

PART 1 - GENERAL

- 1.1 WORK INCLUDED .1 This Section specifies requirements for performing all operations necessary to complete site excavation and filling, to bring the site to subgrade elevations indicated on the Drawings.
- 1.2 RELATED WORK .1 Excavating, Trenching and Backfilling: Section 31 23 10
- .2 Granular Base: Section 32 11 00
- 1.3 PROTECTION .1 Prevent damage to trees, structures, natural features, bench marks, or surface or underground utility lines which are to remain.
- .2 Repair damage to original or better condition.
- 1.4 SITE CONDITIONS .1 A topographical survey is available in electronic format from the Departmental Representative.
- .2 Confirm geotechnical conditions existing on site are capable of supporting solid waste management facility bearing capacity requirements assumed in structural design.
- .3 Existing underground service information is provided on the Project Drawings. Locations are approximate and must be confirmed in the field prior to commencement of construction.
- .4 Known underground and surface utility lines and buried objects are indicated on the plans. The Departmental Representative may furnish base utility plans. Locations are approximate.
- .5 The Departmental Representative does not guarantee accuracy or completeness of underground as-built conditions.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Embankment material: Select Backfill or Gravel Borrow material as indicated and as specified in Section 31 23 10. Maintain material within 1% of optimum moisture content as directed. Protect approved material free from contamination.

PART 3 - EXECUTION

- 3.1 EXCAVATING .1 Prior to commencing cut and fill operations, agree with Departmental Representative as to ground surface elevations to be cut and filled.
- .2 Notify Departmental Representative whenever unsuitable materials are encountered and remove unsuitable materials to depth and extent directed.
- .3 Construct to profiles indicated.
- .4 Excavate in all kinds of material including rock encountered on Site and make own computations of amount and nature of excavation required.
- .5 Perform all excavation within ± 75 mm of the lines, grades and dimensions shown on the Drawings or as established by the Departmental Representative. During the progress of the Work, the Departmental Representative may vary the lines, grades and dimensions of the excavations from those specified in this Section.
- .6 Proof roll subgrade in completed excavations in presence of geotechnical inspector. Over-excavate any soft spots and backfill with approved granular fill or approved structural fill as directed by Departmental Representative.
- .7 Take necessary precautions to preserve the material below and beyond the lines of all excavation in the soundest possible condition.
- .8 Do not stockpile excavated site tills except as directed by the Departmental Representative. If material is stockpiled do not endanger personnel and the work, affect security, reduce sight lines, obstruct roadways, or become saturated.
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3.1 EXCAVATING
(Cont'd)

- .9 Do not obstruct existing drainage ditches and natural watercourses unless indicated on the Drawings.
- .10 Reduce steepness of slopes wherever possible, and expose smallest practical area of land for shortest possible time.
- .11 During construction direct surface runoff to sediment control facilities installed and maintained to the Requirements of Nova Scotia Environment.

3.2 EMBANKMENTS

- .1 Do not place material which is frozen nor place material on frozen surfaces.
- .2 Maintain a sloped surface during construction to ensure ready run-off of surface water.
- .3 Excavate sufficiently into existing embankment to be widened to allow compaction of new construction to be performed by medium or large rolling equipment of 1050 mm minimum drum width.
- .4 Scarify exposed surface of existing embankment to be widened to a depth of 250 mm. Remove soil particles of 175 mm nominal and greater and debris from scarified zone to satisfaction of Departmental Representative.
- .5 Place, blend into existing scarified embankment, and compact embankment material to full width in uniform layers not exceeding 200 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .6 Compact material to a density of not less than 95% ASTM D1557 modified Proctor density.
- .7 Compact last 400 mm of embankment material to a density of not less than 98% ASTM D1557 modified Proctor density.

3.3 FINISHING

- .1 Remove soft or other unstable material that will not compact properly and fill resulting depressions with approved material.
- .2 Shape and compact entire subgrade to within 25 mm of design elevations but not uniformly high or low.

3.3 FINISHING
(Cont'd)

- .3 Do scarifying, blading, compacting or other methods of work as necessary to provide a thoroughly compacted site shaped to grades indicated or directed.
- .4 Finish side slopes to a neat and stable condition, true to lines and grades indicated.
 - .1 Remove boulders encountered and fill resulting cavities.
 - .2 Hand finish slopes that cannot be finished satisfactorily by use of machine.

