

1. GENERAL

1.1 RELATED WORK

- .1 Section 31 32 19 – Geosynthetics.
- .2 Section 32 11 23 – Granular Base.
- .3 Section 32 91 19 – Topsoil Placement and Grading.
- .4 Section 33 42 13 – Culverts.

1.2 DEFINITIONS

- .1 Trench Excavation:
 - .1 Excavation with sidewalls open from the ground surface to the full depth of the pipe to be installed.
- .2 Topsoil Stripping:
 - .1 Excavation and stockpiling, or excavation and removal and disposal, of material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping, and will typically include topsoil, peat or other organic matter such as grasses, sod, shrubs, and other vegetative matter.
- .3 Rock Excavation:
 - .1 Excavation of material from solid masses of igneous, sedimentary, or metamorphic rock which, prior to its removal, was integral with its parent mass, or excavation of boulders or rock fragments having an individual volume in excess of one cubic metre (1m³). Soft or disintegrated rock, concrete or masonry that can be removed with power operated excavator or shovel and loose, shaken or previously blasted rock will not be classified as rock excavation.
- .4 Common Excavation:
 - .1 Excavation of material of whatever nature that are not included under definitions of topsoil stripping and rock excavation, including clay, silt, sand, dense tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with heavy construction equipment.
- .5 Native Fill Material:
 - .1 Approved select material from the trench excavation free from large boulders, large roots, stumps, organics and other debris, within an acceptable moisture content to allow the required compaction standards to be achieved.
- .6 Imported Fill (Borrow) Material:
 - .1 Approved suitable select clay material free of silt, organic matter, rock, roots, stumps and other debris imported to replace excavated material deemed unsuitable for use in backfilling. The imported backfill material must be moisture conditioned to be within ±3% of the optimum moisture content.

- .7 Granular Fill:
 - .1 Clean, hard, durable uniformly graded crushed gravel or stone, free from clay lumps, silt, shale, cementation, organic matter, frozen material and other deleterious matter. Gradations are to be within the limits specified when tested to ASTM C136 giving a smooth curve without sharp breaks when plotted on a semi-log grading chart.
- .8 Pipe Zone Material:
 - .1 That portion of the trench between the pipe bedding and a level at least 300mm above the top of the installed pipe.
- .9 Waste Material:
 - .1 Excavated material determined by the Engineer to be unsuitable for use in the Work or is surplus to the requirements of the Work. This includes excess material generated during the installation of underground municipal utilities, not limited to water mains, sanitary sewer and storm sewer mains, catch basins, manholes, and pipe zone material.

1.3 COMPLIANCE REQUIREMENTS

- .1 Contractors are required to comply with applicable legislation, regulations, acts, codes, and policies, including, but not limited to the Alberta and Saskatchewan Occupational Health and Safety, Worker's Compensation Board Standards, industry standards, and municipal requirements while completing excavation, trenching and backfilling operations.
- .2 In any case of conflict or discrepancy, the higher standard shall apply.

1.4 MEASUREMENT AND PAYMENT

- .1 Excavation, Trenching and Compacted Native Backfill:
 - .1 Payment for excavation, trenching and compacted native backfill material for various types of mains will be made at the unit price per linear metre of pipe installed at various depth ranges, as shown in the Bid Forms.
 - .2 Depth ranges shall be determined from the original ground surface at the pipe centreline to the top of the pressure pipe or invert of the gravity sewer pipe and calculated from a profile drawn from measurements taken every 20m when grade stakes are being set.
 - .3 The unit price shall include all materials, tools, equipment, labour and supervision as well as excavation, trenching, stockpiling, shoring, removal of existing pipelines and fixtures (if required), disconnection of services, trench bottom preparation, dewatering, backfilling and compaction, clean-up, and all other related work.
- .2 Over-excavation and Placement of Granular Fill:
 - .1 Payment for over-excavation and placement of granular fill material will be made at the unit price per cubic metre, as shown in the Bid Forms. Differential will not be made for various depth ranges. The volume of granular fill for payment will be calculated on the basis of the nominal trench width as shown on the Drawings and the depth of compacted base gravel measured vertically from the bottom of the pipe bedding to the bottom of the over-excavated trench at 3m intervals along the centreline of the trench. In the event that the over-excavated material cannot be

