

Section 1
Earthworks

I. SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment, plant and other facilities and perform all work necessary to complete the preparation of site excavation, filling and grading in strict compliance with the applicable drawings and as specified herein.

II. COMPACTION TEST

When backfill is required to be compacted to a specified density test for compliance may be made by at the expense of PPA, using the test procedure specified in “Methods of Test for Moisture-Density Relations of Soils, using a 10 lb. Hammer and 18-in Drop” (ASTM D 1557) modified to use with the test procedure specified in “Methods of Test for Density of Soil in Place by the Sand Cone Method” (ASTM D 1556); or, by the Ballon Method.

III. EXCAVATION

General – Except when otherwise provided excavation shall include removal of all materials and whatever encountered, including all obstructions of nature that would interfere with the proper execution and completion of work. Excavation shall conform to the lines and grades as indicated on the plans or as directed by the Engineer. Bottom of excavation shall be level and free from loose material and other unsuitable material. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The contractor shall furnish, place and maintain all supports and shoring that may be required for the sides of excavations, and all pumping, ditching, or other approved measures for the removal or exclusion of water, including taking care of storm water and waste water reaching the site of the work from any source so as to prevent damage to the work, or adjoining property. Damaged existing underground structures shall be restored to its original conditions.

The walls and faces of all excavations in which workers are exposed to danger from unstable ground shall be supported by shoring system, or other acceptable methods. The Contractor shall furnish, install and maintain shorings and bracings in such a way to protect the workers and to prevent any movement of earth which could injure workmen or delay the work or endanger adjacent properties. In excavations which workers may be required to enter, excavated and other waste material shall be effectively stockpiled at least 60 cm or more from the edge of the excavation. All excavation trenching operations shall conform to any and all national, provincial and local safety requirements.

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Excavation Beneath Proposed Structures – Unless otherwise specified for a particular structure or otherwise ordered by the Engineer, excavation shall be carried to the grade of the bottom of the footing or slab. When over-excavation is shown on the Drawings, both over-excavation and subsequent backfill to the required grade shall be performed by the Contractor at his own expense and shall be considered to include in the preparation of his bid prices. When over-excavation is not shown but is ordered by the Engineer, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established, otherwise payment will be made in accordance with negotiated prices. The exposed surface of the excavation shall be sacrificed to a depth of 15 cm brought to optimum moisture content and rolled with heavy compaction equipment to 95 percent of maximum density.

Excavation Beneath Areas to be Paved – In areas to be paved excavation under shall extend to the bottom of the aggregate base, if such base is called for otherwise, it shall extend to the paving thickness. After the required excavation has been completed, the exposed surface shall be sacrificed, brought to optimum moisture, and rolled with heavy compaction equipment to 90 percent of maximum density.

Pipeline Trench Excavation – Except where shown or ordered, excavation for pipeline shall be open cut trenches. The bottom of the trench including any shorings shall have a minimum equal to the outside diameter of the pipe plus 30 cm (12 in) and a maximum width equal to the outside diameter of the pipe plus 60 cm (24 in). The bottom of the trench shall be excavated uniform to the grade of the bottom of the pipe. The trench bottom shall be given a final trim using a string line for establishing grade, such that each pipe section when first laid will be wholly in contact with the ground or bedding along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be required. The maximum length of open trench to be permitted at any one time and in any one location shall be 305 meters or the length necessary to accommodate the quantity of pipes installed in a single day whichever is greater. Newly laid pipes shall be backfilled at least 0.15m above the top of the pipe (excluding joints) after laying. Barricades and warning lights satisfactory to the Engineer shall be provided and maintained for all trenches left open overnight except at intersections and driveways in which case, heavy steel plate, adequately braced bridge or other type of crossing capable of supporting vehicular traffic shall be furnished as directed by the Engineer.

Over-Excavation Not Ordered, specified, or Shown – Any over-excavation carried below the grade ordered, specified or shown shall be refilled by the Contractor at his own expense to the required grade with suitable selected granular material. Such material shall be moistened as required and compacted to 95 percent of maximum density under structures and 90 percent elsewhere.

Disposal of Excess Excavated Material – The Contractor shall remove and dispose excavated material at his own expense and in manner approved by the Engineer.

Excavation in Lawn Areas – Where pipeline excavation occurs in lawn areas, the sod shall be carefully removed and stockpiled to preserve it for replacement. Excavated material from the trench may be placed on the lawn provided a drop cloth or other suitable method is employed to protect the lawn from damaged. The lawn shall not remain covered for more than 72 hours. Immediately after completion of back filling and sod shall be replaced in a manner as to restore the lawn as near as possible to its original condition.

Excavation in Vicinity of Trees – Except where trees are shown “to be removed” on the Drawings, trees shall be protected from injury during construction operations and no trees is to be removed without written permission from the Engineer. No tree roots over 5 cm (2 in) in diameter shall be cut without verbal permission of the Engineer. Trees shall be supported during excavation as may be directed by the Engineer.

Rock Excavation – Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 0.25 cu.m or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which can not be removed without systematic drilling and blasting. Said rock excavation shall be performed by the Contractor at his own expense, provided that should the quantity of rock excavation be affected by any change in the scope of the work, an appropriate adjustment if the Contract price will be made under a separate additive-deducted bid item if such bid item has been established: otherwise payment or deduction in the Contract amount shall be made in accordance with a negotiated price.

IV. BACKFILL/FILL

Backfill in General – Materials used for backfill shall be selected material, free from grass, roots, brush or other vegetation, or rocks having maximum dimension larger than 15 cm (6in). Backfill shall not be dropped directly upon any structure or pipe. Material placed within 15 cm (6in) of any structure or pipe shall be free of rocks or unbroken masses of earthy materials having a maximum dimension larger than 8 cm (3.2 in). Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water-retaining sufficient shall not be placed until the structures have been tested for leakage, and the structures shall be full of water while backfilling is being placed.

