
Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 16 – Aggregate Materials.
- .2 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

- .1 ASTM International, latest edition
 - .1 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Ontario Ministry of Transportation, latest edition
 - .1 LS-618, Micro-Deval Abrasion of Coarse Aggregate
 - .2 LS-619, Micro-Deval Abrasion of Fine Aggregate
 - .3 LS-614, Freezing and Thawing of Coarse Aggregate
 - .4 LS-608, Percent Flat and Elongated Particles in Coarse Aggregate
- .3 AASHTO, latest edition
 - .1 T-89, Standard Method of Test for Determining the Liquid Limit of Soils
 - .2 T-90, Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils
- .4 New Brunswick Department of Transportation and Infrastructure Standard Specifications (most recent version):
 - .1 NBDTI Standard Specification Item 201 – Production of Highway Aggregates
 - .2 NBDTI Standard Specification Item 203 – Aggregate Base/Subbase

Part 2 Products

2.1 MATERIALS

- .1 Granular Sub-Base material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Crushed rock.
 - .2 Granular Sub-Base shall not consist of sandstone.

- .3 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117.

- .4 Table 1

Sieve Designation	Percent Passing
90.0 mm	100
75.0 mm	95 – 100
63.0 mm	86 - 100
50.0 mm	75 - 95
37.5 mm	61 - 87
19.0 mm	38 – 70
9.5 mm	28 – 56
4.75 mm	19 – 46
2.36 mm	13 – 37
1.18 mm	9 – 30
0.300 mm	4 – 16
0.075 mm	0 - 7

- .5 Other properties as follows:
- .1 Fractured particles, one face: to ASTM D5821, Minimum 95%.
 - .2 Coarse Micro-Deval: to LS-618, Maximum 25%.
 - .3 Fine Micro-Deval: to LS-619, Maximum 25%.
 - .4 Freeze Thaw: to LS-614, Maximum 25%.
 - .5 Flat & Elongated Particles (4:1 ratio): to LS-608, Maximum 35%.
 - .6 Plasticity Index: to AASHTO T89 and T90, Maximum 3.

Part 3 Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

3.2 PLACING

- .1 Place Granular Sub-Base after subgrade is inspected and approved by Departmental Representative.
- .2 Construct Granular Sub-Base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.

- .5 Begin spreading Granular Sub-Base material on crown line or high side of one-way slope.
- .6 Place Granular Sub-Base material using methods which do not lead to segregation or degradation.
- .7 Place Granular Sub-Base material to full width in uniform layers not exceeding 250 mm compacted thickness.
 - .1 Engineer may authorize thicker lifts if specified compaction can be achieved.
- .8 Shape each layer to smooth contours and compact to specified density before succeeding layer is placed.
- .9 Remove and replace portion of layer in which material has become segregated during spreading.

3.3 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact Granular Sub-Base to density of not less than 98% maximum dry density in accordance with ASTM D698.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.4 SITE TOLERANCES

- .1 Finished Granular Sub-Base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.5 PROTECTION

- .1 Maintain finished Granular Sub-Base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 16 – Aggregate Materials.
- .2 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

- .1 ASTM International, latest edition
 - .1 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .5 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Ontario Ministry of Transportation, latest edition
 - .1 LS-618, Micro-Deval Abrasion of Coarse Aggregate
 - .2 LS-619, Micro-Deval Abrasion of Fine Aggregate
 - .3 LS-614, Freezing and Thawing of Coarse Aggregate
 - .4 LS-608, Percent Flat and Elongated Particles in Coarse Aggregate
- .3 AASHTO, latest edition
 - .1 T-89, Standard Method of Test for Determining the Liquid Limit of Soils
 - .2 T-90, Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils
- .4 New Brunswick Department of Transportation and Infrastructure Standard Specifications (most recent version):
 - .1 NBDTI Standard Specification Item 201 – Production of Highway Aggregates
 - .2 NBDTI Standard Specification Item 203 – Aggregate Base/Subbase

Part 2 Products

2.1 MATERIALS

- .1 Aggregate Base Course material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Crushed rock.
 - .2 Aggregate Base Course shall not consist of sandstone.

- .3 Gradations to be within limits specified in Table 1 when tested to ASTM C136 and ASTM C117.