3.4 SURPLUS
MATERIAL

- .1 Surplus excavated material is to be removed off-site. Contractor is to bear the cost of all removals and disposals.

3.5 MAINTENANCE

- .1 Maintain finished surfaces in a condition conforming to this section until acceptance.

PART 1 - GENERAL

- 1.1 WORK INCLUDED
- .1 This Section specifies requirements for furnishing all materials, labour, tools and equipment and performing all operations necessary to excavate all types of material encountered, placing of excavated material as backfill, disposal of unsuitable and surplus material and furnishing backfill material as specified below, all as shown on the Drawings and as specified in this Section.
 - .2 The work generally includes, but is not necessarily limited to the following items:
 - .1 Trench excavation and backfilling for pipelines and appurtenances.
 - .2 Building foundation construction.
 - .3 Structure excavation and backfilling for manholes.
 - .4 Supplying and placing pipe foundation material where required.
 - .5 Control of water by dewatering.
 - .6 Providing borrow material.
 - .7 Removal and disposal of surplus and/or unsuitable material.
 - .8 Sheet piling, shoring and bracing to support trench walls, sides of excavations and existing structures or utilities and retaining walls.
- 1.2 RELATED WORK
- .1 Site Grading: Section 31 22 00
 - .2 Water Mains: Section 33 11 00
 - .3 Sanitary Sewer: Section 33 31 00
 - .4 Sanitary Utility Sewerage Force mains: Section 33 34 00
 - .5 Manholes, Catch Basins and Structures: Section 33 39 00
 - .6 Storm Sewer: Section 33 41 00
- 1.3 REFERENCES
- .1 CAN/CGSB 148.1-2003 COMPLETE SET, Methods of Testing Geotextiles and Geomembranes
 - .2 CAN/ULC-S701-2011, Thermal Insulation, Poly-styrene, Boards and Pipe Covering.
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- 1.3 REFERENCES (Cont'd)
- .3 ASTM D1557-09, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³)).
 - .4 ASTM D4254-00(2006), Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
- 1.4 SUBMITTALS
- .1 Submit samples, sieve analysis in accordance with Section 01 33 00 for items listed.
- 1.5 PROTECTION OF EXISTING FEATURES
- .1 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing excavation work, notify Departmental Representative or applicable authorities having jurisdiction, establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during work.
 - .3 Confirm locations of buried utilities by careful test excavations.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .5 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Advise Departmental Representative of existing lines in area of excavation that require removal or relocation and cost for such work.
 - .6 Record location of maintained, re-routed and abandoned underground lines.
 - .2 Existing surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, pavement, hydrants, 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 to approval of Departmental Representative.
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1.6 SHORING,
BRACING AND
UNDERPINNING

- .1 Protect existing features in accordance with applicable federal and local regulations and with authorities having jurisdiction.
- .2 Engage services of qualified professional engineer who is registered or licensed in province of Nova Scotia, in which work is to be carried out to design and inspect sheeting, shoring, bracing and underpinning required for work.
- .3 Submit design and supporting data for bracing of Nova Scotia Power (NSP) infrastructure to NSP for approval and to Departmental Representative for record.
- .4 Submit design and supporting data at least three (3) weeks prior to commencing work for work to be approved by Departmental Representative.
- .5 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in province of Nova Scotia.

1.7 SUPPORT OF
EXCAVATION

- .1 Suitably slope or properly shore sides of excavations according to site conditions, all in accordance with the Nova Scotia Occupational Health and Safety Act.
 - .2 The choice of any method of support will be the responsibility of the Contractor. However, drawings and calculations for the method of support selected, designed by a qualified professional engineer in accordance with the Provincial safety requirements, are to be submitted to Departmental Representative for review before its use.
 - .3 If it is desirable that any support, other than that which may be shown on the Drawings, be left in the excavations, then Departmental Representative will issue instructions accordingly.
 - .4 Take every precaution against slips or falls, but if any should occur, at once make good the same. If any such slip or fall affects or may affect the stability of the permanent work, execute such remedial work as necessary, including filling up of any space left by the slip or fall with approved granular material. Submit proposed remedial work to Departmental Representative for review.
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PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Select Backfill material: material approved from site excavation or borrow pits. Such material shall be free from stumps, trees, roots, sod, muck, organics or other deleterious material. Material to be well graded having a maximum particle size not exceeding 200 mm with 40% to 60% of the material retained on 75 mm sieve. Material shall not be frost susceptible. The material shall be free from frost, and shall not be placed on frozen ground or in water. It must have a moisture content that will allow compaction to the specified densities.
- .2 Gravel borrow material: composed of hard, durable stones and sand, free from clay, frozen lumps, organic, or deleterious matter, graded as follows:

