

PART 1 - GENERAL

<u>1.1</u>	<u>Related Sections</u>	.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
<u>1.2</u>	<u>Measurement Procedures</u>	.1	<u>Granular Sub-Base (0-75mm)</u> : 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.
<u>1.3</u>	<u>References</u>	.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

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

		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

1.1	<u>Related Sections</u>	.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 16 Granular Sub-base
1.2	<u>Measurement Procedures</u>	.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.
		.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 roads 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	<u>References</u>	.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.
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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 <u>Compacting Equipment</u> | .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 <u>Finish Tolerances</u> | .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. |