.2 Table 1

Sieve Designation	Percent Passing
37.5 mm	100
31.5 mm	95 - 100
25.0 mm	83 - 100
19.0 mm	70 - 90
12.5 mm	55 - 78
9.5 mm	45 - 72
4.75 mm	30 - 57
2.36 mm	20 - 46
1.18 mm	14 - 35
0.300 mm	5 - 19
0.075 mm	0 - 6

.3 Other properties as follows:

- .1 Fractured particles, one face: to ASTM D5821, Minimum 95%.
- .2 Coarse Micro-Deval: to LS-618, Maximum 25%.
- .3 Fine Micro-Deval: to LS-619, Maximum 25%.
- .4 Freeze Thaw: to LS-614, Maximum 25%.
- .5 Flat & Elongated Particles (4:1 ratio): to LS-608, Maximum 35%.
- .6 Plasticity Index: to AASHTO T89 and T90, Maximum 3.

- .4 Shoulder material shall be Reclaimed Asphalt Product (RAP) generated from cold milling Route 117 and supplied from stockpile under Section 02 41 13.14 – Asphalt Paving Removal.

Part 3 Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

3.2 PLACING

- .1 Place Aggregate Base Course after subgrade is inspected and approved by Departmental Representative.

- .2 Construct Aggregate Base Course to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Begin spreading Aggregate Base Course material on crown line or high side of one-way slope.
- .6 Place Aggregate Base Course material using methods which do not lead to segregation or degradation.
- .7 Place material to full width in uniform layers not exceeding 250 mm compacted thickness.
 - .1 Engineer may authorize thicker lifts if specified compaction can be achieved.
- .8 Shape each layer to smooth contours and compact to specified density before succeeding layer is placed.
- .9 Remove and replace portion of layer in which material has become segregated during spreading.
- .10 Shoulder material (RAP) shall be placed as indicated on the Contract Drawings and at other locations within the Park as directed by the Departmental Representative.

3.3 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact Aggregate Base Course to density of not less than 100% maximum dry density in accordance with ASTM D698.
 - .1 Compaction of RAP for shoulder materials and as placed on other areas within the Park shall be based on attaining maximum density as determined from a test rolling strip.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Engineer.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.4 SITE TOLERANCES

- .1 Finished Aggregate Base Course surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.5 PROTECTION

- .1 Maintain finished Aggregate Base Course in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 12 16 – Asphalt Paving.

1.2 REFERENCES

- .1 ASTM International, latest edition
 - .1 ASTM D140/D140M, Standard Practice for Sampling Bituminous Materials.
- .2 New Brunswick Department of Transportation and Infrastructure Standard Specifications (most recent version):
 - .1 NBDTI Standard Specification Item 259 – Bituminous Tack Coat

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide 3 days of notice in advance of the application of bituminous tack coat.
- .3 Submit manufacturer's instructions, printed product literature and data sheets for asphalt tack coat and include product characteristics, performance criteria, physical size, finish and limitations.
- .4 Provide access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work.

1.4 QUALITY ASSURANCE

- .1 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.

Part 2 Products

2.1 MATERIALS

- .1 Anionic emulsified asphalt: RS-1 or CRS-1 to provisions of ASTM D977 and D2397.

2.2 EQUIPMENT

- .1 Equipment required for Work of this Section to be in satisfactory working condition and maintained for duration of Work.
- .2 Pressure distributor:
 - .1 Designed, equipped, maintained and operated so that asphalt material can be:
 - .1 Maintained at even temperature.
 - .2 Applied uniformly on variable widths of surface up to 5 m.

- .3 Applied at readily determined and controlled rates from 0.2 to 5.4 L/m² with uniform pressure, and with allowable variation from any specified rate not exceeding 0.1 L/m².
- .4 Distribute in uniform spray without atomization at temperature required.
- .2 Equipped with meter, registering travel in metres per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
- .3 Equipped with pump having flow meter graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
- .4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
 - .1 Measure temperature to closest whole number.
- .5 Equipped with accurate volume measuring device or calibrated tank.
- .6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
- .7 Equipped with nozzle spray bar, with operational height adjustment in increments of 0.6 metres and capable of being raised or lowered.
- .8 Cleaned if previously used with incompatible asphalt material.

