

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 02 41 13 – Salvage, Removal and Protection.
- .2 Section 31 32 19.01 – Geotextiles.
- .3 Section 31 32 19.02 – Geomembrane.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600kN-m/m³).
 - .2 ASTM D5084 - 16a, Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
- .2 CSA International
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

1.3 DEFINITIONS

- .1 “Common Excavation” means the excavation of on-Site soil materials as specified in the Contract Documents and as defined herein. Common Excavation excludes topsoil and subsoil stripping and rock excavation.
- .2 “Topsoil Stripping to Stockpile” means the excavation of on site topsoil defined in Clause 2.1 and stockpiling on site for future use during this Contract.
- .3 “Topsoil” means uppermost part of the soil, material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding. Friable, fertile, natural loam, neither heavy clay nor of very light sandy nature containing minimum of 4% organic matter of clay loams and not less than 2% organic matter for sandy loams to a maximum of 15%, and capable of sustaining vigorous plant growth, free of rocks of 50 mm in diameter and over, subsoil contamination, roots, weeds, toxic materials, foreign objects and with an acidity range of 7.0 to 8.5; topsoil containing quackgrass, couchgrass or noxious weeds will be rejected.
- .4 “Subsoil” means portion of soil material that lies immediately beneath the Topsoil extending to root depth, very little to no amount of organic soil material.
- .5 “Fill Placement” means the placement of fill materials in designated areas as specified on the Contract Drawings or as directed by the Departmental Representative Authorized Personnel.

- .6 "Imported Material" means material obtained from a source other than the Work Area.
- .7 "Native Material" means the material removed to form an excavation within the Work Area for return to the same or other excavation.
- .8 "Unsuitable" or "Excess Material" means material removed to form an excavation within the Work Area that cannot be returned to the same or other excavation for use as backfill.
- .9 "Unclassified excavation" means excavation of deposits of whatever character encountered in work.
- .10 "Clay material" means a fine grained soil with a high plasticity index in relation to the liquid limit, with a low permeability as specified by the Departmental Representative Authorized Personnel. The clay material percent fines should be equal to or greater than 50% (by weight) and have a clay content equal to or greater than 20% (by weight).
- .11 "Waste material" means excavated material unsuitable for use in work or surplus to requirements.
- .12 "Borrow material" means material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .13 "Surface Vegetation" means existing on-site organic material growing above or at the original ground surface (includes grasses, small shrubs, roots, etc.)

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

1.5 MATERIALS QUALITY CONTROL AND QUALITY ASSURANCE

- .1 Quality Control:
 - .1 Transport only acceptable materials to Site. Do not import any contaminated materials to Site.
 - .2 Imported earthwork materials: Engage an independent certified materials engineer and testing company to perform quality control tests at each borrow site location of imported materials specified in Article 2.1.
 - .1 Submit copies of quality control test results to the Departmental Representative Authorized Personnel for review and approval prior to hauling of import material to Site.
 - .2 Each quality control test shall include: a compaction test (noting soil density and moisture content), permeability test, location of the test, and date when test was taken, and environmental testing. Environmental testing for all import fill material to include analysis of the following parameters:

Basic soil - Characteristics	pH, Salinity (EC), Sodicity (SAR), Saturation (%), Texture (particle size), Moist Consistency, CaCO ₃ equivalency (%)
Basic Soil- Micro/macro Nutrients	Nitrate, Ammonium, Phosphorus, Potassium, Sulfate, Magnesium, Calcium, Sodium, Chloride, Iron, Zinc, Boron, Copper, Manganese
BTEX	Benzene, Toluene, Xylene, Ethylene
PAHs	2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Acridine, Anthracene, B[a]P TPE, Benz[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[ghi]perylene, Benzo[k]fluoranthene, Chrysene, Dibenz[ah]anthracene, Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene, Naphthalene, Phenanthrene, Pyrene, Quinoline
CCME / Alberta Tier 1 Metals in Soil	Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mo, Ni, Se, Ag, Tl, Sn, U, V, Zn
Weed Seed Analysis or Certified Weed Free	Species name and seed % OR Weed Free certification documentation and lot must be referenced.

- .3 If materials are not in accordance with the Contract, Departmental Representative Authorized Personnel may reject the materials, and shall notify the Contractor thereof immediately. The notice shall state the Departmental Representative Authorized Personnel's reasons and the Contractor shall promptly modify procedures to ensure materials comply with the Contract.
- .4 Testing frequency: One test per every 500 cu. m. for each type of imported earthwork material or as determined with Departmental Representative Authorized Personnel.

