotechnical Engineer prior to placing of reinforcing and concrete.

.5 Install steel reinforcement in accordance with Section 03 20 00 - Concrete Reinforcing as indicated on Electrical drawings. Provide suitable method of holding reinforcing steel in position for specified concrete coverage.

.6 Fill pile excavations with concrete to elevations as indicated. Place concrete in one continuous pour in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.7 Carefully place concrete by means of vertical chute or elephant trunk or other approved methods to prevent concrete from striking sides of shaft and to prevent foreign material from entering shaft.

.8 Place concrete by means of tremie should an inflow of water occur that cannot be removed by pumping. Place to a height sufficient to effect a seal. Notify Department Representative prior to proceeding with this work.

.9 Form piles projecting above grade with circular fibre forms to maintain pile diameter to top of pile.

.10 Mechanically vibrate and compact top 3 m of each pile to produce a solid mass, free of honeycomb, air pockets. Do not displace reinforcing steel.

.11 Use steel protective casings in conditions of non-cohesive soil or water seepage. Ensure penetration of casing to required depths either by self-mass or driving. Withdraw casing in conjunction with concrete placing, keeping bottom of casing 600 mm below level of concrete.

.12 Provide and install sono-tube, greased with a 15 mil poly wrapped from the surface to the top of grade as indicated on the electrical drawings.

3.03 TOLERANCES

.1 Install piles vertically, not out of plumb from vertical by more than 2% of pile length; nor out of location by more than 50 mm.

3.04 COLD WEATHER CONDITIONS

.1 When mean daily temperature is below 41F (5°C), heat concrete aggregates and mix water to provide concrete temperature of 50F to 86F (10 - 30°C) at placing.

.2 After placing concrete, cover and heat, with approved heating device to prevent freezing of concrete.

3.05 PILE RECORD

.1 Keep accurate piling records of all installed piles. Record locations, diameters, top and bottom elevations and other pertinent data for each pile installed.

.2 Submit three copies of piling records to Department Representative on completion of piling work.

3.06 DEFECTIVE WORK

.1 The Department Representative has full authority to reject work or materials that do not conform to the drawings or Specifications and to take any action that he feels necessary to achieve a complete, satisfactory installation as specified, at no cost to the Department Representative or Consultant.

.2 Cooperate with the Geotechnical Engineer who will approve pile borings, depths and placing of reinforcing steel.

.3 All concrete shaft piles shall be rejected where:

.1 Soil has entered shaft/casing.

.2 Water has entered shaft/casing.

.3 Shaft/casing is damaged, or out of tolerance, or out of alignment.

.4 Defective pile, as directed by Geotechnical Engineer to be cut off at elevation directed by Geotechnical Engineer and filled with sand and replaced at no cost to the owner.

3.07 INSPECTION AND TESTING

.1 Retain a CSA approved independent testing agency to carry out inspection and testing of concrete and concrete materials in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.2 Costs for inspection and testing by independent testing agency to be paid by the Contractor.

3.08 CLEAN-UP

.1 On completion of piling remove all excavated materials and debris from site.

END OF SECTION