



Part 1 General

1.1 DESCRIPTION OF WORK

- .1 The work described herein shall consist of the excavation of trenches (or excavation of tunnels); the supply and placing of bedding and backfill materials; the disposal of all surplus and unsuitable materials; and the restoration of the site.
- .2 The work shall also include shoring and other protective works including cages necessary for and incidental to the safe and proper execution of the work as well as drainage and dewatering of all excavations.

1.2 CLASSIFICATION OF WORK

.1 COMMON EXCAVATION, BEDDING AND BACKFILLING

Shall be classified as follows:

- .1 Common Excavation
 - .1 Common Excavation shall include all excavation of clay, silt, sand, gravel, hard-pan, earth, roots, rubble, water, ice, snow, shale, cobbles, boulders (less than one cubic metre), asphalt, concrete pavement, existing underground and surface utilities and works, and any other obstacles which may be encountered, excepting bedrock excavation as defined herein.
 - .2 Common excavation shall include all necessary dewatering.
- .2 Bedding
 - .1 There are four classes of bedding, Class "A", "B", "C", and "D", as shown in the Standard Construction Drawings Appendix.
 - .2 Unless otherwise specified in Section 01 00 10, Special Provisions, pipe shall be bedded on Class "C" bedding, except uninsulated copper water service pipe, which shall be bedded in Class "D" bedding.
- .3 Backfill
 - .1 There are four classes of backfill for open cut trenches, namely Common, Compacted Common, Compacted Select Granular Backfill and Unshrinkable Backfill.
 - .2 Unless otherwise specified herein or in Section 01 00 10, Special Provisions, the Contractor shall use Common Backfill.

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.2 BEDROCK EXCAVATION

- .1 Bedrock excavation shall be defined as the breaking down and removal of solid bedrock, consolidated glacial till or hardpan, or boulders in excess of 1 m³ which cannot be removed by means of heavy duty mechanical excavating equipment having a 0.95 to 1.15 m³ bucket.
- .2 Bedrock excavation shall include all necessary de-watering. Excavation of frozen material is not classified as rock excavation.

1.3 STANDARDS

- .1 The following organization publish Standards which have been referred to in this Section
 - .1 CSA International
178 Rexdale Boulevard
Etobicoke, ON M9W 1R3
 - .2 ASTM: - American Society for Testing and Materials
100 Barr Harbor Drive
West Conshohocken PA 19428-2959 USA
 - .3 Manitoba Workplace Safety and Health Act and Regulations

The Standards referred to shall be the most recent edition.

1.4 REFERENCED STANDARD DETAILS

- .1 SD-02 Typical Pipe Bedding Detail

1.5 QUALITY ASSURANCE

- .1 TESTS
 - .1 The Engineer shall carry out such tests on the gradation of bedding sand and backfill materials as he considers necessary in accordance with CSA Standard A23.2.2, Test for Sieve Analysis of Fine and Coarse Aggregate.
- .2 BLASTING

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- .1 Blasting shall be executed by persons who are licensed for such work by the Manitoba Department of Labour. Blasting shall be executed in accordance with all applicable regulations.

1.6 JOB CONDITIONS

.1 CROSSING HIGHWAYS, RAILWAYS AND WATERWAYS

- .1 Where it is required to construct pipelines through paved roads under the jurisdiction of the Province of Manitoba and under railways, the Contractor shall construct the pipeline in accordance with Section 02 70 70, "Highway, Railway, Roadway and Utility Crossings".
- .2 Where it is required to construct pipelines across waterways, the Contractor shall construct the crossing in accordance with Section 02 70 80, "Watercourse Crossings".

.2 OBSTRUCTIONS PROHIBITED

- .1 Hydrants under pressure, valve boxes, curb stop boxes and other existing utility controls shall be unobstructed and accessible during the construction period.

.3 DISRUPTIONS OF SERVICES

- .1 No valve, switch or other control on an existing utility system shall be operated for any purpose by the Contractor without the approval of the Engineer and the respective Utility.
- .2 At least 12 hours prior to the disruption, all affected consumers shall be notified by the Contractor in a manner as directed by the Engineer and the Utility, and advised of the probable time when service will be restored.

.4 EXISTING WORKS

- .1 Prior to the commencement of construction, the Contractor shall inspect the site and examine all available records and contact all relevant utilities to determine the location of all existing surface and underground works.
- .2 The Contractor shall provide temporary support, adequate protection and maintenance of all existing works, such as surface and underground utilities and structures, which may be encountered in the progress of the work.
- .3 Where the proposed grade, alignment or location of the work covered by the Contract cannot be altered but is obstructed by existing works, the

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obstruction shall be permanently supported, relocated, removed or reconstructed by the Contractor in cooperation with the Owner of such utilities or by the Owner of the utility if the Owner chooses.