- .3 Fill materials: Perform quality control tests for placed fill materials specified in Article 2.1.
 - .1 Each quality control test shall include: a compaction test (noting soil density and moisture content), permeability test, location of the test, date when test was taken, and type of fill material placed.
 - .2 Tests shall be taken within 24 hours of fill placement.
 - .3 Test locations shall be so distributed that they are representative of the entire area of the fill operations.
 - .4 Testing frequency: One test per every 100 cu. m. for each type of placed fill material or as determined with Departmental Representative Authorized Personnel until the Contractor consistently meets specified requirements.
 - .5 Testing methods shall not puncture the geotextile and/or geomembrane layers. Any punctures to the geotextile and/or geomembrane layers are to be patched immediately at the Contractor's expense.
- .4 Do not begin backfilling or filling operations until material has been approved for use by the Departmental Representative Authorized Personnel.
- .5 Contractor is responsible for all cost associated with testing of materials.
- .2 Quality Assurance
 - .1 The Departmental Representative Authorized Personnel may reject earthwork materials at the source, in transport vehicles, in stockpiles or in place.
 - .2 Import earthwork materials: Samples will be taken by the Departmental Representative Authorized Personnel for quality assurance testing as deemed necessary. Cooperate with the Departmental Representative Authorized Personnel during sampling and testing. Load and dispose of sampled materials when no longer required by the Departmental Representative Authorized Personnel. The frequency of sampling and testing will be determined by the Departmental Representative Authorized Personnel.
 - .3 Fill materials: The Departmental Representative Authorized Personnel will perform compaction and permeability tests during fill placement. Testing will be conducted in accordance with ASTM standards. The frequency of sampling and testing will be determined by the Departmental Representative Authorized Personnel.
 - .4 Testing of materials and compaction of fill will be carried out by testing laboratory designated by the Departmental Representative Authorized Personnel.

1.6 MEASURE OF PAYMENT

- .1 Topsoil Stripping to On-site Stockpile (0.15 m depth) shall be measured by a unit rate of cubic metres based on the stripped volume of **Surface Vegetation and** Topsoil between the original ground surface and top of existing native subsoil or in stockpiles as measured by survey. The unit price includes all labour, material, equipment and incidentals to excavate to specified lines and grades, remove and haul offsite deleterious materials (such as grass, rocks and roots) load, haul and place suitable material into a temporary stockpile on-site.
- .2 Native Subsoil Stripping to On-site Stockpile (0.45 m depth) for Anchor Trench shall be measured by a unit rate of cubic metres based on the stripped volume of Subsoil below the bottom of stripped existing topsoil or in stockpiles as measured by survey. The unit price includes all labour, material, equipment and incidentals to excavate to specified lines and grades, remove and haul offsite deleterious materials (such as rocks and roots) load, haul and place suitable material into a temporary stockpile on-site.
- .3 Supply, Haul, Place and Compact Imported Clay (0.60 m depth), shall be measured by a unit rate of cubic metres and will be calculated based on the plan area of the clay surface, as measured by survey, multiplied by the in-place thickness. The unit price includes all labour, material, equipment and incidentals required to supply, load from off-site borrow source, haul, place, spread, condition, shape, remove deleterious materials (such as rocks and roots), compact and grade. The Contractor shall have the clay inspected, tested, and approved by the Departmental Representative Authorized Personnel prior to hauling and placing.
- .4 Place and Compact Native Subsoil from On-site Stockpile for Anchor Trench shall be measured by a unit rate of cubic metres and will be calculated based on the volume of placed material from on-site temporary stockpiles, as measured by survey. The unit price includes all labour, material, equipment and incidentals required to load from on-site stockpiles, transport, place, spread, condition, shape, remove deleterious materials (such as rocks and roots), compact and grade. The Contractor shall have the subsoil inspected and approved by the Departmental Representative Authorized Personnel prior to placing.

- .5 Supply, Haul, Place, and Compact Imported Subsoil (0.15 m depth) shall be measured by a unit rate of cubic metres and will be calculated based on the plan area of the subsoil surface, as measured by survey, multiplied by the in-place thickness. The unit price includes all labour, material, equipment and incidentals required to supply, load from off-site borrow source, haul, place, spread, condition, shape, remove deleterious materials (such as rocks and roots), compact and grade. The Contractor shall have the subsoil inspected and approved by the Departmental Representative Authorized Personnel prior to placing.
- .6 Supply, Haul and Place Imported Topsoil (0.15 m depth) shall be measured by a unit rate of square metres and will be calculated based on the surveyed plan area of the topsoil surface. The unit price includes all labour, material, equipment and incidentals required to supply, load from off-site borrow source, haul, place, condition, shape, remove deleterious materials (such as grass, rocks and roots), spread, fine grade and blend into existing ground surface of adjacent areas. The Contractor shall have the topsoil preparation inspected and approved by the Departmental Representative Authorized Personnel prior to placing.
- .7 **Surface Vegetation and** Topsoil Placed from On-site Stockpile (0.15 m depth) shall be measured by a unit rate of square metres and will be calculated based on the surveyed plan area of the topsoil surface. The unit price includes all labour, material, equipment and incidentals required to supply, load from on-site stockpiles, transport, place, condition, shape, remove deleterious materials (such as rocks), spread, fine grade and blend into existing ground surface of adjacent areas. The Contractor shall have the topsoil preparation inspected and approved by the Departmental Representative Authorized Personnel prior to placing.
- .8 No measurement for payment will be made for:
 - .1 Rejected material.
 - .2 Surplus material.
 - .3 Excavation, and stripping and replacement of organic material beyond specified limits.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Common excavation
- .2 Topsoil
- .3 Subsoil
- .4 Waste material
- .5 Borrow material
- .6 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.

