

Electrical System Upgrade**Larry's River****Guysborough County, NS****Project No. R.094341.001**

Granular Sub-Base and Backfill

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PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- 1.2 Reference Standards .1 ASTM D698-91 (or latest edition) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) - Method C.
- 1.3 Measurement for Payment .1 Granular sub-base will be measured in accordance with **Section 01 29 00**.
- .2 Backfill will be measured in accordance with **Section 01 29 00**.

PART 2 - PRODUCTS

- 2.1 Materials .1 Granular sub-base material to **Section 31 05 17** 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 Type 2 granular material gradation will be within the following limits:

ASTM SIEVE SIZE	% PASSING BY MASS
56 mm	100
28 mm	60 - 80
5 mm	25 - 45
0.160 mm	0 - 10

- .3 Backfill material shall be material removed during demolition and removal operations provided the material is sorted such that it

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is free of dredge spoils, timber debris or concrete pieces greater than 300 mm diameter and is approved by the *Departmental Representative*.

- .4 The use of additional backfill material other than the material on site is subject to the approval of the *Departmental Representative* and is to be free from rocks larger than 150 mm, cinders, ashes, sods, refuse, or other deleterious materials.

PART 3 - EXECUTION

3.1 Inspection of
Existing Sub-Base
Surface

- .1 Do not place new granular sub-base until underlying backfill material is compacted, inspected and approved by the *Departmental Representative*.

3.2 Placing

- .1 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow or ice.
- .2 Place Type 2 and backfill material to full width in uniform layers not exceeding 200 mm compacted thickness. *Departmental Representative* may authorize thicker lifts (layers) if specified compaction can be achieved.
- .3 Shape each layer to a smooth contour and compact to specified density before the succeeding layer is placed.
- .4 Remove and replace portion of a layer in which material has become segregated during spreading.

3.3 Compacting

- .1 Compact to density of not less than 98% maximum dry density in accordance with ASTM D698.
- .2 Shape and roll alternately to obtain a smooth, even and uniformly compacted sub-base.

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- 3.4 Finish Tolerances
- .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 approved mechanical tampers.
- 3.5 Maintenance
- .1 Backfill material will be compacted to the thickness as required to attain the grades indicated on the drawings.
 - .2 Finish compacted surface to within plus or minus 25 mm of established grade but not uniformly high or low.
 - .3 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by *Departmental Representative*.
 - .2 *Departmental Representative* will pay costs for inspection and testing. Refer to **Section 01 45 00.**

PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- 1.2 Reference Standards .1 ASTM D698-91 (or latest edition) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) - Method C.
- 1.3 Measurement for Payment .1 Granular base will be measured in accordance with **Section 01 29 00**.

PART 2 - PRODUCTS

- 2.1 Materials .1 Granular Base: Material to **Section 31 05 17** 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 Type 1 granular material gradation will be within following limits:

ASTM SIEVE SIZE	% PASSING BY MASS
20 mm	100
14 mm	50 - 85
5 mm	20 - 50
0.16 mm	0 - 10
0.080 mm	0 - 7

PART 3 - EXECUTION

- 3.1 Inspection of Underlying Sub-Base .1 Do not place granular base until finished sub-base surface is inspected and approved by *Departmental Representative*.

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Granular Base

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| 3.2 <u>Placing</u> | .1 | Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice. |
| | .2 | Place using methods which do not lead to segregation or degradation of aggregates. |
| | .3 | Place material to full width in a uniform layer to 150mm compacted thickness. |
| | .4 | Shape each layer to a smooth contour and compact to specified density before succeeding layer is placed. |
| 3.3 <u>Compacting</u> | .1 | Compact to density not less than 98% maximum dry density 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 approved mechanical tampers. |
| 3.4 <u>Finish</u>
<u>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. |
| 3.5 <u>Maintenance</u> | .1 | Maintain finished base in a condition conforming to this section until succeeding material is applied or until acceptance. |

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Hot Mix Asphalt Concrete Paving