Part 3 Execution

3.1 APPLICATION

- .1 Apply asphalt tack coat only on clean and dry surface.
- .2 Apply asphalt tack coat in a uniform manner without streaking at a rate of 0.15 to 0.25 L/m² or as directed by the Departmental Representative.
- .3 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.
- .4 Apply asphalt tack coat only when air temperature greater than 10 degrees C, when the surface to be treated is dry and when rain is not forecast within 2 hours minimum of application.
- .5 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.
- .6 Where traffic is to be maintained, treat no more than one half of width of surface in one application.
- .7 Keep traffic off tacked areas until asphalt tack coat has set (break).
- .8 Do not place new asphalt mix until asphalt tack coat has set (break).
- .9 Re-tack contaminated or disturbed areas as directed by Departmental Representative.
- .10 Submit summary report within 7 days minimum of date of application and include information as follows:

- .1 Total area tack coated.
- .2 Quantity of tack coat used.
- .3 Mean application rate.
- .4 Actual product quantity used when using equipment on pressure distributors.
- .5 Dipstick measurements or electronic printouts are acceptable.
- .11 Inspect tack coat application to ensure uniformity.
 - .1 Re-spray areas of insufficient or non-uniform tack coat coverage as directed by Departmental Representative.
 - .2 Ensure tack coating performed using hand held devices is consistent in appearance with adjacent areas of machine applied material.

3.2 CLEANING

- .1 Leave Work area clean at end of each day.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 31 05 17 - Aggregate Materials.

1.2 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

- .1 Reclaimed asphalt pavement (RAP) is to be incorporated into base course and only RAP obtained from this project is to be used.

1.3 REFERENCES

- .1 American Association of State Highway and Transportation Officials (AASHTO), latest edition
 - .1 AASHTO M320, Standard Specification for Performance Graded Asphalt Binder.
 - .2 AASHTO R29, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.
 - .3 AASHTO T245, Standard Method of Test for Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.
- .2 Asphalt Institute (AI)
 - .1 AI SP-2, Third Edition, Superpave Mix Design.
- .3 ASTM International, latest edition
 - .1 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C117, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C123, Standard Test Method for Lightweight Particles in Aggregate.
 - .4 ASTM C127, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .5 ASTM C128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
 - .6 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.
 - .9 ASTM D995, Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
 - .10 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

- .11 ASTM D3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
- .12 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .4 New Brunswick Department of Transportation and Infrastructure Standard Specifications (most recent version):
 - .1 NBDTI Standard Specification Item 260 – Asphalt Concrete – Method Specification

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit viscosity-temperature chart for asphalt cement to be supplied showing Kinematic Viscosity in centistokes for a temperature range of 105 to 175 degrees C 2 weeks prior to beginning Work.
- .3 Samples:
 - .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks prior to beginning Work.
 - .2 Submit samples of following materials proposed for use 2 weeks prior to beginning Work.
 - .1 One 5 L container of asphalt cement.
 - .2 50 kg of each aggregate to be used in the asphalt mix.
- .4 Test and Evaluation Reports:
 - .1 Submit manufacturer's test data and certification that asphalt cement meets specification requirements.
 - .2 Submit asphalt concrete mix design and trial mix test results to Departmental Representative for approval at least 2 weeks prior to beginning Work.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and stockpile aggregates in accordance with Section 31 05 16 - Aggregate Materials. Stockpile minimum 30 % of total amount of aggregate required before beginning asphalt mixing operation.
- .2 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.
- .3 Stockpile fine aggregate separately from coarse aggregate, although separate stockpiles for more than two mix components are permitted.
- .4 Provide approved storage, heating tanks and pumping facilities for asphalt cement.
- .5 Submit to Departmental Representative copies of freight and waybills for asphalt cement as shipments are received.

- .6 Stockpile crushed RAP separately in accordance with Section 31 05 16 - Aggregate Materials.

Part 2 Products

2.1 MATERIALS

- .1 Performance graded asphalt cement: to AASHTO M320, grade PG 52-34 when tested to AASHTO R29.
- .2 RAP:
 - .1 Crushed and screened to ensure 100% of RAP material passes 50 mm screen before mixing.
- .3 Aggregates: in accordance with Section 31 05 16 - Aggregate Materials and requirements as follows:
 - .1 Crushed stone or gravel.
 - .2 Asphalt aggregate properties:
 - .1 Gradations: As per NBDTI Standard Specifications, Item 260, Table 260-1 for Mix Types B and D.
 - .2 Coarse aggregate is retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C136.
 - .3 Coarse aggregate physical properties: As per NBDTI Standard Specifications, Item 260, Table 260-1 for Mix Types B and D.
 - .1 Physical properties for coarse aggregate shall meet 0.3 to <3 million design ESAL criteria except for crushed particles.
 - .2 Crushed particles in the coarse aggregate shall be minimum 80%, two faces.
 - .4 Fine aggregate physical properties: As per NBDTI Standard Specifications, Item 260, Table 260-1 for Mix Types B and D.
 - .1 Physical properties for coarse aggregate shall meet 0.3 to <3 million design ESAL criteria.
 - .3 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.
 - .4 Do not use aggregates having known polishing characteristics in mixes for surface courses.
 - .5 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.
- .4 Anti-stripping agent: As per NBDTI Standard Specifications, Item 260.2.1.5.

