

1. General

1.1 Section Includes

1.1.1 This Section specifies requirements for the supply and installation of granular base.

1.2 Related Sections

- Section 31 05 16 – Aggregate Materials.
- Section 32 11 16 – Granular Sub-Base.

1.3 References

1.3.1 American Society for Testing and Materials (ASTM):

- ASTM C 117-95, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- ASTM C 131-96, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- ASTM D 422-63 (1998), Standard Test Method for Particle Size Analysis of Soils.
- ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
- ASTM D 1883-99, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- ASTM D 1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
- ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- ASTM D76-03, Standard Practise for Sampling Aggregates.
- ASTM D3665-06, Standard Practise for Sampling of Construction Materials.

1.3.2 Canadian General Standards Board:

- CAN/CGSB – 8.2 – M88, Sieves Testing, Woven Wire, Metric.

1.4 Submittals

1.4.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

- 1.4.2 Submit to Departmental Representative, complete records as per the submittal schedule, complete with Inspection and Testing Plans (ITP), for pre-approval prior to construction.

1.5 Waste Management and Disposal

- 1.5.1 Separate and recycle waste material.

2. Products

2.1 Materials

- 2.1.1 The aggregate materials shall be composed of clean, hard, uncoated particles and shall be free from organic matter, clay lumps and deleterious materials such as shale, slate, orchre and schists.
- 2.1.2 Materials from deposits acceptable as to the quality of the particles, but deficient in sizes to provide the required gradation, may be accepted if the Contractor furnishes and satisfactorily incorporates into the product supplementary sizes from other sources to produce the required grading.
- 2.1.3 Materials shall be considered unsuitable even though particle sizes are within the specified gradation limits if particle shape or any other characteristic precludes satisfactory compaction or fails to provide a roadway suitable for traffic. If, in the opinion of the Departmental Representative, an improved particle shape can be achieved by using a different crushing unit from that proposed by the Contractor, then the Contractor shall supply and use a crushing unit of the type directed by the Departmental Representative.
- 2.1.4 Granular base shall be processed by crushing and, when necessary, to eliminate surplus fines passing the 4.76 mm sieve, shall be screened and washed.
- 2.1.5 Granular base material to following requirements: Gradation to be within following limits when tested to ASTM C136-84a and ASTM C117-87. The grading shall not show marked fluctuations from opposite extremes of the limiting sizes, having a smooth curve without sharp breaks when plotted on a semi-log grading chart to ASTM E11-87.

| ASTM Sieve Designation | % Passing |
|-------------------------------|-------------------|
| 19.0 mm | 100 |
| 9.51 mm | 55-80 |
| 4.76 mm | 35-60 |
| 1.20 mm | 17-35 |
| 0.300 mm | 7-20 |
| 0.075 mm | 3-6 (Pit Source) |
| 0.075 mm | 3-8 (Rock Source) |

2.1.6 Granular Base Material shall also conform to the following physical requirements:

- Los Angeles Abrasion ASTM C131-89, C535 – 89, Maximum percent loss by weight: 35.
- Crushed Fragments (Minimum) to ASTM D5821: 50%. The percent of crushed particles will be determined by examining the fraction retained on the 4.76 mm sieve and dividing the weight of the crushed particles by the total weight retained on the 4.76 mm sieve. Pieces having one or more freshly fractured faces only will be considered as crushed material, or rejection of the material shall be decided on the basis of test results of samples taken from the roadways.
- Plasticity Index ASTM D4318 – 84, Maximum 0.
- Petrographic Number (Maximum) to CSA 23 2-M90: Maximum 150.
- Micro-Deval Test for Fine Aggregate (% Maximum) to CSA A23.2-23A: Maximum 30.
- Micro-Deval Test for Coarse Aggregate (% Maximum) to MTO LS.618: Maximum 25.

3. Execution

3.1 Preparation of Underlying Sub-Base

3.1.1 The Contractor shall prepare the sub-base material in accordance with Section 32 11 16 – Granular Sub-Base to the satisfaction of the Departmental Representative before commencing placement of any granular base materials.

3.1.2 Placement of aggregate base material shall not commence until the Departmental Representative has inspected and approved the Granular Sub-Base.

3.2 Installation of Aggregate Base Material

3.2.1 Install granular base to the depths and grades indicated on the Contract Documents, unless otherwise directed by the Departmental Representative.

3.2.2 Ensure that no frozen aggregate base material is installed.

3.2.3 Install aggregate base material on clean, unfrozen surface, free from snow or ice.

3.2.4 Do not place any aggregate base material where there is standing water present. If standing water is present the Contractor shall reshape the Granular Sub-Base to conform to the cross slopes indicated on the Contract Documents.

3.2.5 Begin installing granular base material on crown line or high side of one-way slope.

3.2.6 Install granular base materials in such a manner as to prevent segregation or degradation.

- 3.2.7 Install materials to full width in uniform layers such that the thickness of the compacted layer does not exceed 150 mm. The Departmental Representative may authorize thicker lifts if specified compaction densities can be achieved.
- 3.2.8 Shape each layer to smooth contour and compact to specified density before succeeding layer is installed.
- 3.2.9 Prior to closing down operations for each working day, all granular materials shall be bladed and compacted to the specified density.
- 3.2.10 Each layer of material shall be bladed, shaped and compacted as necessary to produce the required profile and cross-section.

3.3 Compaction

- 3.3.1 Compaction equipment shall be capable of obtaining required material densities. In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- 3.3.2 All Granular Base materials placed on the roadway shall be compacted to not less than 100% of the Maximum Standard Proctor Dry Density ASTM D698-00a.
- 3.3.3 Compaction operations shall be carried out as closely as possible behind the placing and spreading operation.
- 3.3.4 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- 3.3.5 Correct surface irregularities by loosening and adding or removing material until surface is within the specified tolerance.
- 3.3.6 At the end of each working day, all materials placed shall have been compacted to the specified density.
- 3.3.7 Each layer of material shall be graded and compacted as specified before the next layer is placed.
- 3.3.8 When necessary to obtain the required density, the Contractor shall apply sufficient water by means of an approved distributor.

3.4 Tolerances

- 3.4.1 The finished aggregate base surface shall be within 10 mm of established grade and cross section but not uniformly high or low.

3.5 Maintenance

- 3.5.1 Maintain finished base in a condition conforming to this section until succeeding material is applied or until acceptance.

4. Measurement and Basis for Payment

4.1 Measurement for Payment

- 4.1.1 Measurement for payment will only be made for those materials accepted for use under this specification and then only when incorporated into the work at the required locations and thicknesses as indicated on the Contract Documents.
- 4.1.2 Granular Base materials will be measured in tonnes of material incorporated into the work within the areas and to the thicknesses indicated on the Contract Drawings unless otherwise specified.
- 4.1.3 Weigh Scales shall be provided by the Contractor and shall conform to current Provincial standards. The Contractor shall submit a calibration certificate for the Weigh Scales after setup at the work site. The Contractor shall supply scale tickets, and the Departmental Representative will issue tickets. Only loads certified by the Departmental Representative as being placed in the works at the required locations shall be included in measurements for payment. The weight shall be computed in tonnes, rounded to one decimal place.
- 4.1.4 Backfilling of sub-grade with suitable materials will be measured for payment as imported backfill.