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PART 1 - GENERAL

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| 1.1 | <u>Description</u> | .1 | This section specifies requirements for supplying, hauling, placing, shaping and compacting of hot-mix asphalt concrete. |
| 1.2 | <u>Reference Standards</u> | .1 | ASTM C136-96a, Sieve Analysis of Fine and Coarse Aggregates. |
| | | .2 | ASTM D995-95b, Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures. |
| | | .3 | ASTM D1559-89, Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus. |
| | | .4 | ASTM D3203-94, Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures. |
| 1.3 | <u>Related Work Specified Elsewhere</u> | .1 | Refer to other Specification Sections for related information. |
| 1.4 | <u>Source Sampling</u> | .1 | Inform <i>Departmental Representative</i> of proposed source of asphaltic concrete, and provide access for sampling at least [two] weeks prior to commencing hauling this material to plant site. |
| 1.5 | <u>Production Sampling</u> | .1 | Use only material approved by <i>Departmental Representative</i> . |
| | | .2 | One or more samples per day to be taken of mix, or components thereof, being produced to determine compliance with general and special requirements. |
| 1.6 | <u>Measurement For Payment</u> | .1 | Hot mix asphalt paving will be measured in accordance with Section 01 29 00 . |
| | | .2 | Regrading of base material prior to placement of new asphalt will be considered incidental to the work. |

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PART 2 - PRODUCTS

2.1 Materials

- .1 Hot-mix Asphaltic Concrete design mix formula to be provided to *Departmental Representative* [two] weeks prior to commencing paving operations. Submit design mix for review providing at least the following information:
 - .1 Nominal aggregate size
 - .2 Marshall strength at 60°C
 - .3 Marshall stability at 60°C
 - .4 Flow Index
 - .5 Percent Air Voids in Mixture
 - .6 Min. % Voids in Mineral Aggregate
 - .7 Retained Stability
- .2 *Departmental Representative* may approve use of current grading requirements of Nova Scotia Department of Transportation Standard Specification for Pavement mixture.
- .3 Do not change job mix without prior approval of *Departmental Representative*. Should a change in a material source be contemplated, a new job mix formula is to be provided to the *Departmental Representative* and approved prior to installation.

PART 3 - EXECUTION

3.1 Equipment

- .1 Pavers:
Provide mechanical grade controlled self powered pavers capable of spreading mix, within specified tolerances, true to line, grade, and crown indicated on plans.
- .2 Rollers:
Provide sufficient number of rollers of type and weight to obtain specified density of compacted mix.
- .3 Haul Trucks: Provide trucks of such size, speed and condition to ensure orderly and continuous operation and as follows:
 - .1 Boxes with tight metal bottoms.

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- .2 Covers of sufficient size and mass to completely cover and protect asphalt mix when truck fully loaded.
 - .3 In cool weather or for long hauls, insulate entire contact area of each box.
 - .4 Trucks which cannot be weighed in a single operation on scales supplied will not be accepted.
 - .4 Hand Tools:
 - .1 Provide lutes or rakes with covered teeth during spreading operation when finishing by hand.
 - .2 Provide straight edges, 2.4 m in length to test finished surface.
 - .3 Provide tamping irons having weight not less than 12 kg and a bearing area not exceeding 310 sq. cm for consolidating material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, approved by *Departmental Representative*, may be used instead of tamping irons.
 - 3.2 Preparation
 - .1 When paving over existing asphalt surface, clean pavement surface to remove dust, contaminants, loose and foreign materials, oil and grease.
 - .2 Prior to laying mix, clean surfaces of loose and foreign material.
 - 3.3 Transportation of Mix
 - .1 Transport mix to job site in vehicles cleaned of foreign material which may affect mix.
 - .2 Paint or spray truck beds with light oil, limewater, soap or detergent solution, at least once a day or as often as required. After this operation, elevate truck bed and thoroughly drain; no excess solution is permitted.

