

This specification outlines the requirements for roadway excavation, borrow excavation, embankment construction and disposal of material conforming to lines, grades, dimensions and typical cross-sections shown on plans or established by the Owner.

## PART 1 REFERENCES

This specification refers to the following standards, specifications, or publications:

ASTM International

D698                      Standard Test Methods for Laboratory Compaction  
Characteristics of Soil Using Standard Effort (12  
400 ft·lbf/ft<sup>3</sup> (600 kN·m/m<sup>3</sup>))

## PART 2 GENERAL

### 2.1 SUBMITTALS

- .1 Submit in accordance with Section 01340 – Shop Drawings, Samples and Submissions
- .2 Submit for approval and review blasting program as per Section 02202 – Rock Removal including preshear details, powder factors fly-rock control, and vibration monitoring methods.

### 2.2 QUALITY ASSURANCE

- .1 Regulatory Requirements:
  - .1 Adhere to regulations of authority having jurisdiction when blasting is required.
  - .2 Adhere to Provincial and National Environmental requirements when potentially toxic materials are involved.

### 2.3 PROTECTION

- .1 Maintain finished surfaces in condition conforming to this section until acceptance by the Owner.
- .2 Provide silt fences and erosion protection as required to mitigate and prevent impacts to adjacent properties.

### 2.4 TRAFFIC PROVISIONS

- .1 Provide and maintain roadways, walkways and detours, for vehicular and pedestrian traffic and access to fire hydrants.

PART 3 PRODUCTS

3.1 MATERIALS

- .1 Embankment materials require approval by the Owner.
- .2 Material used for embankment not to contain organic matter, frozen lumps, weeds, sod, roots, logs, stumps or any other objectionable matter and have not more than 10 % passing 0.075 mm sieve nor particles larger than 250 mm. Within 300 mm of sub-grade the maximum particle size shall be 150 mm.
- .3 Common Material including borrow shall be obtained from sources indicated or approved by the Owner.
  - .1 Earth Embankment materials to consist of acceptable earth material and processed rock material free from objectionable quantities of organic matter, frozen soil, stumps, trees, moss, and other unsuitable materials.
  - .2 Rock Embankment material to consist of fragmented rock produced by drilling and blasting operations, and boulders which cannot be placed in layers as specified for Earth Embankment s.
  - .1 Rock Embankment to conform to gradation as indicated in the Contract Documents.

3.2 GEOTEXTILE (FILTER FABRIC)

- .3.1 Geotextile in accordance with Section 02897 – Geotextile (Filter Fabric). Type as indicated in Contract Documents.

PART 4 EXECUTION

4.1 EXAMINATION

- .1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:
  - .1 Visually inspect substrate in presence of the Owner.
  - .2 Inform the Owner of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Owner.

#### 4.14.2 COMPACTION EQUIPMENT

- .1 Compaction equipment must be capable of obtaining required densities in materials on project.
  - .1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.
  - .2 Replace or supplement equipment that does not achieve specified densities.
- .2 Operate compaction equipment continuously in each embankment when placing material.

#### 4.24.3 WATER DISTRIBUTORS

- .1 Apply water with equipment capable of uniform distribution.
- .2 Water used for this purpose shall be fresh water.

#### 4.4 STRIPPING OF TOPSOIL:

- .1 Commence topsoil stripping of areas as indicated after brush, weeds, and grasses have been removed from these areas.
- .2 Do not handle topsoil while in wet or frozen condition or in any way soil structure is adversely affected as determined by the Owner.
- .3 Strip topsoil from areas and to depths indicated or directed by the Owner prior to beginning of excavation and embankment work. Do not mix subsoil.
- .4 Avoid contamination to topsoil and underlying soil.
- .5 Stockpile in locations as indicated.
  - .1 Stockpile height: not to exceed 2 m.
- .6 Remove materials unsuitable for embankments to lateral limits and depths directed and dispose of as directed.
- .7 Remove clearing and grubbing debris from stripping.

#### 4.34.5 EXCAVATING

- .1 General:
  - .1 Advise the Owner sufficiently ten (10) business days prior to excavation operations for initial cross-sections to be taken.