- accurately measured by the Engineer through survey or other means, payment based upon the cubic metre of hauled material, divided by a factor of 1.30, will be made.
- .2 The unit price shall include the supply of all materials labour, supervision, and equipment required to over-excavate, including loading, hauling, and disposal of the unsuitable material, the supply, placement and compaction of the specified granular fill material, bracing and sheeting as may be required and all other tasks related to or deemed incidental to the over-excavation and placement of the granular fill material.
 - .3 Payment for this work will only be made when, in the opinion of the Engineer, it is necessitated by the natural existence of an unsatisfactory soil condition. No payment will be made for this work when these conditions have resulted from acts, neglects, or delays of the Contractor.
- .3 Over-excavation and Placement of Imported Backfill:
- .1 Payment for over-excavation and placement of imported backfill material will be made at the unit price per cubic metre, as shown in the Bid Forms. Differential will not be made for various depth ranges. The volume of imported backfill for payment will be calculated on the basis of the nominal trench width dimension combined with the depth of compacted imported backfill and its length measured along the pipeline installed. In the event that the over-excavated material cannot be accurately measured by the Engineer through survey or other means, payment based upon the cubic metre of hauled material, divided by a factor of 1.30, will be made.
 - .2 The unit price shall include the supply of all materials labour, supervision, and equipment required to over-excavate, including loading, hauling, and disposal of the unsuitable material, the supply, placement and compaction of the specified imported backfill material, bracing and sheeting as may be required and all other tasks related to or deemed incidental to the over-excavation and placement of the imported backfill material.
 - .3 Payment for this work will only be made when, in the opinion of the Engineer, it is necessitated by the natural existence of an unsatisfactory soil condition. No payment will be made for this work when these conditions have resulted from acts, neglects, or delays of the Contractor.
- .4 Excess/Waste Material:
- .1 The removal of excess/waste material generated during the installation of underground municipal utilities (water mains, sanitary sewer and storm sewer mains, catch basins, manholes, etc.) shall be disposed of by the Contractor. All costs associated with loading, hauling, and disposing of the excess/waste material shall be included in the appropriate unit price. No separate payment will be made due the Contractor for the disposal of such material.
- .5 Rock Excavation:
- .1 Payment for rock excavations will be made at the unit price per cubic metre shown in the Bid Form. The nominal trench width will be used as the governing dimension combined with the depth of rock, from rock surface to 150mm below pipe depth and its length measured along the pipe to be installed. The unit price shall also include blasting (if required), loading, hauling, and disposal of the rock material.

- .6 Pavement Structure Replacement:
 - .1 Payment for the replacement of pavement structure will be made at the unit price per square metre shown in the Bid Form. The price shall include the supply of all material, labour, supervision, and equipment required to complete the sub-grade preparation, and the supply and replacement of the granular base course, asphalt concrete pavement and prime coat and all other related tasks.

- .7 Surfacing Gravel:
 - .1 Payment for surfacing gravel will be made at the unit price per cubic metre shown in the Bid Form. The volume shall be as measured compacted in place. The price shall include the supply of all material, labour, supervision, and equipment required to complete the sub-grade preparation, and the supply and replacement of the granular base course and all other related tasks.

- .8 Stripping, Stockpiling and Re-spreading Topsoil:
 - .1 Payment for stripping, stockpiling and re-spreading topsoil as specified will be made at the unit price per square metre shown in the Bid Form. The unit price shall include all material, labour, supervision, and equipment to satisfactorily complete the stripping of the topsoil, hauling the topsoil to stockpile site(s) from the areas to be stripped, stockpiling, and re-spreading of the topsoil from the stockpile when trenching operations have been completed.

