

Wharf Reconstruction, Structures 406, 408 and 409 Lameque, NB Project No. R.068072.001	GRANULAR SUB-BASE	Section 32 11 16 Page 1 2014/12/01
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PART 1 - GENERAL

<u>1.1 Related Sections</u>	.1	Section 01 45 01 Weigh Scales
	.2	Section 31 05 16 Aggregates - General
	.3	Section 31 23 10 Excavation and Backfill
	.4	Section 32 11 23 Granular Base
<u>1.2 Measurement Procedures</u>	.1	<u>Granular Sub-Base</u> : Granular Sub-Base to be measured in metric 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.
	.3	Construction and maintenance of haul road will not be measured separately for payment.
	.4	Weighing will not be measured separately for payment, but will be considered as incidental to the work of this section.
<u>1.3 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/ft ³)

- (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: 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 DESIGNATION	BY 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

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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 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, (Standard Proctor).
- .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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| <u>1.1 Related Sections</u> | .1 | Section 01 45 01 Weigh Scales |
| | .2 | Section 31 05 16 Aggregates - General |
| | .3 | Section 31 23 10 Excavation and Backfill |
| | .4 | Section 32 11 16 Granular Sub-base |
| <u>1.2 Measurement Procedures</u> | .1 | <u>Granular Base</u> : to be measured in metric 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. |
| | .3 | Construction and maintenance of haul roads will not be measured separately for payment. |
| | .4 | Weighing will not be measured separately for payment, but will be considered as incidental to the work of this section. |
| <u>1.3 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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| | .4 | ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils. |
| | .5 | ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates. |
| | .6 | ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600kNm/m ³)) |
| | .7 | ASTM D1557-12, Standard Test Methods for |

Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³ (2,700kN-m/m³)).
.8 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted 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 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.

SIEVE DESIGNATION	PASSING BY WEIGHT
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.
- .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 95% in accordance with ASTM D698, (Standard Proctor).
- .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.

PART 1 - GENERAL

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| <u>1.1 Description</u> | .1 | This section specifies requirements for supply, hauling, placing, shaping and compacting hot mix asphalt concrete paving as shown on drawings. |
| <u>1.2 Source Sampling</u> | .1 | Inform Departmental Representative of proposed source of aggregates and provide access for sampling. |
| | .2 | If requested, at least 1 week prior to commencing work submit samples of following materials proposed for use. |
| | .1 | One 5 litre container of asphalt cement. |
| | .3 | If materials have been tested by an independent testing laboratory within previous 2 months and have successfully passed tests equal to requirements of this specification, disregard above instructions and submit test certificates from testing laboratory showing suitability of materials for this project. |
| <u>1.3 Measurement Procedures</u> | .1 | <u>Asphalt Paving</u> : The asphalt pavement will be measured for payment in square metres, (M ²), acceptably installed in the work as specified, calculated from theoretical neat dimensions indicated on plans or as authorized in writing by the Departmental Representative. Payment will include all equipment, labour and material to complete the work. |
| | .2 | The supply of asphalt cement, tack coat will not be measured for payment but considered incidental to the work. |
| <u>1.4 References</u> | .1 | New Brunswick Department of Transportation (NBDOT) Standard Specifications 2011. |

PART 2 - PRODUCTS

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| <u>2.1 Materials</u> | .1 | All materials to meet the New Brunswick Department of Transportation (NBDOT) specification for asphaltic concrete. Asphalt cement to ASTM D946, performance grade PG 58-34. Unless otherwise indicated, Pavement Structure to consist of the following: |
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- .1 Asphalt Concrete Surface course – (NBDOT Type D) 90 mm thick.
- .2 Asphalt Concrete base course – (NBDOT Type B) 40 mm thick.
- .2 The Contractor will supply previous test results of the proposed materials for review and approval.
- .3 Submit job mix formula to Departmental Representative for approval. Design of mix to meet NBDOT specification. Do not change job-mix without prior approval. Should change in material source be proposed, a new job-mix formula to be provided to the Departmental Representative.

PART 3 - EXECUTION

3.1 General

- .1 Requirements for the plant and equipment used and the mixing, transportation, placing, compaction and rolling of the materials to meet NBDOT specification unless otherwise indicated or directed.

3.2 Preparation

- .1 Reshape granular bed as required to attain proper drainage as directed.
 - .1 Place asphaltic concrete to depths, widths and lines indicated or as directed by the Departmental Representative.
- .2 The contractor will need to match the new grades with the existing adjacent asphalt pavement surfaces to ensure that service and parking lot area drainage will drain to the existing catch basins.

3.3 Placing

- .1 Place asphaltic concrete to depths, widths and lines indicated or as directed by the Departmental Representative.
- .2 The maximum thickness of asphalt to be placed per lift is 50mm. The finish elevation of the asphalt over the existing pavement on the ramp should have a uniform surface as much as possible.

3.4 Finish Tolerances

- .1 Finished asphalt surface to be within 5 mm of design

elevation but not uniformly high or low.

- .2 Finished asphalt surface not to have irregularities exceeding 5 mm when checked with a 4 m straight edge placed in any direction.
- .3 Finish surface smooth, true to grade to following tolerances:
 - .1 Base Course: 7mm in 3m.
 - .2 Seal Course: 3mm in 3m.

3.5 Defective Work

- .1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form a true and even surface and compact immediately to specified density.
- .2 Repair areas showing checking or hairline cracking.