- .2 Notify the Owner whenever unsuitable materials are encountered in cut sections and remove unsuitable materials to depth and extent directed.
- ~~.3 Sub-excavate 500 mm below subgrade in cut sections unless otherwise directed by the Owner.~~
  - ~~.1 Compact top 150 mm below sub-excavate to minimum 95 % maximum dry density, to ASTM D698.~~
  - ~~.2 Replace with approved embankment material and compact to specified embankment density.~~
- ~~.3.1 Maintain crowns and cross slopes to provide good surface drainage.~~
- .4 Where subgrade is on transition from excavation to embankment treat ground slopes at grade points as indicated or as directed by the Owner.
- ~~.2 Stripping:~~
  - ~~.1 Strip topsoil from areas and to depths indicated or directed by the Owner prior to beginning of excavation and embankment work. Avoid contamination to topsoil and underlying soil.~~
  - ~~.2 Remove materials unsuitable for embankments to lateral limits and depths directed and dispose of as directed.~~
- ~~.2 Drainage:~~
  - ~~.1 Maintain crowns and cross slopes to provide good surface drainage.~~
  - ~~.2 Provide ditches as work progresses to provide drainage.~~
  - ~~.3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.~~
  - ~~.4 Provide effective drainage to ditches, leaving no undrained pockets in foundation.~~
- .3 Rock Excavation:
  - .1 If during excavation, material appearing to conform to classification for rock is encountered, notify the Owner in sufficient time to enable measurements to be made to determine volume of rock.
  - ~~.2 Do not proceed without written approval of blasting program from the Authority Having Jurisdiction.~~
  - ~~.2.3 Remove rock to 300 mm below sub-grade elevation indicated.~~
  - ~~.4 Reduce overbreak and increase stability of rock faces by using smooth blasting techniques.~~
  - ~~.5 Scale down rock slopes and remove rock fragments that are liable to slide or roll down slopes.~~

- .6 Use smooth blast and excavate short sections in rock cuts to determine optimum spacing of holes when requested by the Owner.
  - .7 Stem holes as necessary to contain blast.
  - .8 Do not use prilled type ammonium nitrate and fuel oil (ANFO) explosives within 4 m of final cut line.
  - .9 Form back wall by pre-splitting at least 10 m in advance of production blasting.
  - .1 Smooth wall blast just prior to or just after production blast as determined by approved blast program.
  - .10 Scale rock backslopes to achieve smooth, stable face, free of loose rock and overhangs to design backslope.
  - .11 Control blasting to minimize flying particles.
  - ~~.3.1 Provide effective drainage to ditches, leaving no undrained pockets in foundation.~~
  - ~~.4.1 Scale down rock slopes and remove rock fragments that are liable to slide or roll down slopes.~~
- .4 Borrow Excavation:
  - .1 Completely use in embankments, suitable materials removed from excavations before taking material from borrow areas.
  - .2 Obtain from borrow areas additional suitable embankment material.
    - .1 Owner to approve location and extent of borrow areas, and allowable depth of cutting.
  - .2.3 Shape edges of borrow areas on slopes of 2:1 and provide drainage as directed by the Owner.
  - .3.4 Trim and leave borrow pits in a condition to permit accurate measurement of material removed.
  - .4.5 Leave borrow pits in safe condition suitable for rehabilitation.
- .5 Side Ditches:
  - .1 Construct side ditches to depths and widths indicated or directed by the Owner, to permit ready flow of surface water.
  - .2 Maintain and keep ditches open and free from debris until final acceptance of work.

#### 4.44.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations and embankments dry while Work is in progress by draining and pumping as required.
- .2 Provide for Owner's review all details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in a manner not detrimental to public health, environment, public and private property, or any portion of the work completed or under construction. Comply with all requirements of the Department of Environment and Climate Change and other regulatory Agencies Having Jurisdiction regarding disposal of water from excavation.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

#### 4.54.7 EMBANKMENTS

- .1 When directed by the Owner, scarify or bench existing slopes in side hill or sloping sections to ensure a proper bond between new materials and existing surfaces. Obtain prior approval of method to be used.
- .2 Break up or scarify existing road surface prior to placing embankment material
- .2.3 Do not place material that is frozen or place material on frozen surfaces.
- .3.4 Maintain a crowned surface during construction to ensure ready run-off of surface water. Do not place material in free standing water. Drain low areas before placing.
- .5 Drain low areas before placing materials.
  - .1 Place and compact to full width in layers not exceeding 200 mm loose thickness. Owner's Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25 % by volume stone and rock fragments larger than 100 mm.
- .4.6 Where material consists principally of rock:
  - .1 Place to full width in layers of sufficient depth to contain maximum sized rocks but in no case is layer thickness to exceed 500 mm.
  - .2 Carefully distribute rock material to fill voids with smaller fragments to form a compact mass.

.3 Fill surface voids at subgrade level with rock spalls or selected material to form an earth-tight surface.

.4 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of subgrade elevation.

.4.7 Deductions from excavation will be made for overbuild of embankments.

~~.5.1 Upon completion of embankment construction, if so directed, place stock piled and windrowed topsoil and unsuitable material against embankment and trim to maintain embankment slope.~~

~~.6.1 Place topsoil taken from stockpile or other sources, at locations and to depths directed. Remove surface stones, roots and other debris and leave surface in uniform condition.~~

#### 4.8 COMPACTION

.1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.

.2 Deposit, spread, and level, embankment material in layers 200 mm maximum thickness before compaction.

.1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.

.2 Ensure required compaction for each layer before placing any material for next layer.

.3 Use specialized compaction equipment supplemented by routing, hauling, and leveling equipment over each layer of fill.

.4 Obtain written approval from the Owner before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results

.1 For tamping rollers, use equipment that exerts 1000 kPa minimum of pressure on tamping surface of each tamping foot in transverse row.