- .9 On-Site Material Handling and Material Storage
 - .1 The Contractor will be responsible for all costs associated with stockpiling, handling, cycling, and managing all material generated during the execution of the Work. The Contractor shall supply all tools, equipment, labour and supervision required to stockpile the material generated during the trenching, excavation, and backfilling stages of the Work, and manage this material accordingly to maintain the construction schedule. It is understood by the Owner and the Engineer that the Contractor has reviewed the site conditions in conjunction with the scope of work and applicable Occupational Health and Safety regulations and has included such costs associated with the stockpiling, handling, and cycling of all material generated on site within the unit prices within the Bid Forms. There will be no separate payment made due to the Contractor for stockpiling, handling, cycling, and managing material generated during the execution of the Work as this has been deemed incidental to the Work. If such material is to be hauled off site and then returned to site due to site constraints identified by the Contractor, the Contractor shall make all necessary arrangements to load, haul, stockpile, and import the material back to the site at the Contractors sole expense.
 - .2 No separate payment will be made due to the Contractor for completing common excavation embankment of suitable backfill material from one area of the project site to the other as this material handling and management has been deemed incidental to the Work.

2. PRODUCTS

2.1 BASE GRAVEL

- .1 Base gravel shall be placed in accordance with Section 32 11 23 – Granular Base.

2.2 BACKFILL

.1 Native Backfill

- .1 Native backfill shall consist of select soils native to the trench excavation, unfrozen and free from cinders, ashes, organics, sods, refuse and other deleterious matter and suitable for backfilling to the required compaction densities; maximum size of rock shall be 100mm; natural water content shall be within $\pm 5\%$ of the optimum moisture content.

.2 Granular Backfill

- .1 Granular backfill shall consist of a well graded granular material comprised of hard, durable uncoated particles, free from clay lumps, cementation, organic and other objectionable matter which contains no rocks larger than 50mm in any dimension. Granular backfill shall meet the following gradation when tested to ASTM C136 and ASTM C117:

Sieve Designation	% Passing
60mm	100
16mm	32-85
5mm	20-65
0.315mm	6-30
0.080mm	2-10

.3 Fillcrete

- .1 Fillcrete may be used in lieu of granular backfill. This consists of non-shrinking fill made up of a mixture of Portland cement, sand, water and admixtures conforming to the following:

Minimum 28 day compressive strength	1.00 to 2.00 MPa
Slump	100mm +/-25mm
Portland Cement	Type HS
Air entrainment	5% +/-1%

2.3 GEOSYNTHETICS

- .1 Geosynthetic material shall be in accordance with Section 31 32 19 – Geosynthetics.

2.4 TOPSOIL

- .1 Placed in accordance with Section 32 91 19 – Topsoil Placement and Grading.

3. EXECUTION

3.1 STRIPPING AND STOCKPILING TOPSOIL

- .1 Prior to trenching, the entire trench width plus the area to be occupied by the backfill spoil pile shall be stripped of all topsoil, and the topsoil material stockpiled such that it will not become mixed with the excavated subsoil material. Topsoil shall be stockpiled on designated topsoil stockpile sites.

3.2 TRENCHING ALIGNMENT AND DEPTH

- .1 The trench shall be excavated so that pipe can be laid to the established alignment and depth with allowance made for specified trench wall clearance and bedding as required.
- .2 Prior to excavation of the trench, the Engineer will establish the location at which the pipe shall be installed by setting stakes at 20m intervals along a line offset from the center of the proposed pipe.
- .3 Where pipe is to be installed to a predetermined grade, the Contractor will be provided with a cut sheet showing the depth to the pipe invert or to the top of the pipe relative to the grade stake at the respective locations along the pipeline.

3.3 TRENCHING AND BACKFILLING EQUIPMENT

- .1 Mechanical trenching and backfilling equipment may be used except where shown on the Drawings. In these areas, trenches shall be hand excavated and backfilled.

3.4 CAUTION IN EXCAVATION

- .1 Trenches shall be excavated only as far in advance of the pipe laying operation as safety, traffic, and weather conditions permit. Caution shall be exercised with respect to structures, piping, or other manmade obstacles that may exist within the working area and due consideration given to the protection and support of such properties and structures.

