

PART 1 - GENERAL

- 1.1 Related Sections
- .1 Section 01 45 01 Weigh Scales.
 - .2 Section 31 05 16 Aggregates – General.
 - .3 Section 31 23 10 Excavation, Trenching and Backfilling
 - .4 Section 32 11 23 Granular Base
- 1.2 Measurement Procedures
- .1 Granular Sub-Base (0-75mm): Granular Sub-Base to be measured in tonnes, (Tonnes), of material supplied and acceptably placed in the works to the lines and grades specified.
 - .2 Mobilization/demobilization of equipment will not be measured separately for payment, but will be considered as incidental to the work of this section.
 - .3 Construction and maintenance of haul road will not be measured separately for payment, but will be considered as incidental to the work of this section.
 - .4 Weighing will not be measured separately for payment, but will be considered as incidental to the work of this section.
- 1.3 References
- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C88-05, Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.
 - .2 ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .4 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM D422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils.

- .6 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600kNm/m³))
- .7 ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³ (2,700 kn-m/m³)).
- .8 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .9 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

PART 2 - PRODUCTS

2.1 Materials

- .1 Granular sub-base material: to Section 31 05 16
Aggregates - General and following requirements:
 - .1 Crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
 - .2 Gradations to be within following limits when tested to ASTM C136 and ASTM C117 and to have a smooth curve without sharp breaks when plotted on a semi-log grading chart. Sieve sizes to CAN/CGSB-8.1.

ASTM % PASSING	
SIEVE	BY
DESIGNATION	WEIGHT
75.0 mm	100
63.0 mm	95 - 100
50.0 mm	85 - 100
37.5 mm	73 - 95

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
0.300 mm	4 - 16
0.075 mm	0 - 9

- .3 Liquid Limit: to ASTM D4318 Maximum 25.
- .4 Plasticity Index: to ASTM D4318 Maximum 6.
- .5 Los Angeles Abrasion: to ASTM C131, Gradation 'A' Max. % loss by weight: 35.
- .6 Crushed particles: at least 60% of particles by mass retained on the 4.75 mm sieve to have at least one freshly fractured face.
- .7 Petrographic Number (maximum) 135.
- .8 Magnesium Sulphate Soundness to ASTM C88, max. % by mass:15.
- .9 Flat and elongated particles: maximum % by mass: 15.

PART 3 - EXECUTION

- 3.1 Inspection of Subgrade Surface
 - .1 Do not place granular sub-base until finished sub-grade is inspected and approved by Departmental Representative.
- 3.2 Placing
 - .1 Ensure no frozen material is placed in work.
 - .2 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.
 - .3 Begin spreading sub-base material on crown line or high side of one-way slopes.
 - .4 Place granular sub-base materials using methods which do not lead to segregation or degradation.
 - .5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
 - .6 Shape each layer to smooth contour and compact to the

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- specified density before succeeding layer is placed.
- .7 Remove and replace portion of layer in which material has become segregated during spreading.
- 3.3 Compaction Equipment
- .1 Compaction equipment must be capable of obtaining required densities in materials used in the Work.
- .2 Compaction equipment is to be hand operated within 2.0 metres behind wall.
- 3.4 Compacting
- .1 Compact to a density not less than 95% in accordance with ASTM D698.
- .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .3 Apply water as necessary during compaction to obtain specified density. If sub-base is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
- .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental representative.
- 3.5 Finish Tolerances
- .1 Finished compacted surface to be within plus or minus 20 mm of established grade, but not uniformly high or low.
- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.6 Maintenance
- .1 Maintain finished sub-base in a condition conforming to this section until succeeding base is constructed.

PART 1 - GENERAL

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| <p>1.1 <u>Related Sections</u></p> | <p>.1 Section 01 45 01 Weigh Scales</p> <p>.2 Section 31 05 16 Aggregates - General</p> <p>.3 Section 31 23 10 Excavation, Trenching and Backfilling</p> <p>.4 Section 32 11 16 Granular Sub-base</p> |
| <p>1.2 <u>Measurement Procedures</u></p> | <p>.1 <u>Granular Base (0-31.5mm)</u>: to be measured in tonnes, (Tonnes), of material supplied and acceptably placed in the works to the lines and grades specified.</p> <p>.2 Mobilization/demobilization of equipment will not be measured separately for payment, but will be considered as incidental to the work of this section.</p> <p>.3 Construction and maintenance of haul roads will not be measured separately for payment, but will be considered as incidental to the work of this section.</p> <p>.4 Weighing will not be measured separately for payment, but will be considered as incidental to the work of this section.</p> |
| <p>1.3 <u>References</u></p> | <p>.1 American Society for Testing and Materials (ASTM)</p> <p>.1 ASTM C88-05, Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.</p> <p>.2 ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.</p> <p>.3 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.</p> <p>.4 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.</p> <p>.5 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.</p> |

- .6 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600kNm/m³))
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- .8 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

PART 2 - PRODUCTS

2.1 Materials

- .1 Granular base material: to Section 31 05 16 Aggregates - General and following requirements:
 - .1 Crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
 - .2 Gradations to be within following limits when tested to ASTM C136 and ASTM C117 and to have a smooth curve without sharp breaks when plotted on a semi-log grading chart. Sieve sizes to CAN/CGSB-8.1.

<u>SIEVE DESIGNATION</u>	<u>PASSING BY WEIGHT</u>
37.5 mm	100
31.5 mm	95 - 100
25.0 mm	81 - 100
19.0 mm	66 - 90
12.5 mm	50 - 77
9.5 mm	41 - 70
4.75 mm	27 - 54
2.36 mm	17 - 43

1.18 mm	11 - 32
300 µm	4 - 19
75 µm	0 - 8

- .3 Liquid Limit: to ASTM D4318 Maximum 25.
- .4 Max. % loss by weight: 35.
- .5 Crushed particles: at least 60% of particles by mass retained on the 4.75 mm sieve to have at least two freshly fractured face.
- .6 Petrographic Number (maximum) 135.
- .7 Magnesium Sulphate Soundness to ASTM C88, max. % by mass: 15.
- .8 Flat and elongated particles: maximum % by mass: 15.

PART 3 - EXECUTION

3.1 Inspection of Underlying Subgrade Surface

- .1 Do not place granular base until finished granular sub-base is inspected and approved by Departmental Representative.

3.2 Placing

- .1 Ensure no frozen or blended recycled asphalt product is placed with granular base material.
- .2 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.
- .3 Begin spreading base material on crown line or high side of one-way slopes.
- .4 Place granular base materials using methods which do not lead to segregation or degradation of aggregate.
- .5 Place granular base immediately upon approval of granular sub-base placement.
- .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
- .7 Shape each layer to a smooth contour and compact to specified density before succeeding layer is placed.

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- .8 Remove and replace portion of a layer in which material becomes segregated during spreading.
- 3.3 Compacting Equipment
- .1 Compact to a density not less than 98% in accordance with ASTM D698.
- .2 Shape and roll alternately to obtain a smooth, even and uniformly compacted base.
- .3 Apply water as necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
- .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- 3.4 Finish Tolerances
- .1 Finished base surface shall be within plus or minus 10 mm of established grade, but not uniformly high or low.
- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.