2.2 EQUIPMENT

- .1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

- .2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.
- .3 Vibratory rollers:
 - .1 Drum diameter: 1200 mm minimum.
- .4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
 - .1 Boxes with tight metal bottoms.
 - .2 Covers of sufficient size and weight 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 truck box.
 - .4 Use only trucks which can be weighed in single operation on scales supplied.
- .5 Hand tools:
 - .1 Lutes or rakes with covered teeth for spreading and finishing operations.
 - .2 Tamping irons having mass 12 kg minimum and bearing area not exceeding 310 cm² for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Departmental Representative, may be used instead of tamping irons.
 - .3 Straight edges, 4.5 m in length, to test finished surface.
- .6 Plant testing facility: provide laboratory space at plant site for exclusive use of Departmental Representative, for performing tests, keeping records and making reports.

2.3 MIX DESIGN

- .1 Mix design to be approved in writing by Departmental Representative.
- .2 Mix design to be developed by testing laboratory approved by Departmental Representative.
 - .1 The asphalt concrete mix design shall follow AASHTO R35 Standard Practice for Superpave Volumetric Design for Hot-Mix Asphalt (HMA), AASHTO R30-02 Standard Practice for Mixture Conditioning of Hot-Mix Asphalt (HMA) and AASHTO T312 Standard Method for Preparing and Determining the density of Hot-Mix Asphalt (HMA) specimens by means of Superpave Gyratory Compactor.
- .3 The asphalt concrete physical requirements shall be as per NBDTI Standard Specifications Item 260, Table 260-1 for Mix Types B and D.
- .4 Mix Type B to contain 30% \pm 5% by mass of RAP produced from project.
- .5 Mix Type D shall not contain RAP.
- .6 The use of warm mix asphalt mixes is permitted but not required.
 - .1 Warm mix materials shall be in accordance with the NBDTI Standard Specifications, Item 260.2.1.6.

.7 Following acceptance of the Contractor's mix design, the contractor shall submit a Job Mix Formula (JMF) with targets for the asphalt binder content, percent passing the 4.75mm sieve and percent passing the 0.075mm sieve.

.1 During production, the mix acceptance criteria for physical properties are as follows:

Test Properties	Criteria
Air Voids	2.50% - 5.00%
Asphalt Binder Content	JMF \pm 0.40%
Percent passing 4.75mm sieve	JMF \pm 6.0%
Percent passing 0.075mm sieve	JMF \pm 1.0%

.2 Do not change the JMF without approval from the Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate are acceptable for asphalt paving.

.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

3.2 PLANT AND MIXING REQUIREMENTS

.1 Batch and continuous mixing plants:

.1 To ASTM D995.

.2 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders.

.1 Do not load frozen materials into bins.

.3 Feed cold aggregates to plant in proportions to ensure continuous operations.

.4 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.

.5 Before mixing, dry aggregates to moisture content not greater than 0.5% by mass or to lesser moisture content if required to meet mix design requirements. Heat to temperature required to meet mixing temperature after combining with RAP].

.6 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.

.7 Store hot screened aggregates in manner to minimize segregation and temperature loss.

.8 Heat asphalt cement and aggregate to mixing temperature. Do not heat asphalt cement above 160 degrees C.

.9 Make available current asphalt cement viscosity data at plant.