3.5 OPEN TRENCHES

- .1 The amount of open trench for pipes and appurtenances that is not backfilled for each trenching or excavating machine shall not exceed 30m for mainline trenches. The Contractor may only exceed the above limits following a written request to and upon receipt of written approval from the Engineer.
- .2 If the Contractor fails to meet the above requirements, the Engineer may instruct the Contractor to stop trenching until backfill operations have reduced the amount of open trench to less than that specified above.

3.6 PILING TRENCH MATERIAL

- .1 Excavated trench material may be piled in a spoil pile alongside the trench, provided the near edge of the piled excavated material is maintained a minimum of one (1) metre away from the edge of the trench, and provided the working space is adequate for this

purpose, and provided that by so doing the backfill material does not spill onto private properties adjacent to the line of the trench, thereby disturbing fences, buildings, shrubs, lawns, or other items of value.

- .2 Piling of excavated material along the trench shall not unduly restrict cross traffic at road intersections. Material shall be cleared from road intersections and provision made for use of the cross road by traffic as soon as possible after the excavation has taken place. Pedestrian traffic to individual properties shall be maintained at all times. Roadways, driveways, and drainage facilities shall not be blocked unnecessarily. The spoil pile shall be located such that hindrance to local traffic is minimal.
- .3 In order that excavated material may be piled along the trench, roads may be temporarily closed off to traffic provided that adequate detour traffic routes can be established to move traffic around the construction area, and provided also that street entrances to driveways are not blocked from vehicular traffic for periods in excess of one day. The Contractor shall obtain a Road Closure Permit prior to obstructing traffic, and the route used by traffic shall be as identified in the approved Traffic Accommodation Strategy.
- .4 Where excavated material cannot be piled along the trench in compliance with the above restrictions, it shall be hauled to locations where backfilling is taking place or hauled to a stockpile for return to the trench at the time of backfilling. Alternately, excavated material shall be disposed of and replaced with approved material at the time of backfilling.

3.7 TRENCH WIDTH

- .1 The width of the trench at the bottom shall be such as to permit the pipe to be laid, jointed, bedded, and backfilled, all in accordance with the applicable Specifications of this Contract.
- .2 For pipes 525mm in diameter or smaller, the maximum trench width shall be 900mm.
- .3 Trench walls shall be of such extra width where required to permit the placing of timber supports, shoring, bracing, or the handling of special items.
- .4 Ledge rock, boulders and large stones shall be removed to provide a clearance of at least 150 mm below and on all sides of pipes and fittings.
- .5 Should the Contractor desire to use a wider trench width than that Specified, a written request is to be made to the Engineer for an alternate design. The costs for heavier wall pipe, alternative bedding conditions or any other costs related to the alternate design will be the responsibility of the Contractor.
- .6 When trench excavation involves asphalt pavement removal, the entire depth of asphalt shall be saw cut to maintain a straight and true cut face. On approval of the Engineer, the Contractor will saw cut the entire trench width and remove and dispose of the asphalt.

3.8 BRACING AND SHEETING

- .1 Trenches shall be sheeted and braced in the manner recommended by the Saskatchewan and the Alberta Departments of Labour Occupational Health and Safety Division or as designed by a professional engineer, registered in the province of the Place of Work, and hired by the Contractor. Bracing and sheeting shall be designed and constructed to protect life, property, and structures adjacent to the Work, the Work itself, and maintain trench widths within the Specified limits. Trench sheeting and bracing shall be located no closer than 250 mm to the widest section of any installed pipe.
- .2 Whenever possible, vertical trench timber or sheeting shall be placed so that it does not extend below the springline of the pipe being installed. When it is necessary to place sheeting or timber below the pipe springline, as in the case of over-excavation for trench bottom stabilization, sheeting shall be raised in a 0.6m lift and all backfill placed below the level of the pipe springline shall be thoroughly compacted on each lift to fill the void left by the raised sheeting.
- .3 Trench sheeting and bracing shall be removed where its removal will not result in damage to adjacent structures, otherwise it shall be left in place.
- .4 Where sheeting or timber is removed from a trench in which backfill is to be compacted, it shall be removed in a manner which permits compaction of the backfill in the manner Specified; otherwise it shall be left in place.

