

1 General

1.1 RELATED SECTIONS

- .1 31 23 10 - Excavating, Trenching and Backfilling.
- .2 32 11 19 – Granular Sub-base
- .3 32 11 23 – Granular Base

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 SAMPLES

- .1 Allow continual sampling by Departmental Representative during production.
- .2 Provide Departmental Representative with access to source and processed material for sampling.
- .3 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
- .4 Samples for quality testing will be required for each material and at the discretion of the Departmental Representative. Do not use any material in the work until it has been approved.
- .5 Provide subsequent and progress samples from the processed materials when and as required by the Departmental Representative.
- .6 Furnish such casual labour as is necessary to obtain and handle samples at the project or at other sources of material.
- .7 Quality testing shall not relieve the Contractor of his responsibility to furnish materials in compliance with the Contract Documents.
- .8 Testing of aggregates will be carried out in accordance with CSA, MTO or ASTM methods.

2 Products

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
  - .1 Greatest dimension to exceed five times least dimension.

- .3 Fine aggregates satisfying requirements of applicable section to be one or blend of the following:
  - .1 Natural sand.
  - .2 Manufactured sand.
  - .3 Screenings produced in crushing of quarried rock, boulders, or gravel.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.

## 2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling at least four (4) weeks prior to commencing production.
- .2 If, in opinion of Departmental Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise Departmental Representative four (4) weeks in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

## 3 Execution

### 3.1 PREPARATION

- .1 Stripping
  - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials.
  - .2 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
- .2 Processing
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
  - .2 Blending of qualitatively acceptable aggregates will be permitted in order to satisfy the grading requirements specified, provided that the blending is performed in a satisfactory manner and with approved equipment so as to consistently produce a uniformly well graded and acceptable product.

- .3 Wash aggregates if required to meet specifications.
- .4 Blending performed to increase the percentage of crushed particles or decrease the percentage of thin and elongated particles will be permitted.
- .3 Handling
  - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .4 Stockpiling
  - .1 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .2 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  - .3 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .4 Do not use intermixed or contaminated materials.
  - .5 Stockpile materials in uniform layers of maximum thickness of 1.5 m. Complete each layer over the entire area before beginning the next layer.
  - .6 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
  - .7 Do not cone piles or spill material over edges of piles.
  - .8 Do not use conveying stackers.
  - .9 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.
- .5 Defective Materials
  - .1 Unless otherwise permitted by the Departmental Representative, remove rejected materials from the site of the work within 48 hours of such rejection.

### 3.2 CLEANING

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

END OF SECTION

1 General

1.1

1.1 SECTION INCLUDES

- .1 The work under this section shall include the supply of all labour, supervision, materials, plant, equipment and transportation necessary to complete excavations, backfilling and compaction of earthwork as shown on the drawings, as specified herein and as directed by the Departmental Representative, complete in every respect.
- .2 Generally, the work includes but is not limited to the following:
  - .1 Supply, placing, shaping and compaction of structural fill.
  - .2 Supply, placing, shaping and compacting of clean crushed rock.
  - .3 Inspection and checking of profile of excavation to accommodate the works.
  - .4 Preparation of any required stockpile areas.
  - .5 Disposal of unsuitable and waste excavation materials.
  - .6 Drainage and any required dewatering of excavation.
  - .7 Protection of existing facilities and services.

1.2 RELATED SECTIONS

- .1 Section 31 05 17 – Aggregate Materials
- .1 Section 32 11 19- Granular Sub-Base
- .2 Section 32 11 23- Aggregate Base Course.

1.3 MEASUREMENT FOR PAYMENT

- .1 There shall be no separate payment for common excavation, dewatering, disposal of unsuitable and surplus material. Include costs in bid items for which excavating, trenching, backfilling are required.
- .2 Trench excavation in rock: Measurement to be in cubic metres in original position with calculations based on profile of top of rock and depth to 300 mm below bottom of pipe; width for quantity calculations to be the minimum unsloped width excavated at pipe invert elevation.

1.4 REFERENCES

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .2 ASTM D422-63 2002, Standard Test Method for Particle-Size Analysis of Soils.
  - .3 ASTM D698-00a<sup>1</sup>, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m<sup>2</sup>).
  - .4 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

## 1.5 DEFINITIONS

.1

.1 Subgrade: the surface of mass excavation and embankment finished to lines and elevations indicated.

.2 Surplus material: excavated material not required for re-use.

.3 Common: materials of whatever nature, which are not included under definition of solid rock or topsoil, including dense tills or hardpan which can be ripped or excavated with heavy construction equipment.