.5 PAVEMENT

- .1 Where it is required to install works under existing oiled surface, asphalt or concrete pavement (including roads, driveways and sidewalks) by means of an open cut trench, the Contractor shall saw cut the pavement to ensure that when the trench is excavated, the excavated portion of the pavement breaks cleanly away from the portion of the pavement which is not to be disturbed.
- .2 When it is required to install works under gravelled roads or driveways, the gravel shall be removed from the road surface prior to excavation, stockpiled, and replaced subsequent to backfilling. The trench shall be excavated with vertical walls.
- .3 The Contractor shall not permit the width of the trench to exceed the dimensions specified in Clause 3.2 and 3.3 of this Section. Any damage to pavement beyond the allowed trench width (overbreak) shall be restored to the original condition by the Contractor at his own expense.
- .4 Except as specified herein, or in Section 02 70 70, Highway, Railway, Roadway and Utility Crossings, or in Section 01 00 10, Special Provisions, the Contractor shall not be required to replace asphalt or concrete pavement or sidewalks. The Contractor shall backfill trenches through pavement, roads and driveways with compacted select granular material, unless specified otherwise in Section 01 00 10, Special Provisions.
- .5 The Contractor may, at their option and subject to the approval of the Engineer, use tunnelling methods to reduce the damage (and hence the amount of restoration required) to roads.

.6 CULVERTS

- .1 The Contractor shall take all necessary precautions to avoid damaging existing culverts.
- .2 Where existing culverts must be removed in the course of construction, the Contractor shall salvage the existing culverts and reinstall them in their original location and elevation.
- .3 Where in the opinion of the Engineer, the existing culvert is not salvageable, the Contractor shall dispose of the culvert in accordance with "Disposal of Surplus and Unsuitable Materials" (Clause 3.12 of this

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Section), and the Contractor shall be required to install a new culvert in accordance with Section 02 53 60, Placing Pipe Culverts and Pipe Arches in place of the original, the supply of which shall be by the Owner.

.7 GRADING AND SEEDING

.1 The Contractor shall restore all areas affected by the construction to original grade and condition, and in accordance with elevations shown on the plans, or as specified in Section 01 00 10, Special Provisions. Areas shall be re-seeded with grass as per Section 02 48 60, Seeding.

.8 SETTLEMENT

.1 The Contractor shall assume responsibility to correct settlement of trenches for a period defined in General Conditions Section 12 or as otherwise directed by the Engineer.

1.7 INSPECTION

.1 Inspection of the work described in this Section shall be performed by the Engineer. Inspection shall be required before any pipe is placed in the bottom of the trench.

Part 2 Products

2.1 BEDDING SAND

.1 Bedding sand for Class "B" Bedding installation shall be dry, unfrozen, fine granular material all of which passes through a 9.5 mm sieve, and not more than 8% of which passes through a 75 um sieve.

2.2 EXCAVATED BEDDING MATERIAL

.1 Excavated bedding material for Class "C" or "D" Bedding installation shall be unfrozen clay, silt, sand or gravelly sand excavated from the trench which shall be free from stones and hard lumps of earth larger than 10 mm in diameter or as otherwise approved by the Engineer. If the material excavated from the trench cannot meet this Clause and is not approved otherwise by the Engineer, Bedding Sand shall be used in its place.

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2.3 CONCRETE BEDDING

- .1 Concrete for Class "A" bedding installation and where required for tunnel backfill shall have a 28 day compressive strength of 15 MPa. Cement used in concrete shall be sulphate resistant meeting CAN 3-A23.1, Portland Cement, Type 50.

2.4 BACKFILL

.1 COMMON BACKFILL

Common backfill shall consist of unfrozen material excavated from the trench with no lumps or stones exceeding 150 mm in diameter.

.2 COMPACTED COMMON BACKFILL

Compacted common backfill shall consist of unfrozen material excavated from the trench with no lumps or stones exceeding 150 mm in diameter

.3 COMPACTED SELECT GRANULAR BACKFILL

Compacted select granular backfill shall consist of a dry, uniform granular material conforming to the following gradation:

75mm	-	100% passing
25mm	-	80% - 100% passing
4.75mm	-	40% - 70% passing
75um	-	0% - 15% passing

.4 UNSHRINKABLE BACKFILL

.1 DRY

- .1 Unshrinkable backfill shall consist of a mixture of dry, unfrozen, blended concrete aggregate and cement in a ratio of 30 kg of cement per cubic metre of aggregate.

.2 WET

- .1 Unshrinkable backfill (Filcrete) shall consist of fine aggregate, water and 30 kilograms of cement per cubic metre of aggregate.