<u>Sieve Size, mm</u>	<u>% Passing</u>
112	100
14	15-65
0.080	3-10

- .3 Structural fill: composed of crushed pit or beach gravel, or crushed rock, well graded, sound, durable, granular material, free from clay, frozen lumps, organic, or deleterious matter, graded as follows:

<u>Sieve Size, mm</u>	<u>% Passing</u>
112	100
80	95-100
20	20-90
5	20-70
0.080	0-10

- .4 Clear stone: crushed and screened, hard, durable stone, free from clay and organic matter, and graded as follows:

.1 Clear Stone, 28 mm:

<u>Sieve Size (mm)</u>	<u>Cum. % Passing</u>
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2.1 MATERIALS
 (Cont'd)

- .4 Clear stone:(Cont'd)
 .1 Clear Stone, 28 mm:(Cont'd)

<u>Sieve Size (mm)</u>	<u>Cum. % Passing</u>
28	100
20	90-100
10	0-40
5	0-10

- .2 Clear Stone, 80 mm:

<u>Sieve Size (mm)</u>	<u>Cum. % Passing</u>
80	100
56	25-60
28	0-5

- .5 Pipe bedding materials: well graded, granular material conforming to concrete aggregate matching Type 1 granular base aggregate gradation specification as indicated in Section 32 11 00.
- .6 Type C3 (Surge): hard, durable, dense cuboid igneous quarry stone, free from cracks, seams or other structural defects. Resistant to water and ice attack.

<u>Sieve Size (mm)</u>	<u>Cum. % Passing</u>
200	100
150	90-100
112	20-35
80	0-20
20	0-10

- .7 Rock liner: hard, durable, dense cuboid igneous quarry stone, free from cracks, seams or other structural defects. Resistant to water and ice attack. Free from stumps, roots, sod,mulch or other deleterious material. Sieve gradation in percent passing:

- 2.1 MATERIALS (Cont'd)
- .7 Rock liner:(Cont'd)
- .1 300mm Nominal:
- | Sieve Size (mm) | Cum. % Passing |
|-----------------|----------------|
| 350 | 100 |
| 300 | 70 |
| 200 | 20 |
- .8 Granular materials for pavements: to Section 32 11 00.
- .9 Rigid insulation: to Section 07 20 00.
- .10 Geotextile: non-woven, needle-punched synthetic filter fabric composed of minimum 85% by mass of polyester with inhibitors to resist deterioration. Muller Burst 1.40 MPa to CAN/CGSB-148.1 No. 6.1, Grab Tensile 450 N to CAN/CGSB-148.1 No. 7.3.
- .1 Acceptable products: Terrafix 270R or approved equivalent.
- .11 Underground warning tape:
- .1 Detectable metallic tape, 50 mm wide clearly marked as follows:
- .1 "CAUTION - BURIED SEWER LINE", colour green with black text.
- .2 "CAUTION - BURIED WATER LINE", colour blue with black text.
- .2 Polyethylene, 3.5 mils thick, 75mm wide, clearly marked as follows:
- .1 "CAUTION - BURIED ELECTRICAL CONDUIT", colour red with black text.

PART 3 - EXECUTION

- 3.1 SITE PREPARATION
- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement, curb or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
- 3.2 STOCKPILING
- .1 Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation.

3.3 BLASTING

- .1 Blasting of rock is not permitted.