Backfill around and Beneath Proposed Structures and Paved Areas – Unless otherwise specified for a particular structure or when ordered by the Engineer,

backfill placed around and beneath proposed structures and paved areas shall be placed in horizontal layers not to exceed 20 cm. in thickness, as measured before compaction where compaction is attained by means of sheepsfoot rollers. Where the use of sheepsfoot rollers is impractical, the layers shall not exceed 15 cm (6 in) in thickness before compaction, and driven tampers. The backfill shall be brought up evenly with each layer moistened and compacted by mechanical means to 95 percent of maximum density beneath proposed structures, and 90 percent of maximum density around the sides of structures and beneath proposed paved areas.

Pipeline Trench Backfill – Pipeline trenches shall be backfilled to a level 15 cm (6 in) above the top of the pipe with selected sandy material obtained from the excavation if, in the Engineer's opinion, said material is unsuitable for backfill purposes borrow material having a sand equivalent value of not less than 20 (ASTM 2419) shall be used for this portion of the trench backfill. Borrow material, when ordered by the Engineer, will be paid for under a separate unit price bid item has been established otherwise payment will be made in accordance with a negotiated price. Such material shall be compacted to 95 percent of maximum density elsewhere. Compaction shall be obtained by tamping or by using excess water and passing a concrete vibrator between the pipe and the side of the trench.

Within 4 hours after the initial portion of the backfill has been placed as specified above, the remaining of the trench shall be backfilled. The remainder of the backfill shall be placed in a horizontal layers. Each layer shall be moistened, tamped, puddle, rolled or otherwise compacted to 95 percent of maximum density elsewhere. If the backfill material is sandy or granular in nature and the trench is not located under structure, the layer construction may be eliminated, and compaction may be obtained by flooding and jetting. The remaining backfill shall be placed in layers not exceeding 90 cm in thickness. Each layer shall be flooded, jetted and rodded to secure complete saturation of the materials before placing the next layer. Prior to flooding and jetting, the pipe shall be filled with water to prevent floating.

Embankment Fill – Fill material shall consist of suitable excavated or free draining granular material as approved by the Engineer. The materials shall be free from roots, vegetables and other extraneous materials. No work shall be started until the surface to be filled has been approved by the Engineer. Base under concrete slab shall be pitrun gravel or crushed rock or other similar material as specified on the plans or as required by the Engineer and shall be thoroughly tamped before placing concrete. Fill and backfill materials shall be evenly placed and spread in layers of not more than 150 mm, and compacted by mechanical tamper or vibratory roller to a maximum density of ninety percent (90%) at optimum moisture content as determined by AASHTO T90-Method C. Areas inaccessible to mechanical tamper or vibratory roller shall be compacted with hand tampers or as directed by the Engineer. Excess materials

after completion of the work shall be disposed off by hauling the same off-site or spreading it around the perimeter of the building or as directed by the Engineer.

V. SITE IMPROVEMENT

All grading thorough the area shall be as uniform as practicable, and shall be constructed so as to readily drain water into the drainage facilities or adjacent natural drainage areas, without formation of pockets in which water will stand. Tolerances in final grading in unpaved areas shall not exceed 30 mm above or below the specified grades. The construction of pavement surface and course, curb and gutter, sidewalk, drainage structures and other facilities or utilities shall conform to the requirements as prescribed in the pertinent Items of the specification for the required work.

VI. CUTTING AND RESTORING EXISTING PAVEMENT

Pavement surfacing destroyed in connection with performing the work required under the contract shall be placed with the same kind of surfacing or better in accordance with the latest acceptable specifications at the expense of the Contractor. If a strip of existing pavement less than one meter is left between the trench and gutter, it shall be removed and new pavement placed in its stead. In cutting or breaking up pavement surfacing, the Contractor shall not use equipment which will damage the adjacent pavement. All concrete pavement surfaces to be removed shall be scored with concrete sawing equipment: provided, that any portland cement concrete base under an asphalt mix surface will not be required to be scored by sawing. Asphalt-concrete pavement shall be removed to a clean straight lines.

Concrete sidewalks, curbs and gutters required to be removed in connection with performing the work under the contract shall be cut to the nearest score marks and shall be replaced with the same kind of better materials in accordance with the latest specifications, rules and regulations, and subject to inspection and approval of the agency having injurisdiction.

Immediately after completing the backfilling of any section of pipelines in a paved area, temporary surfacing of at least 4 cm (1.6 in) in thickness, shall be placed over the backfilled trench and maintained by the Contractor at his own expense until permanent surfacing is completed. Upon completion of substantial parts of the project, but not before the pipeline is tested, the temporary resurfacing shall be replaced with permanent surfacing

VII. SLOPE STABILIZATION

Excavation or embankment slopes steeper than 3 units horizontal to 1 unit vertical shall be stabilized by sodding unless otherwise shown as directed by

the Engineer. Strips of sod not less than 30 cm (12 in) wide shall be placed along slope banks.

Sods shall be taken only from the fields not less than three (3) years old and have been previously rolled and moved at least once. Sods taken from wild field that have not been mowed will not be accepted. Sod shall be of sufficient thickness to prevent excessive breakage and shall be stripped in the largest practicable size. It shall tamped in place, properly leveled and immediately well sprinkled. All sods in poor condition after planted in place shall be removed and replaced.

Immediately after setting of grass sod, sod shall be covered with 6 mm (1/4 in) of screened top soil which has been well mixed with 450 gms (1 lb) of grass seed per sq.m. (1,076 sq.ft.). Sod shall be watered frequently until it is in growing condition. Watering, cutting, reseeding shall continue until acceptance of the work.