- .10 Maintain temperature of materials within 5 degrees C of specified mix temperature during mixing.
- .11 Mixing time:
 - .1 In batch plants, continue wet mixing as long as necessary to obtain thoroughly blended mix but not less than 30s or more than 75s.
 - .2 In continuous mixing plants, mixing time to be not less than 45s.
- .12 Where RAP is to be incorporated into mix:
 - .1 Feed from separate cold feed bin specially designed to minimize consolidation of material.
 - .1 Provide 50 mm scalping screen on cold feed to remove oversized pieces of RAP.
 - .2 Ensure positive and accurate control of RAP cold feed by use of hydraulic motor or electric clutch and equip with anti-rollback device to prevent material from sliding backward on feed belt.
 - .3 Combine RAP and new aggregates in proportions as specified. Dry mix thoroughly, until uniform temperature within plus or minus 5 degrees C of mix temperature is achieved prior to adding new asphalt cement.
 - .1 Do not add new asphalt cement where temperature of dried mix material is above 160 degrees C.
- .2 Dryer drum mixing plant:
 - .1 To ASTM D995.
 - .2 Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.
 - .3 Feed aggregates to burner end of dryer drum by means of multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.
 - .4 Where RAP is to be incorporated into mix, dryer drum mixer is to be designed to prevent direct contact of RAP with burner flame or with exhaust gases hotter than 180 degrees C.
 - .5 Feed RAP from separate cold feed bin designed to minimize reconsolidation of material.
 - .6 Meter total flow of aggregate and RAP using electronic weigh belt system with indicator that can be monitored by plant operator and which is interlocked with asphalt pump to ensure proportions of aggregate, RAP and asphalt entering mixer remain constant.
 - .7 Allow for easy calibration of weighing systems for aggregates and RAP without having material enter mixer.
 - .8 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
 - .1 Calibrate weigh bridge on charging conveyor by weighing amount of aggregate passing over weigh bridge in set amount of time.
 - .2 Difference between this value and amount shown by plant computer system to differ by not more than plus or minus 2 %.

- .9 Make provision for conveniently sampling full flow of materials from cold feed.
- .10 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate and RAP from cold feed prior to entering drum.
- .11 Provide system interlock stop on feed components if either asphalt or aggregate from bin stops flowing.
- .12 Accomplish heating and mixing of asphalt mix in approved parallel flow dryer-mixer in which aggregate enters drum at burner end and travels parallel to flame and exhaust gas stream.
 - .1 Control heating to prevent fracture of aggregate or excessive oxidation of asphalt.
 - .2 Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with printing recorder that can be monitored by plant operator.
 - .3 Submit printed record of mix temperatures at end of each day.
- .13 Ensure mixing period and temperature to produce uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer is 2 % maximum.
- .3 Temporary storage of hot mix:
 - .1 Provide mix storage of sufficient capacity to permit continuous operation and designed to prevent segregation.
 - .2 Do not store asphalt mix in storage bins in excess of 3 hour.
- .4 While producing asphalt mix for this Project, do not produce mix for other users unless separate storage and pumping facilities are provided for materials supplied to this project.
 - .1 Permissible variation of mix temperature at discharge from plant: 10 degrees C.

3.3 PREPARATION

- .1 Reshape granular roadbed as necessary to attain specified grades and slopes
- .2 When paving over existing asphalt surface, clean pavement surface to approval of Departmental Representative.
- .3 Apply tack coat in accordance with Section 32 12 13.16 - Asphalt Tack Coats prior to paving.
- .4 Prior to laying mix, clean surfaces of loose and foreign material.

3.4 TRANSPORTATION OF MIX

- .1 The Contractor has the option of using a Material Transfer Vehicle (MTV) for the placement of all asphalt concrete.
 - .1 No unit cost adjustments will be applied to asphalt concrete placed using a material transfer vehicle.
 - .2 Material transfer vehicles shall be self-propelled equipment capable of transferring asphalt concrete from the hauling equipment into the paver, and shall have the following characteristics:
 - .1 Minimum storage capacity of 20 t;

- .2 A conveyor system to transfer asphalt concrete from the hauling equipment to the paver hopper insert; and
- .3 An auger system in the MTV or paddle mixers in the hopper insert to remix the asphalt concrete prior to discharge from the hopper insert.
- .2 Transport mix to job site in vehicles cleaned of foreign material.
- .3 Paint or spray truck beds with limewater, soap or detergent solution, or non-petroleum based commercial product, at least daily or as required.
 - .1 Raise truck bed and thoroughly drain, and ensure no excess solution remains in truck bed.
- .4 Schedule delivery of material for placing in daylight, unless Departmental Representative approves artificial light for night placing.
- .5 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.
 - .1 Do not dribble mix into trucks.
- .6 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.
- .7 Deliver loads continuously in covered vehicles and immediately spread and compact.
 - .1 Deliver and place mixes at temperature not less than 135 degrees C.