3.4 EXCAVATION -
GENERAL

- .1 Excavate in all kinds of materials including rock encountered on Site and make own computations of amounts and nature of excavation required.
- .2 Select method of excavation, support and dewatering suitable for the works. Submit proposed method to Departmental Representative for review.
- .3 Prior to excavating trenches, measures shall be in place to handle and monitor pumped water from trench excavations, as per the Contractor's Sediment and Erosion Control Plan. Monitor water for pH and suspended solids, and discharged in an approved manner.
- .4 Protect property or structures above or below ground in accordance with the Contract.
- .5 Bear foundations or underside of all structures including pipe surrounds on the material as shown on the Drawings and neatly finish all bearing surfaces to the required levels and grades.
- .6 Earth bottoms of excavations to be undisturbed soil, free from loose, soft, or organic matter. Remove any soil softened due to frost or standing water prior to placing structures.
- .7 Excavations of structure bearing surfaces are to be proof rolled in the presence of an experienced geotechnical inspector and approved by Departmental Representative. Any soft spots are to be overexcavated and backfilled with approved fill.
- .8 If the excavated surface is unsuitable the Departmental Representative will determine what work is required to secure a proper foundation. If such work is due solely to the nature of the ground, then Departmental Representative will measure the work, but if such work is due to any act or default of the Contractor in carrying out of the Works, resulting in disturbance of natural ground conditions, then the Contractor shall execute such work at no additional cost to the Contract.
- .9 Excavation to greater depth than is shown on the Drawings shall be at no additional cost to the Contract, unless ordered by Departmental Representative. Make good trench bottom with approved granular material adequately compacted as approved by
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3.4 EXCAVATION -
GENERAL
(Cont'd)

- .9 (Cont'd)
Departmental Representative or with concrete as may be necessary for the safety or stability of the Works.
- .10 Pile excavated material a safe distance away from sides of trench so it will not endanger personnel and the work, reduce sight distances, or obstruct roadways.
- .11 Leave existing utility controls unobstructed and accessible at all times.
- .12 Do not obstruct drainage ditches and natural watercourses.
- .13 Departmental Representative reserves the right to require surplus material to be placed for embanking, general grading or other improvement or use on site, for the general benefit of PWGSC.
- .14 Control grading so that the surface of the ground will be properly sloped to prevent water from running into excavated areas. Promptly remove any water which accumulates in excavations.
- .15 Place excavated soil to be re-used as backfill in stockpiles properly graded and sealed against rain.

3.5 DEWATERING
AND HEAVE
PROTECTION

- .1 Keep excavations and trenches free of water. Control excavations to prevent surface water running into excavated areas.
- .2 Do work in connection with dewatering and supply and maintain on the work, pumps, in number and capacity sufficient to keep bottom of excavations dry and free from water so placing of pipe, manholes, and concrete will be done in the dry. Operate equipment for as long as necessary.
- .3 Ensure that sub-drains, sump holes, wells or the like required for dewatering shall not endanger the stability of the Works. On completion of the Work completely backfill and consolidate excavations.
- .4 Dispose of water removed from excavations in a manner that will prevent injuries to public health or private property or to any operation of the work completed or under construction. Do not pump water containing silt or other material in suspension into natural water courses.

3.5 DEWATERING .5 Provide flocculation tanks, settling basins, or
AND HEAVE other treatment facilities to remove suspended solids
PROTECTION or other materials before discharging to storm
(Cont'd) sewers, water courses or drainage areas.

3.6 STRUCTURE .1 Excavate to lines, grades, dimensions and elevations
EXCAVATION shown on Drawings.

.2 Extend excavations sufficient distance from footings
and walls to allow placing and removal of forms and
for placing backfill materials indicated.

.3 Prior to excavation around any manhole (existing or
newly constructed as part of the tender), the
Contractor shall supply and install catchment or
diversion devices in all manholes prior to work
commencing on the manhole. Construct and install such
devices in a manner so as not to impede the flow
through the manhole and shall be removed after all
work is completed.

3.7 TRENCH .1 Trenches for piping, conduit, and related
EXCAVATION excavations to be of sufficient width and depth at
all points to allow pipes to be laid, joints to be
formed, and appurtenant structures to be built in a
workmanlike manner, and when needed, to allow for
sheeting and shoring, pumping, draining, and for
removing and replacing all materials unsuitable for
foundations.

.2 Excavate trenches so pipe can be laid to the
alignment and depth required. Excavation length to be
not more than pipe length that can be laid and
backfilled in one day. Brace and drain trench so
workers may work safely and efficiently.

.3 Remove organic material and soft deposits to a depth
where medium dense to dense materials are encountered
as designated by Departmental Representative.

.4 Do not stockpile excavated materials alongside
trench if the bearing soil will cause trench side
failure or bottom uplift and affect pipe alignment.

