1.0 GENERAL

1.1 GENERAL CONDITIONS

.1 The Contractor shall read and be governed by the General Conditions, General Instructions, Instructions to Bidders, Addenda, Form of Tender and Agreement of the complete specifications for this project.

.2 The complete work under this trade shall be governed by the dictates of good practice in all details of materials and methods, even if not minutely specified. The work shall be properly coordinated with the requirements of other units of work specified in other sections.

1.2 STANDARDS

.1 American Society for Testing and Materials: ASTM (where noted).

1.3 SITE CONDITIONS

.1 Visit the site and note all characteristics and irregularities affecting the work of this section.

.2 To proceed with the work will mean acceptance of the conditions, and failure to comply with the above will in no sense form the basis for any claims.

1.4 UTILITY LINES

.1 Contact all required utility companies prior to commencing work, and become informed of exact location of utilities. Protect utilities during construction, and assume liability for damage to utilities.

1.5 PERMITS

.1 Obtain and pay for any necessary permits required to complete the work.

1.6 COMPACTION DENSITIES

.1 Compaction densities are percentages of Standard Proctor dry density SPDD., at optimum moisture content obtainable from ASTM D698.

1.7 INSPECTION AND TESTING

.1 Testing of materials and compaction will be carried out by testing laboratory in accordance with Section 01400.

.2 Owner will pay costs for inspection and testing.

.3 Sieve Analysis: Proposed fill materials may be tested to confirm suitability for intended use, and conformity with specifications.

.4 Frequency of Tests:

.1 Excavated Surfaces: When undisturbed excavated surface is being prepared, a series of three (3) tests of surface for each 500 m^2 area will be made.

.5 Backfilling and compaction densities not conforming to the specifications and drawings, as represented by test results, shall be rejected at any time defects are found during the progress of the work. Defective materials shall be removed, replaced, and the fill retested at the Contractor's expense.

1.8 PROTECTION

.1 Protect bottoms of excavations from softening. Should softening occur, remove softened soil, and replace with Type 1 fill compacted to 98% SPDD.

.2 Protect bottoms of excavations from freezing.

.3 Construct banks in accordance with local bylaws, and local soil conditions. Protect excavations by shoring, bracing or by other methods, as required to prevent cave-ins or loose dirt from falling into excavation.

.5 Provide adequate protection around bench markers, lay-out markers, survey markers, and geodetic documents.

.5 Provide protection to ensure no damage to existing facilities and equipment situated on site.

.6 Do not stockpile excavated material to interfere with site operations or drainage.

.7 Maintain adequate barriers and construction signs to prevent injury to the public.

2.0 PRODUCTS

2.1 MATERIALS

.1 All materials to be subject to Engineer's approval.

.2 Grading of granular materials to show no marked fluctuations between opposite ends of extreme limits.

.3 Type 1 Fill: Clean crushed gravel composed of sound, hard particles free from frozen material, flaky particles, soft shale, organic matter, or foreign matter, to meet the following requirements:

Sieve Size (mm)	Percent Passing (by weight)
25.0	100
10.0	30 - 77
5.0	15 - 55
1.250	0 - 30
0.080	0 - 12

.4 Type 2 Fill: Pit run gravel composed of sound, hard particles free from frozen material, flaky particles, soft shale, organic matter, or foreign matter, to meet the following requirements:

Sieve Size (mm)	Percent Passing (by weight)
125.0	100
50.0	55 - 100
25.0	38 - 100
16.0	32 - 85
5.0	20 - 65
0.315	6 - 30
0.080	2 - 15

.5 Type 3 Fill: Clean, natural river or bank sand, free from frozen material, silt, clay, loam, friable or soluble materials, and vegetable matter, to meet the following requirements:

Sieve Size (mm)	Percent Passing (by weight)
10.0	100
5.0	95 - 100
2.5	80 - 100
1.25	50 - 90
0.630	25 - 65
0.315	10 - 35
0.160	2 – 10

.6 Type 4 Fill: Excavated earth free from frozen material, roots, rocks larger than 75 mm in size, and building debris and organic material. Fill under landscaped areas to be free from alkali, salt, petroleum products, and other materials detrimental to plant growth. Use subsoil excavated from site only if approved by Engineer.

.7 Type 5 Fill: Imported earth free from frozen material, roots, rocks larger than 75 mm in size, approved by the Engineer.

2.2 STOCKPILING

Stockpile fill materials in areas designated by Engineer. Stockpile granular materials in manner to prevent segregation.

Protect fill materials from contamination.

3.0 EXECUTION

3.1 EXCAVATING

.1 Excavate to expose existing pipelines as indicated for installation, construction, and inspection of work specified.

.2 Excavate to well-defined lines to minimize quantity of fill material required.

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

.4 When complete, the Engineer shall inspect excavations to verify soil bearing capacity, depths, and dimensions.

.5 Correct unauthorized excavation or over-excavation at no extra cost as follows:

.6 Fill under areas with Type 1 fill compacted to 95% SPDD.

.7 Excavate trenches to lines and grade shown, to a minimum of 150 mm below underside of pipe. Provide recesses for bell and spigot pipe to ensure bearing will occur along barrel of pipe.

.8 Cut trenches 300 mm wider than maximum pipe diameter. Trim and shape trench bottoms, and leave free of irregularities, lumps, or projects to give uniform and even bearing for length of pipe.

3.2 BACKFILLING

.1 Do not commence backfilling until areas of work to be backfilled have been inspected by the Engineer.

.2 Areas to be backfilled shall be free from debris, snow, ice water or frozen ground. Backfill material shall not be frozen or contain ice, snow or debris.

.3 Place and compact fill materials in continuous horizontal layers, not exceeding 200 mm loose depth or 150 mm compacted depth.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures, use extreme caution during backfill operations. Maximum unbalanced earth elevations against foundations to be 300 mm, unless noted otherwise. Shore as required. Shoring to be the responsibility of the Contractor.

.5 If, during progress of work, tests indicate fills do not meet specified requirements, remove defective fills, replace, and retest at no extra cost.

3.3 FILL TYPES AND COMPACTION

.1 Underground Services:

.1 Pipe Bedding and Immediate Protection Cover: Bed pipe on a 150 mm layer of Type 3 fill. Place immediate cover of Type 3 fill for the full trench width, in layers not exceeding 150 mm to a point at least 80 mm above the crown of the pipe. Compact cover to 95% SPDD.

.2 Fill Above Protective Cover: Fill to sub-grade level using Type 2 fill or Type 4 fill (if approved).

.3 Compaction: Compact bedding and immediate protective cover to 95% SPDD. In areas within buildings, compact remainder of fill to 97% SPDD. Where paving and walks occur, compact remainder of fill to 95% SPDD. In other areas, compact remainder of fill to 95% SPDD.

3.4 SURPLUS MATERIAL

.1 Remove from the site and dispose of surplus or unsuitable material not required for backfill or grading.

3.5 DEWATERING

.1 Keep excavations dry at all stages of construction.

.2 If trenches are used, ensure that trench excavation does not interfere with or weaken footing bearing surfaces.

END OF SECTION 02221