.4 Waste material: excavated material unsuitable for use in work or surplus to requirements.

.5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.

.6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

.7 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 All organic or excavated material which is not suitable for use in work and must be disposed of.

.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 C136.

.2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

.8 Rock excavation

.1 Rock excavation is defined as excavation in solid rock or boulders, concrete or masonry exceeding 3.0 m<sup>3</sup> in volume. Soft, reasonably hard, layered or broken rock which can be removed by a 2.0 m<sup>3</sup> hydraulic backhoe equipped with rock teeth, working reasonably hard, is not classified as rock excavation. The Departmental Representative's decision on classifying materials is final.

#### 1.6 INSPECTION AND TESTING

- .1 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.
- .2 Testing of materials and compaction will be carried out by the testing laboratory designated by the Departmental Representative in accordance with Section 01 45 00 - Quality Control.
- .3 The Departmental Representative will pay for inspection and testing.
- .4 Compaction densities are percentages of maximum dry density as determined by ASTM D698.

#### 1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

#### 1.8 EXISTING CONDITIONS

- .1 The Contractor will confirm with appropriate agencies the location of existing underground utilities within the work area.
- .2 Furnish temporary support, adequate protection and maintenance of all underground and surface features encountered in the progress of the work, under the direction of the Departmental Representative.
- .3 Restore upon completion of the work, features which have been disturbed.
- .4 Protect trees, fences, poles and other property and surface structures unless their removal is shown on the drawings or authorized by the Departmental Representative.
- .5 Wherever obstructions not shown on the drawings are encountered during progress of the work and interfere to such an extent that an alteration in the works is required, the Departmental Representative shall have the authority to change the drawings and order a deviation from the line and grade or arrange with the owner of the structure for removal, relocation and reconstruction of the obstructions encountered during the progress of the work.
- .6 Proceed with caution in excavation and preparation of trenches so that exact location of all buried pipes and services and underground structures may be determined and be responsible for repair of pipes, services and structures when broken or otherwise damaged.

- .7 Whenever it is necessary to explore and excavate to determine the location of existing underground utility structures, make such examination and excavation at no additional cost to the Contract.

## 2 Products

### 2.1

### 2.1 MATERIALS

#### .1 Type I Engineered Fill:

- .1 Crushed rock base/subbase shall be produced by the crushing and processing of rock to conform to the grading limits as set out in Table 201-2, when tested in accordance with ASTM C136 and C117.

#### .2 Table:

Sieve Designation	% Passing
90.0 mm	100
75.0 mm	95 - 100
63.0 mm	85 - 100
50.0 mm	73 - 95
37.5 mm	58 - 87
19.0 mm	35 - 69
9.5 mm	25 - 54
4.75 mm	17 - 43
2.36 mm	12 - 35
1.18 mm	8 - 28
300 $\Phi$ m	4 - 16
75 $\Phi$ m	0 - 9

## 3 Execution

### 3.1 GENERAL

- .1 The Contractor shall advise Departmental Representative two (2) weeks in advance of intended use of materials to allow sufficient time for sampling and testing. Submit samples of granular materials to be used in the works when requested by the Departmental Representative. Approval of a sample does not mean acceptance of the whole source. Each load of material received at the job site shall be subject to all the requirements of that material.

- .2 The costs of any additional testing of backfill, as deemed necessary by the Departmental Representative, to determine the acceptability or degree of compaction shall be paid by the Contractor.
- .3 Operations on earthwork shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing weather or other conditions of the field. At all times, the Contractor shall drag, blade or slope the fill to provide proper surface drainage.
- .4 Materials to be compacted shall be placed in layers no thicker than can be compacted by anticipated compaction equipment, and be of the proper moisture content. Submit technical data for compaction equipment when requested by the Departmental Representative.
- .5 Final grades shall be within 13 mm of the levels shown on the drawings. All areas shall be sloped to avoid puddles.
- .6 It shall be the responsibility of the Contractor to repair all damage and correct all deficiencies which may result from the settlement of backfill areas.

### 3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow from surfaces to be excavated within limits indicated.
- .2 Identify required lines, levels, contours and datum.
- .3 Identify known underground, above ground and aerial utilities. Stake and flag locations.
- .4 Notify utility company to remove or relocate utilities.
- .5 Protect above and below grade utilities which are to remain.
- .6 Protect plant life, lawns, rock outcropping and other features remaining as a portion of the final landscaping.
- .7 Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

### 3.3 STOCKPILING AND DISPOSAL

- .1 All excess material suitable for backfill must be hauled to designated areas and spread to lines and grades as directed by the Departmental Representative.
- .2 Stockpile fill material in areas designated by the Departmental Representative. Stockpile granular material in a manner to prevent segregation.