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3.4 Placing.1 General

- .1 Place asphalt mixtures only when base of lower course is dry and air temperature is above 5°C.
- .2 When surface temperature on which material is to be placed falls below 10°C, provide extra rollers to compact mix before it cools too much to obtain required density.
- .3 Do not mix and place hot-mix asphalt when moisture of aggregate in stockpile or from dryer interferes with quality of mix production or with normal plant operations, or when pools of water are observed on surface to be paved.
- .2 Construct asphalt concrete to depth, width, and grade to match existing adjacent surfaces.
- .3 Place asphalt concrete mix at temperature not less than 120°C at time of placing.
- .4 Place asphalt concrete mix in two layers, not exceeding 50mm compacted thickness each.
- .5 Commence spreading at high side of pavement or at crown.
- .6 Employ experienced rakers to correct irregularities prior to rolling.
- .7 Spread and strike off mixture with self-propelled mechanical finisher.
 - .1 Construct longitudinal joints and edges to true line markings.
 - .2 When paving against a compacted mixture that has cooled, paint edge of previously laid lane with a thin coating of asphaltic material or heat joint with an Infra Red-type joint heater mounted on side of paving machine.
 - .3 When segregation occurs, immediately suspend spreading operation until cause is determined and corrected.

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- .4 Correct irregularities in alignment left by paver by trimming directly behind machine.
 - .5 Correct irregularities in surface of pavement course directly behind paver.
 - .8 When hand spreading is used:
 - .1 Distribute material uniformly. Broadcasting of material will not be permitted.
 - .2 Provide heating equipment used for keeping hand tools free from asphalt. Prevent high heating temperatures which may burn material. Temperature of tools when used shall not be greater than temperature of mix being placed.
 - 3.5 Compacting
 - .1 Start rolling operations as soon as placed mixture can bear mass of roller without undue displacement of material or cracking of surface.
 - .2 Operate roller slowly initially to avoid displacement of material. Subsequent rolling not to exceed 5 km/h for steel-wheeled rollers and 8 km/h for pneumatic-tired rollers.
 - .3 Overlap successive trips of roller by at least one half width of roller and alternate trip lengths.
 - .4 Keep wheels of roller slightly moistened with water to prevent pick-up of material, but do not over water.
 - .5 Roll material continuously to a density not less than 98% of density obtained with marshall specimen prepared from plant mix.
 - .6 General:
 - .1 Provide minimum two rollers paver and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller must be a pneumatic-tired type.

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- .2 Operate rollers at a slow but uniform speed with drive roll or wheel nearest paver.
 - .3 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling. Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
 - .7 Breakdown Rolling:
 - .1 Commence breakdown rolling immediately following rolling of longitudinal joint and edges.
 - .2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.
 - .3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or super-elevated sections.
 - .4 Use only experienced roller operators for this work.
 - .8 Second Rolling:
 - .1 Use pneumatic-tired, tandem or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix is still of a temperature that will result in maximum density from this operation.
 - .2 Rolling shall be continuous after initial rolling until mix placed has been thoroughly compacted.
 - .9 Finish Rolling:
 - .1 Accomplish finish rolling with two-axle tandems or three-axle tandems while material is still warm enough for removal of roller marks. If necessary to obtain desired surface finish, *Departmental Representative* shall specify use of pneumatic-tired rollers.

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- .2 Conduct rolling operations in close sequence.

3.6 Joints

- .1 General:
 - .1 Trim vertical face to provide true surface and cross section against which new pavement may be laid. Remove loose particles.
 - .2 Paint joint face with thin coat of hot asphalt cement or cut back asphalt or preheat joint face with approved heater, prior to placing of fresh mixture.
 - .3 Overlap previously laid strip with spreader by 100 mm.
 - .4 Rake fresh mixture against joint and thoroughly tamp and roll.
 - .5 Remove any material from surface of previously laid strip.
 - .6 Do not throw surplus material on freshly screened mat surface.
- .2 Longitudinal Joints:
 - .1 Roll longitudinal joints directly behind paving operation.
 - .2 Before rolling, carefully remove with a lute or rake, and discard coarse aggregate in material overlapping joint.
 - .3 Ensure joints are offset at least 150 to 200 mm from those in lower layers.

3.7 Finish Tolerances

- .1 Finish pavement surfaces smooth and true to design line, crown, and grade.
- .2 Remove irregularities exceeding 5 mm when checked with a 2.4 m long straight edge placed in any direction and replace with new material and compact.
- .3 Use straight edge at transverse joints and along pavement to check for surface irregularities.

3.8 Defective Work

- .1 Repair areas showing checking or hairline cracking to the approval of the *Departmental Representative*.