- .2 Frost susceptible materials under excavated areas.
- .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

<u>Sieve Designation</u>	<u>%Passing</u>
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45

- .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
- .7 Fill materials

PART 3 EXECUTION

3.1 SITE PREPARATION

- .1 Remove debris, bones, pieces of metal, metal wire, and pieces of wood, rocks, snow, ice, water, and loose material prior to start of fill placement. Do not place fill material when the material, the foundation, or the surface on which it would be placed is frozen.
- .2 Accidental Finds: As archaeological testing is by nature sampling (not 100 percent coverage) there could be a chance, however low, that features or artifact concentrations are encountered in the course of work. If cultural features (i.e., structural remains and/or artifact concentrations) are encountered when a professional archaeologist is not onsite, work should stop in the immediate area, photographs and a GIS reading should be taken, and the Departmental Representative should be contacted immediately.

3.2 EXAMINATION

- .1 Verification of Conditions:
 - .1 Before commencing work establish locations of buried monitoring wells on and adjacent to the Site.
- .2 Evaluation and Assessment:
 - .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by the Departmental Representative Authorized Personnel.
 - .2 Not later than 48 hours before backfilling or filling with approved material, notify the Departmental Representative Authorized Personnel so that compaction tests can be carried out by designated testing agency.

- .3 Before commencing work, conduct, with the Departmental Representative Authorized Personnel, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

3.3 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Use temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, in accordance with sediment and erosion control drawings.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Protection of in-place conditions:
 - .1 Protect excavations from freezing.
 - .2 Keep excavations clean, free of standing water, and loose soil.
 - .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative Authorized Personnel's.
 - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
 - .5 Protect buried services that are to remain undisturbed.
- .3 Remove surface debris, bones, rocks, snow, ice, water, and loose material prior to start of fill placement. Do not place fill material when the material, the foundation, or the surface on which it would be placed is frozen.

3.4 EXCAVATION

- .1 Topsoil and subsoil stripping:
 - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
 - .2 Strip topsoil to depths as indicated on Contract drawings. Avoid mixing topsoil with subsoil.
 - .3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
 - .4 Stockpile in locations as directed by Departmental Representative Authorized Personnel. Contractor is responsible for all cost associated with temporary stockpiling of materials on Site.

- .5 Keep material stockpiles neat and regular in form and ensure maximum height does not exceed 6 m.
- .6 Maintain a minimum clearance distance of 5 m between each stockpile.
- .2 Excavate as required to carry out work, in all materials met.
 - .1 Do not disturb soil or rock below bearing surfaces. Notify the Departmental Representative Authorized Personnel when excavations are complete.
- .3 Drain surface water away from the stripped areas to prevent ponding and infiltration in fill placement areas.

3.5 SITE QUALITY CONTROL

- .1 Fill material and spaces to be filled to be inspected and approved by the Departmental Representative Authorized Personnel.

3.6 FILL PLACEMENT

- .1 Start fill placement only after inspection and receipt of written approval of fill material and spaces to be filled from Departmental Representative Authorized Personnel.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of fill around structures as work progresses, to equalize earth pressures.
- .4 Compaction of subgrade: compact existing in-situ subgrade soil to same compaction as specified for Clay fill. Fill excavated areas with selected subgrade material compacted as specified for fill.
- .5 Placing:
 - .1 Place fill materials in 150 mm (uncompacted) lifts. Add water as required to achieve specified density.
- .6 Compaction Requirements: Compact each layer of material to following standard proctor maximum dry densities (SPMDD) to ASTM D698:
 - .1 Clay: 98% SPMDD at 0 to +3% Optimum Moisture Content (OMC).
 - .2 Subsoil: 95% SPMDD.
 - .3 Topsoil: 85% SPMDD.
- .7 Proof rolling of the compacted clay layer is allowable to determine locations of weak spots. Care should be taken to minimize damage to monitoring wells within and adjacent to the middens. In areas not accessible to rolling equipment, the Contractor shall use mechanical tampers.
- .8 The Contractor shall not operate rollers to compact fill within one metre of monitoring wells. The Contractor is responsible for all cost associated with damage to on site monitoring wells.

- .9 Proof rolling of the subsoil or topsoil layers is not allowed as it may damage the placed geotextile and geomembrane layers.

3.7 GRADING

- .1 Additional topsoil may be required to counteract settlement.
- .2 Grade to ensure that water drain away from the waste midden areas. Pooling of surface water within the middens areas is not acceptable. Grade to be gradual between finished spot elevations as indicated.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Dispose of cleared and grubbed material off site daily.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

END OF SECTION