3.8 UNSUITABLE
MATERIAL
EXCAVATION

- .1 Notify Departmental Representative when materials unsuitable for use in the work are encountered and remove to depth and extent as directed by Departmental Representative.
- .2 Backfill excavations with foundation material or selected backfill material as directed by Departmental Representative.
- .3 Dispose of unsuitable material off site.

3.9 GRANULAR
BEDDING & SURROUND

- .1 Do not dump bedding materials directly onto pipe.
 - .2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
 - .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe. Do not use blocks when bedding pipe.
 - .4 Shape transverse depressions in bedding as required to suit joints.
 - .5 Carry bedding material across actual trench width. Compensate for installation of clay liners. Mounding bedding shall not be permitted.
 - .6 Compact each layer full width of bed to at least 95% to ASTM D1557.
 - .7 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material or foundation material as directed by Departmental Representative.
 - .8 After pipe installation, place and compact bedding to haunch line of pipe. Place and compact bedding material from haunch line of pipe to top of pipe in maximum 150 mm layers. Place remaining bedding material to 300 mm above top of pipe before further compaction. Compact 98% to ASTM D1557.
 - .9 In areas of excessive groundwater, the Departmental Representative may approve the substitution of the specified bedding with 28mm clear stone completely surrounded with geotextile separator to prevent the migration of fines into the clear stone.
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3.10 BACKFILLING-
GENERAL

- .1 At the start of pipe laying operations, the Contractor's geotechnical engineer is to be on-site to establish rolling and compaction patterns in the presence of the Departmental Representative.
 - .2 Every second day during pipe laying operations, or as otherwise directed by the Departmental Representative, the Contractor's geotechnical engineer is to be on-site to confirm compaction of bedding and backfill materials.
 - .3 Submit compaction results to the Departmental Representative for approval.
 - .4 Do not proceed with backfilling operation until Departmental Representative has inspected and approved installations.
 - .5 After pipelines and structures have been built, backfill trenches and other excavated areas with materials shown on Drawings or as specified. Remove timber and debris from excavation before backfilling is commenced. Do not cover up or put out of view any work until it has been examined, measured and approved by Departmental Representative. If any work is covered without approval of Departmental Representative, Departmental Representative may order backfilled excavation to be uncovered for examination.
 - .6 Place backfill in unfrozen condition.
 - .7 Do not backfill around or over cast-in-place concrete within 24 hours after placing.
 - .8 Where temporary unbalanced earth pressures are liable to develop on walls or other structures, permit concrete to cure minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure.
 - .9 Place foundation material to provide suitable surface for construction as directed by the Departmental Representative.
 - .10 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.
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- 3.11 BACKFILLING STRUCTURES .1 Clean excavations of trash and debris. Backfill shall consist of Structural Fill material or material shown on Drawings. Place material to meet following requirements and approval of the Departmental Representative.
- .1 Place backfill in horizontal layers not more than 300 mm thick.
- .2 Compact each layer by rollers, mechanical tampers, or other suitable equipment to obtain a density of not less than 97% to ASTM D1557.
- .3 Compact the Structural Fill placed below the footings and slabs to not less than 100% to ASTM D1557.
- 3.12 BACKFILLING TRENCHES .1 Backfill trench from top of bedding to top of subgrade using materials shown on Drawings.
- .2 Place backfill in 300 mm layers and compact 97% to ASTM D1557. Thoroughly compact each layer before placing next layer. Carry out compaction tests to demonstrate the effectiveness of backfill thickness per lift versus the number of passes with the selected equipment to achieve the specified compaction.
- .3 During backfilling, keep trenches free of water at all times and controlled so as to prevent surface water running into excavated areas. Remove silty materials, which become wetted and subsequently liquid or extremely plastic.
- .4 Leave surface of backfill initially high and repair settlement of trench backfilling.
- 3.13 MARKER TAPE .1 Place marker tape and plank in trenches above electrical conduits and pipes, where indicated.
- 3.14 INSULATION .1 Place rigid insulation in trench where indicated or as required in areas where pipe cover is less than 1600 mm. Do not disturb or break boards during backfilling.
- 3.15 REINSTATEMENT .1 Upon completion of work, remove surplus materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
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- 3.15 REINSTATEMENT .2 Reinstatement of disturbed areas to condition, elevation
(Cont'd) and thickness equal to or better than that, which
existed before excavation.
- .3 Clean and reinstate areas affected by work as
directed by Departmental Representative.