Part 3 Execution

3.1 ALIGNMENT

- .1 The trench or tunnel centre line shall follow the line and grades staked out by the Engineer. The trench or tunnel centre line shall not deviate from the required

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alignment by more than 100 mm. Where a profile of the proposed pipeline is provided, and where elevations are given on the stakes, the pipe shall be installed within 25 mm of the required elevations. When the pipe installation is a gravity sewer main the pipe shall be installed within 12 mm of the required elevation. In cases where no profile of the proposed pipe is provided, the plans or specifications shall specify a minimum depth of cover for the pipe. In cases where the pipe crosses a road or driveway, the pipe shall be laid at a uniform gradient between the elevations of the pipe on either side of the road or driveway.

3.2 TRENCH EXCAVATION

- .1 The excavation of trenches shall be carried out in accordance with the plans and specifications and as staked out on the ground by the Engineer. Where in the opinion of the Engineer, the subgrade is found to be unstable, unsuitable material shall be removed and replaced with approved materials. Trench walls shall be kept vertical from the bottom to 300 mm above the top of the pipe. The trench width in this section shall be not less than twice the outside diameter of the pipe and not greater than 900 mm (or, in the case of PVC "Series" Pipe, twice the outside diameter) plus the outside diameter of the pipe. The minimum clear width shall be available between any shoring or bracing that is required. The trench shall not be open more than 30 m ahead of or behind the pipe-laying operations, unless otherwise directed by the Engineer.
- .2 Where excavation is made in bedrock, or where excavation is made in a material which cannot provide an even, uniform and smooth surface, or where large boulders are encountered in the trench, such material shall be removed to provide a clear distance between any part or projection of such material and the surface of all pipe and fittings of not less than 150 mm for 600 mm O.D. pipe or less and 225 mm for pipe having an O.D. greater than 600 mm. The trench bottom shall be brought to proper elevation (to receive bedding material) by backfilling with compacted granular backfill material or as approved by the Engineer

3.3 TRENCH WALLS

- .1 Trench walls located 300 mm above the top of the pipe shall be excavated with side slopes consistent with the stability of the soil and consistent with the current Manitoba Workplace Safety and Health Regulations. Where excavation of side slopes is not possible due to limitations on available right-of-way, existing utilities, structures, roads, pavements or other works, then the trench shall be excavated with walls as nearly vertical as possible, and with shoring or bracing, where required to prevent falling, slipping or caving in of the trenches. Bracing and shoring shall be constructed at the Contractor's expense and in accordance

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with the current Manitoba Workplace Safety and Health Regulations. Placing and removal of shoring, bracing, sheet piling or cages shall be undertaken in a manner that permits proper backfilling.

3.4 BEDROCK EXCAVATION

- .1 Bedrock shall be removed by blasting or by mechanical means.
- .2 Rock blasting to be carried out in accordance with the Manitoba Workplace Safety and Health Regulations and the Federal Explosives Act regarding storage, handling and use of explosives and shall take all necessary safety precautions. A certified blaster shall be retained who is qualified to handle and use explosives to supervise preparations, precautions and perform rock blasting operations.
- .3 The Contractor shall use protective mats and other methods as required to maintain safety during blasting operations.
- .4 Excavated rock bed to be level, sound, free of any rocks or fragments, earth or debris which would be detrimental to pipe installation or finished road cross section.
- .5 Remove boulders and fragments which may slide or roll into excavated areas.
- .6 Loose rock shall be excavated by normal open trench methods. Excavated rock shall not be used for backfill.
- .7 Correct unauthorized rock removal at no extra cost, in accordance with backfilling requirements.

3.5 DEWATERING

- .1 The bottom of the excavation shall be maintained in a condition to permit the proper installation of the pipe. The installed pipe 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 excavation.

3.6 PIPE BEDDING

- .1 The pipe bedding shall be smooth and even to provide full support for the pipe invert, with cavities provided for flanges, couplings, sleeves or bells.
 - .1 **CLASS "A"**
 - .1 Concrete shall be placed in the trench such that the pipe is supported along its entire length by a layer of concrete. Concrete shall be placed as shown on the plans and as directed by the Engineer. The concrete shall be allowed to cure for no less than

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three hours prior to backfilling. The pipe shall be backfilled with bedding material approved by the Engineer to a depth not less than 200 mm above the top of the pipe.

.2 CLASS "B"

- .1 Bedding sand shall be placed and thoroughly compacted in the trench such that the pipe is supported along its entire length (and under bells and flanges) by a layer of sand, the thickness of which shall be no less than 100 mm. Additional bedding sand shall be placed and compacted around the pipe and to 200 mm above the top of the pipe for the entire width of the trench.