.7.5 With material containing less than 25 % by volume of stone or rock fragments larger than 100 mm:

.1 Place and compact to full width in uniform layers not exceeding 500 mm loose thickness. The Owner may authorize thicker lifts if specified compaction can be achieved.

.2 Except the top 150 mm up to sub-grade elevation, Compact to a density ~~a minimum of not less than~~ 95 % corrected maximum dry density, ~~where the~~ maximum dry density ~~is determined in~~ accordance with ASTM D698 ~~and corrected as specified in Section~~



~~02501 – Corrected Maximum Dry Density except last 150 mm up to sub-grade elevation.~~

~~2.1~~ Compact last 150 mm to 100 % corrected maximum dry density, ~~where the~~ maximum dry density ~~is determined in~~ accordance with ASTM D698 ~~and corrected as specified in~~ Section 02501 – Corrected Maximum Dry Density.

~~.6~~ Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

#### 4.64.9 FINISHING

- .1 Remove soft or other material that will not compact properly and fill resulting depressions with approved material.
- .2 Shape and compact entire roadbed to within 30 mm of design elevations but not uniformly high or low.
- .3 Do scarifying, blading, compacting or other methods of work as necessary to provide a thoroughly compacted roadbed shaped to grades and cross sections indicated or directed.
- .4 Finish back and side slopes of common material to a neat condition, suitable for seeding, true to line and grade.
  - .1 Remove boulders encountered in cut slopes and fill resulting cavities.
  - .2 Hand finish slopes that cannot be finished satisfactorily by machine.
- .5 Finish back and side slopes of rock material to a neat and safe condition, true to line and grade. For rock slopes greater than 1:1, scale slope by removing loose fragments.
- .6 Grade and leave all disposal areas or dump sites in a condition acceptable to the Owner and do not obstruct flow of surface drainage or natural watercourses. Ensure that approved disposal sites are available so that the Work shall not be delayed.
- .7 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.
- ~~.8~~ Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts

#### 4.10 PLACEMENT OF TOPSOIL

- .1 Upon completion of embankment construction, if so directed, place stock piled and windrowed topsoil and unsuitable material against embankment and trim to maintain embankment slope.



- .2 Place topsoil taken from stockpile or other sources, at locations and to depths directed. Remove surface stones, roots and other debris and leave surface in uniform condition.

4.74.11 MAINTENANCE

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

PART 5 PAYMENT

5.1 MEASUREMENT FOR PAYMENT

- .1 Stripping of topsoil: measure in cubic metres calculated from cross sections taken by the Owner's Representative in areas of excavation.
- .1 The Owner's Representative will take initial cross sections after clearing and grubbing completed.
- .2 Stripping unit price to include cost of placing material on slopes upon completion of excavation and embankment.
- ~~.1 Placing and spreading of topsoil on site and/or imported topsoil will be paid by the square metre to the specified depth.~~
- .2 Excavated materials will be measured in cubic metres from cross sections taken in areas of excavation after any Clearing and Grubbing activities.
- .3 Mass Rock Excavation:
- .1 Where depth indicated on the Drawings or directed by the Owner is less than 300 mm below original rock surface, depth excavated for measurement purposes will be taken as 300 mm.
- .2 Volume of excavated boulders and rock fragments in excess of 0.5 m<sup>3</sup> will be determined by measuring three maximum mutually perpendicular dimensions.
- .4 Mass Common Excavation:
- .1 In areas of excavation provided by the Owner, initial cross-sections will be taken prior to clearing and grubbing and prior to stripping of topsoil.
- .2 Topsoil and Unsuitable material to be paid under common excavation will be measured for payment as common excavation in its original location.
- .5 Mass borrow~~Imported~~ rock and common backfill including compaction to be measured in cubic metres in place to specified paylines unless otherwise specified by the Owner.

- .6 No measurement will be made for:
  - .1 Unnecessary excavation beyond lines established.
  - .2 Extra handling of windrowed materials blended on embankment slopes.
  - .3 Placing of excavated material at another location on site or disposal of waste material off site.
  - .4 Ripping and/or drilling and blasting of material.
  - .5 Scarifying or benching existing slopes or existing road surfaces.
  - .6 Removing and disposing of roots, stumps and other materials excavated during waste operation.
  - .7 Burying existing culverts from old road.
  - .8 Removing unsuitable material from embankment attributable to negligence.
  - .9 Shattering rock to 300 mm below subgrade elevation.
  - .10 Scaling and removing loose rock from rock face.
  - .11 Watering, drying and compacting.
  - .12 Finishing.

## 5.2 BASIS OF PAYMENT

- .1 All costs associated with the work outlined in this specification shall be deemed to be included in the appropriate unit and lump sum prices quoted as outlined in the Measurement for Payment subsection of this section and as included in the MERX Schedule of Quantities and Prices. Payment for excavation and borrow material will include placing and compacting in embankments elsewhere on the project, as well as disposal of all waste material at approved dump sites.
- .2 Supply and placement of filter fabric will be paid in accordance with Section 02897 – Geotextile (Filter Fabric).