

1. General

1.1 Section Includes

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

1.2 Related Sections

- Section 31 05 16 – Aggregate Materials.
- Section 32 11 23 – Granular Base.
- Section 31 05 10 - Corrected maximum Dry Density for Fill.

1.3 References

- 1.3.1 American Society for Testing and Materials (ASTM):

- ASTM C117-95, 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) (2700 kN-m/m³).
- ASTM D 4318-00, 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.

1.5 Waste Management and Disposal

- 1.5.1 Separate and recycle waste material.

2. Products

2.1 Materials

- 2.1.1 Granular 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, ochre 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 sub-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 sub-base material to the following requirements: Gradation to be within following limits when tested to ASTM C136-96a and ASTM C117-95. 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 D11-87.

ASTM Sieve Designation	% Passing
50.8 mm	75-100
15.9 mm	45-80
4.76 mm	25-55
1.20 mm	12-35
0.300 mm	7-20
0.075 mm	3-6 (Pit Source)
0.075 mm	3-8 (Rock Source)

2.1.6 Granular sub-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-Grade

3.1.1 Placement of Granular Sub-base material shall not commence until the Departmental Representative has inspected and approved the Sub-grade.

3.2 Installation of Sub-base Material

3.2.1 Install granular sub-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 sub-base material is installed.

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

3.2.4 Do not place any sub-base material where there is standing water present. If standing water is present reshape sub-grade to conform to cross slopes indicated in the Contract Documents.

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

3.2.6 Install granular sub-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. Departmental Representative may authorize thicker lifts if specified compaction 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 sub-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 surface shall not deviate at any place on a 3 m straight edge by more than 20 mm for granular sub-base.
- 3.4.2 This upper layer shall be maintained to these tolerances and to the specified density until the granular base material is placed.
- 3.4.3 This may require keeping the moisture content at the appropriate value during periods of dry weather in addition to re-grading and re-compacting as frequently as may be deemed necessary by the Departmental Representative.

3.5 Maintenance

- 3.5.1 Maintain finished sub-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 Sub-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 Excavation of sub-base and sub-grade materials to correct deficiencies in sub-grade (soft areas) discovered during placing of base or sub-base will be measured for payment as common excavation under Standard Specification 31 00 00 – Earthwork & Related Work.
- 4.1.5 Backfilling of sub-grade with suitable materials will be measured for payment as imported backfill under Standard Specification 31 00 00 – Earthwork & Related Work.

4.2 Basis for Payment

- 4.2.1 All costs associated with work specified in this section shall be deemed to be included in the unit price per tonne for Granular Sub-Base in the Schedule of Quantities and Prices.