.3 CLASS "C"

- .1 Excavated bedding material shall be placed and thoroughly compacted the entire width of the trench such that the pipe is supported along its entire length (and under bells and flanges) by a layer of compacted excavated bedding material the thickness of which shall be no less than 100 mm.
- .2 Excavated bedding material shall be placed and compacted around the pipe and to 200 mm above the top of the pipe for the entire width of the trench.

.4 CLASS "D"

- .1 The bottom of the trench shall be smooth, such that the pipe is supported along its entire length with cavities provided for flanges, couplings, sleeves or bells of the pipe. Excavated bedding material shall be placed around and to 200 mm above the top of the pipe for the entire width of the trench.

3.7 RURAL PRESSURE PIPELINE BEDDING

- .1 The Contractor may intend to use a backhoe rather than a trencher or plough to construct the work. The Contractor shall note that Class "B" bedding in accordance with this Section shall be required for all pipeline installation performed with a backhoe to the requirements of Section 02 70 60, Pressure pipelines.
- .2 The Engineer may approve the excavated materials to be used for pipe bedding provided that the bedding material is in conformance with Part 2.2 of this Section.
- .3 The Contractor shall use Class "D" bedding in accordance with this Section for all pipeline installation performed with a trencher or plough to the requirements of

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Section 02 70 60, Pressure Pipelines, and in accordance with the pipe manufacturer's recommendations.

3.8 BACKFILL

.1 COMMON BACKFILL

.1 The trench shall be backfilled with common backfill material to the top of the trench. The backfill material shall be consolidated with the wheels or tracks of excavating or grading equipment. The backfilled trench shall be left in a slightly mounded condition to minimize the effects of settlement.

.2 COMPACTED COMMON BACKFILL

.1 Compacted common backfill shall be placed in layers no greater than 300 mm thick. Each layer shall be compacted by mechanical means to a density equivalent to that of the surrounding in-situ material.

.3 COMPACTED SELECT GRANULAR BACKFILL

.1 Where this class of backfill is specified, the trench shall be backfilled entirely with select granular backfill material placed in layers no greater than 150 mm thick and compacted to 98% of maximum Standard Proctor Dry Density (ASTM D698).

.4 UNSHRINKABLE BACKFILL

.1 Where dry unshrinkable backfill is specified, the trench shall be backfilled entirely with unshrinkable backfill material, placed in layers no greater than 150 mm thick, and compacted to 98% of maximum Standard Proctor Dry Density (ASTM D698).

.2 Where wet unshrinkable backfill is used i.e. Filcrete, it shall be poured in place from a concrete truck.

3.9 TUNNELLING (CORING, PUSHING, or DIRECTIONAL BORING)

.1 If specified in Section 01 00 10, Special Provisions, the Contractor shall install pipe by pushing, coring or by directional boring instead of by means of open cut trenching. For coring or pushing at each end of the proposed tunnel, the Contractor shall excavate pits such that adequate space is allowed around the proposed tunnel openings for the equipment to construct the tunnel at the required elevation and grade. Tunnels shall be straight. For directional boring the Contractor shall maintain and provide to the Engineer in an acceptable format an accurate record of the installed pipe elevation, grade and location at identified drill sections by continuously tracking and recording the location of the bore

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head. The method of tunnelling shall be subject to the prior approval of the Engineer. Excavated pits shall be backfilled in the same manner as required for open trench pipe backfill installation. Where the pit bottom at subgrade is found to be unstable, the unstable material shall be removed and replaced with compacted granular backfill or as required by the Engineer.

3.10 REMOVAL OF BRACING

- .1 Whenever shoring, sheeting, timbering and bracing of excavations is required it shall comply to all applicable safety regulations, provide safe access and egress to the area and permit placing and tamping of bedding material under and around piping. The Contractor shall remove all bracing or shoring slowly and uniformly, keeping pace with backfilling so that the trench wall does not collapse.

3.11 PREFABRICATED CAGES AND SHIELDS

- .1 Whenever prefabricated cages or shields are used they shall comply with all Manitoba Workplace Safety and Health Regulations, provide safe access and egress to and from the cage and permit placing and tamping of bedding material under and around piping.
- .2 The Contractor shall provide safe access and egress to and from the cage or the trench to permit the Engineer to view pipe installations at all times. This includes ramps as required to access the cage or trench.

3.12 DISPOSAL OF SURPLUS AND UNSUITABLE MATERIALS

- .1 Surplus excavated material and material which is unsuitable for backfill shall be hauled to, stockpiled or spread at locations approved by the Engineer. Such locations shall not be greater than two kilometres away from the point of excavation. In the event that such material is required to be hauled more than two kilometres, the Contractor shall be compensated for the overhaul on the basis of Extra Work in accordance with the General Conditions attached hereto, or as specified in Section 01 00 10, Special Provisions.

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