3.9 DEWATERING

- .1 Ground and surface water shall be controlled to the extent that excavation and pipe installation can proceed in the specified manner and such that the trench bottom is not disturbed to the detriment of the pipe installation. Trench water shall not be permitted to enter the pipe being installed unless approval is received from the Engineer.
- .2 The necessary pumps, well points, dewatering wells or other equipment or methods shall be employed to keep the excavation free of water. Caution shall be exercised to make sure that foundation problems with existing structures and works under construction do not result from the selected method of dewatering. Discharge from pumps, well points, or other dewatering equipment shall be located and controlled such that loss, damage, nuisance, or injury to the public does not result.
- .3 Keep the excavation free from surface water and protect against flooding or damage due to surface run-off. Material that is rendered unsuitable through the Contractor's failure to divert or control surface water from entering the trenches shall be excavated and removed as waste material and replaced with approved material compacted in 150mm lifts, all at the Contractor's expense.

3.10 TRENCH BOTTOM CONDITIONS

- .1 Trenches shall be maintained such that pipe can be installed without getting water, muck, silt, gravel, or other foreign materials into the pipe. Material remaining in the trench bottom on completion of machine excavating which has been disturbed or softened by workers or trench water shall be removed before bedding material is placed.

The trench bottom shall be firm and capable of supporting the pipe to be installed, otherwise the bottom shall be stabilized by means of over-excavation or a special foundation designed to support the pipe as hereinafter described.

- .2 Prior to placing the pipe bedding material, hand trim the bottom of the trench, taking care to remove all rocks or stones, and compact loose material to a density at a minimum equal to the density of the adjacent soil.
- .3 Place the pipe bedding material specified for the particular pipeline installation, hand trim, shape and compact to provide a uniform and continuous support for the pipe.
- .4 Notify the Engineer for inspection of the trench bottom prior to commencing pipeline installation operations.

3.11 UNSTABLE SUBGRADE

- .1 Where the subgrade of the trench is unstable or will not properly support the pipe, or where it contains materials harmful to the pipe such as ashes, cinders, refuse, vegetable or organic material, the Contractor shall excavate such material to the width, depth and length ordered by the Engineer and dispose of the material as directed. The subgrade shall then be made by backfilling with an approved stabilizing gravel compacted in 75mm layers. The finished subgrade surface shall be shaped by hand tools to provide uniform and continuous support for the pipe.
- .2 If determined by the Engineer that existing ground conditions dictate, the stabilization gravel must be completely wrapped in filter fabric. The fabric shall be overlapped a minimum of one (1) metre at all joints to provide a full, continuous wrap and shall be smooth and free of tension, stress, folds, wrinkles or creases.
- .3 Where the subgrade cannot be made to properly support the pipe by replacing unsound material with stabilizing gravel, the Contractor shall construct a foundation for the pipe in accordance with the drawing prepared at the time by the Engineer. Payment for this work shall be made in accordance with the provisions for extra work unless specified otherwise.

3.12 DISPOSAL OF MATERIAL

- .1 Surplus or unsuitable/waste material shall be removed from the Site and hauled to the designated disposal area by the Contractor at its expense, unless otherwise specified.

3.13 BACKFILL WITHIN PIPE ZONE

- .1 Bedding shall be as specified for the particular pipe installed.
- .2 Unless specified otherwise or directed by the Engineer, use Class "B" Pipe Bedding Material as illustrated in the Drawings.

3.14 PLACING BACKFILL

- .1 In order that consolidation of backfill is not hampered, trench water, if present, shall be removed prior to commencement of backfilling. To prevent damage to the installed

pipe, backfill shall be placed in the trench by rolling down a slope and not by pushing it over the edge of the trench and allowing it to drop vertically. Every effort shall be made to plan the backfilling operation such that exposure of backfill material to wet weather is kept to a minimum.