3.5 TEST STRIP

- .1 Construct and test an asphalt test strip to approval of Departmental Representative.
- .2 Construct test strip with at least 500 tonnes of mix, and involving more than one lane, so that joint finishing techniques can be established.
- .3 During construction of test strip, the Contractor will establish optimum rolling pattern by taking nuclear densimeter readings and observations to:
 - .1 Determine sequence and number of passes.
 - .2 Determine correct operating characteristics of vibratory rollers.
 - .3 Determine maximum density of asphalt mix.
 - .4 Ensure smooth surface finish.
 - .5 Establish actual density achieved by coring in order to determine if additional or other rolling equipment is required to achieve density of not less than 93 % of laboratory maximum theoretical density from samples of mix being used.

3.6 PLACING

- .1 Obtain Departmental Representative's approval of existing surface prior to placing asphalt.
- .2 Place asphalt concrete to thicknesses, grades and lines as directed by Departmental Representative.
- .3 Placing conditions:
 - .1 Place asphalt mixtures only when air temperature is 5 degrees C minimum.

- .2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.
- .3 Do not place asphalt mix when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
- .4 Place asphalt concrete in minimum compacted lifts of thickness as follows:
 - .1 Mix Type B in minimum 60mm layers.
 - .2 Mix Type D in minimum 40mm layers.
- .5 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.
- .6 Place individual strips no longer than 500 m unless approved by the Departmental Representative.
- .7 Spread and strike off mixture with self-propelled mechanical finisher.
 - .1 Construct longitudinal joints and edges true to line markings.
 - .2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver.
 - .1 Work pavers as close together as possible and in no case permit them to be more than 30 m apart.
 - .3 Maintain constant head of mix in auger chamber of paver during placing.
 - .4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
 - .5 Correct irregularities in alignment left by paver by trimming directly behind machine.
 - .6 Correct irregularities in surface of pavement course directly behind paver.
 - .1 Remove excess material forming high spots using shovel or lute.
 - .1 Fill and smooth indented areas with hot mix.
 - .2 Do not broadcast material over such areas.
 - .7 Do not throw surplus material on freshly screeded surfaces.
- .8 When hand spreading is used:
 - .1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section.
 - .1 Use measuring blocks and intermediate strips to aid in obtaining required cross-section.
 - .2 Distribute material uniformly without broad casting material.
 - .3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes.
 - .1 Reject material that has formed into lumps and does not break down readily.
 - .4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.
 - .5 Provide heating equipment to keep hand tools free from asphalt.

- .1 Control temperature to avoid burning material.
- .2 Do not use tools at higher temperature than temperature of mix being placed.

3.7 COMPACTING

- .1 Roll asphalt continuously using established rolling pattern to density of not less than 93% of maximum theoretical density of mix samples.
- .2 Do not change rolling pattern unless mix changes or lift thickness changes.
 - .1 Inform Departmental Representative prior to making changes to rolling pattern.
- .3 General:
 - .1 Provide at least 2 rollers and as many additional rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type.
 - .2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.
 - .3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.
 - .4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 25 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.
 - .5 Overlap successive passes of roller by minimum of 200 mm and vary pass lengths.
 - .6 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
 - .7 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
 - .8 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
 - .9 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.
 - .1 Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.
 - .10 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.
 - .11 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.
- .4 Breakdown rolling:
 - .1 Begin breakdown rolling with vibratory roller immediately following rolling of transverse and 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. Use only experienced roller operators.
- .5 Intermediate rolling:
 - .1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.
 - .2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.
- .6 Finish rolling:
 - .1 Accomplish finish rolling with two-axle or three-axle tandem steel wheeled rollers while material is still warm enough for removal of roller marks.
 - .1 If necessary to obtain desired surface finish, use pneumatic-tired rollers as directed by Departmental Representative.
 - .2 Conduct rolling operations in close sequence.

3.8 JOINTS

- .1 General:
 - .1 Remove surplus material from surface of previously laid strip.
 - .1 Do not deposit on surface of freshly laid strip.
- .2 Transverse joints:
 - .1 Offset transverse joint in succeeding lifts by at least 600 mm.
 - .2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.
 - .3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.
- .3 Longitudinal joints:
 - .1 Offset longitudinal joints in succeeding lifts by at least 150 mm.
 - .2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.
 - .1 If cold joint cannot be avoided, an approved joint heater will be used prior to paving the adjacent lane.
 - .2 All cold joints shall painted with an application of tack coat prior to paving the adjacent lane
 - .3 Overlap previously laid strip with spreader by 25 mm.
 - .4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.
 - .5 Roll longitudinal joints directly behind paving operation.
 - .6 When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.