- .3 Protect all fill materials from contamination.
- .4 Excess material unsuitable for backfill shall become the property of the Agriculture and Agri-Food Canada. Contractor will confirm the on-site location to transport and grade the excess material from the Departmental Representative. This will be considered incidental to the bid items.
- .5 In case of a dispute, the Departmental Representative shall be the sole judge as to which material is unsuitable and has to be hauled away.

3.4

#### 3.4 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off. All excavations and trenches shall be kept free from water. Dams, dykes and other works necessary for dewatering including duplicate pumps of sufficient capacity for the purpose shall be placed at the Contractor's expense.
- .3 The discharge of water from any dewatering operation shall be to a sediment pond and not to a storm sewer.

#### 3.5 EXCAVATING AND TRENCHING

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Excavate subsoils required to accommodate building foundations, slabs-on-grade and construction operations.
- .3 Remove all other obstructions encountered during excavation.
- .4 Trench excavate for footings.
- .5 Excavation shall include the removal of all water, ice, snow and material of any nature which interferes with construction work.
- .6 Excavation must not interfere with the bearing capacity of adjacent foundations.
- .7 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations.
- .8 All earth banks created by excavating shall be sloped at sufficient angle to prevent sliding or caving in and if they are not adequately sloped, then shoring and/or trench boxes must be used.

- .9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .10 Bottom of excavations in rock to be level. Remove soft till and unsuitable materials.
- .11 Bare foundations or underside of all structures including pipe surrounds on the material as shown on the drawings and neatly finish all baring surfaces to be required levels and grades.
- .12 Notify Departmental Representative when bottom of excavation is reached.
- .13 Obtain Departmental Representative approval of completed excavation.
- .14 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .15 Excavation within fine sand layer to be carried out with smooth trenching bucket.
- .16 Excess proof-rolling of sub-grade will be avoided.
- .17 Where excavation carried out by the Contractor exceeds limits authorized by the Departmental Representative, the cost of such unauthorized excavation shall be borne by the Contractor as shall all necessary fill required to fill the void.

### 3.6 FILL TYPES AND COMPACTION

- .1 Use fill types as indicated or specified below. Compaction densities are obtained from ASTM D698.
  - .1 Granular base (within 150 mm of bottom of slab):
    - .1 Granular base fill to 98% of maximum dry density as determined by ASTM D698.
  - .2 Foundation backfill:
    - .1 Type 1 engineered fill.
    - .2 Compact engineered fill to 98% of maximum dry density as determined by ASTM D698 with maximum lift thickness of 200 mm..
  - .3 Fill to correct over excavation and fill to subgrade:
    - .1 Type I engineered fill.
    - .2 Compact engineered fill to 98% of maximum dry density as determined by ASTM D698.
  - .4 Granular subbase:
    - .1 Compacted to 95% of maximum dry density as determined by ASTM D698.
  - .5 Pipe bedding:
    - .1 Refer to applicable pipe and manhole sections of these specifications.

- .2 Compact fill to 95% of maximum dry density as determined by ASTM D698.

### 3.7 BACKFILLING

- .1 Do not proceed with backfilling of operations until Departmental Representative has inspected and approved installations.
- .2 Proof-roll area with 8 tonne roller in static mode prior to placement of fill. Undercut any loose or soft areas and fill to subgrade level.
- .3 Areas to be backfilled to be free from snow, ice, debris, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150mm to compaction thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 The in situ fill soils and topsoil are not to be used as structural backfill.
- .7 Fill placed within 0.4 m of subgrade must be static rolled.
- .8 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placement of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 1.0m.

### 3.8 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by the Departmental Representative.
- .2 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .3 Restore site to its normal state prior to excavation.

### 3.9 PROTECTION

- .1 Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

### 3.10 REPAIRS DURING WARRANTY PERIOD

- .1 During the specified guarantee period, make good any damage to walk, roads, etc., due to settlement of backfilled areas. All such repairs shall be made at the Contractor=s expense upon notification by the Departmental Representative.
- .2 Should the Contractor fail to carry out the necessary maintenance within five (5) days after receiving written instruction from the Departmental Representative, the Departmental Representative will carry out the work and deduct the cost incurred from the money owing the Contractor.

END OF SECTION