- .2 If, at any time, there is a change in the source of the backfill material, immediately notify the Engineer.

3.15 BACKFILL ABOVE PIPE ZONE

- .1 Do not commence trench backfilling operations until the Engineer has inspected the pipeline installation.
- .2 All concrete supports and thrust blocking shall be allowed to cure for a minimum of twenty-four (24) hours prior to being backfilled.
- .3 Backfilling shall be completed as soon as possible after the pipe is laid.
- .4 Sheeting and bracing shall be removed progressively as backfilling proceeds and in such a manner as to prevent voids or slips. Backfilling procedures above the pipe zone shall be carried out in accordance with the following:
 - .1 Compaction of backfill above the pipe zone shall be obtained by using approved, mechanical, power driven compactors.
 - .2 Native backfill compaction shall be carried out, with soil moisture content within $\pm 3\%$ of optimum, such that compaction to 98% of Standard Proctor Density (ASTM D698) is achieved. Backfill material shall be compacted in layers not exceeding 150mm in thickness when compacted. Material that has undergone extreme changes in moisture content during the period between excavation and backfilling operations shall not be used as backfill until the moisture content has been adjusted to satisfactory limits.
 - .3 Granular backfill compaction shall be carried out such that compaction to 100% Standard Proctor Density (ASTM D698) is achieved. Backfill material shall be compacted in layers not exceeding 150mm in thickness when compacted.
 - .4 Backfill compaction within 300mm of the subgrade elevation shall be carried out such that compaction to 100% Standard Proctor Density (ASTM D698) is achieved. Backfill material shall be compacted in layers not exceeding 150mm in thickness when compacted.
- .5 For trenches of more than 15m in length, a minimum of two (2) density tests shall be performed per 600mm of trench depth per 100m of length. The tests shall be representative of the entire length, width and depth of trench backfill, including around catch basins, manholes, valves and service connections.
- .6 For trenches of 15m in length or less, a minimum of three (3) density tests shall be performed evenly spaced through the depth of the trench. For service connection trenches, at least one (1) additional (fourth, or more) density test must be taken between the back of curb and separate walk, or between the back of monolithic walk and property line, over each service connection line within the uppermost 0.5m as measured from final finished grade.

3.16 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- .1 Excess excavated material shall be removed from the trench area at the time of backfilling. It shall be hauled to the City of Lloydminster landfill site on 40 Avenue North of 67 Street or to a designated site provided by the Contractor and approved by the Engineer. Material so disposed of shall be shaped or spread and levelled as directed by the Engineer and left in a neat and tidy condition.

3.17 RESTORATION OF WORKING AREAS

- .1 Surfaces adjacent to the trench or which otherwise have been disturbed by the trenching or backfilling operations shall be restored to a condition which is at least the equivalent of that which existed prior to construction, and shall be maintained in this condition until the project has been accepted by the Owner at the end of the warranty period.

3.18 TRENCH CLEANUP AND SURFACE MAINTENANCE

- .1 When backfilling operations are completed the construction area shall be cleaned up, shaped and graded to the satisfaction of the Engineer. Any excess material resulting from trenching operations shall be loaded and hauled to the designated disposal area as directed by the Engineer.
- .2 In areas where asphalt pavement was removed:
 - .1 The Contractor shall remove and dispose of the asphalt.
 - .2 The Contractor is responsible for replacement of removed asphalt in this Contract.
 - .3 The Contractor, upon completion of backfilling shall restore and maintain the street surface in good graveled condition as per Section 32 11 23 – Granular Base until pavement structures can be replaced.

3.19 SURFACING GRAVEL

- .1 Where indicated by the Engineer, road surfaces shall be resurfaced with gravel as per Section 32 11 23 – Granular Base upon completion of trenching, backfilling and compaction testing. The gravel shall be placed for the full width of trench at the directed thickness and material.

END OF SECTION

REVISION LOG		
DATE	REVISION	COMMENTS
03/01/2019	Addition of 1.4.9 On-Site Material Handling and Material Storage	N/A