3.9 Surface Defects

- .1 The finished surface of any pavement course shall have a uniform texture and be free of visible signs of poor workmanship and bumps and/or dips exceeding 3 mm as measured with a 3 m straight edge.
- .2 Any obvious defects, as determined by the Engineer, shall be cause for rejection of the pavement course.
 - .1 Multiple defects within a 10 metre section shall be considered as one defect.
 - .2 If a defect is continuous beyond 10 metres it shall be considered as one defect.
- .3 Defects shall include but not necessarily be limited to the following:
 - .1 Segregated areas;
 - .2 Ravelling;
 - .3 Roller marks;
 - .4 Cracking or tearing;
 - .5 Improper matching of longitudinal and transverse joints;
 - .6 Tire marks;
 - .7 Sampling locations not properly reinstated;
 - .8 Improperly constructed patches;
 - .9 Contaminant on the mat;
 - .10 Flushed areas; and
 - .11 Pneumatic-tired roller pickup.
- .4 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.
 - .1 If irregularities or defects remain after final compaction, remove asphalt course promptly and lay new material to form true and even surface and compact immediately to specified density.

3.10 FINISH TOLERANCES

- .1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.

3.11 CLEANING

- .1 Leave Work area clean at end of each day.

END OF SECTION

Part 1 General

1.1 STANDARD

- .1 All work of this section shall comply with the requirements of the most recent version of the NBDTI Standard Specifications Item 191, except as amended herein.

1.2 REFERENCES

- .1 New Brunswick Department of Transportation and Infrastructure Standard Specifications (most recent version):
 - .1 NBDTI Standard Specification Item 191 – Application of Water.

Part 2 Products

2.1 MATERIALS

- .1 Water: in accordance with NBDTI Standard Specification Item 191 and in conformance with the Contract Documents.

Part 3 Execution

3.1 GENERAL

- .1 As per the requirements of the most recent version of the NBDTI Standard Specifications Item 191 and in conformance with the Contract Documents.

END OF SECTION

Part 1 General

1.1 STANDARD

- .1 All work of this section shall comply with the requirement of the most recent version of the NBDTI Standard Specification Item 571, except as amended herein.
- .2 No separate payment for:
 - .1 Painted Arrows
 - .2 Stop Bars
 - .3 Cross-hatching
 - .4 Symbols and Letters

1.2 REFERENCES

- .1 New Brunswick Department of Transportation and Infrastructure Standard Specifications (most recent version):
 - .1 NBDTI Standard Specification Item 571 – Pavement Markings
 - .2 Transportation Association of Canada Manual of Uniform Traffic Control Devices for Canada (MUTCDC) (most recent version)
 - .3 Work Area Traffic Control Manual (WATCM) (most recent version)

Part 2 Products

2.1 MATERIALS

- .1 Per the most recent version of the NBDTI Standard Specification Item 571.

Part 3 Execution

3.1 GENERAL

- .1 As per the requirements of the most recent version of the NBDTI Standard Specification Item 571, and in conformance with the Contract Documents.
- .2 The Departmental Representative shall coordinate pavement pre-marking by NBDTI.

END OF SECTION

Part 1 General

1.1 STANDARD

- .1 All work of this section shall comply with the requirement of the most recent version of the NBDTI Standard Specification Item 613, except as amended herein.

1.2 REFERENCES

- .1 New Brunswick Department of Transportation and Infrastructure Standard Specifications (most recent version):
 - .1 NBDTI Standard Specification Item 613 – Topsoil

Part 2 Products

2.1 MATERIAL

Per the most recent version of the NBDTI Standard Specifications Item 613.

Part 3 Execution

3.1 GENERAL

- .1 As per the requirements of the most recent version of the NBDTI Standard Specification Item 613, and in conformance with the Contract Documents

END OF SECTION

Part 1 General

1.1 STANDARD

All work of this section shall comply with the requirement of the most recent version of the NBDTI Standard Specification Item 614, except as amended herein.

1.2 REFERENCES

- .1 New Brunswick Department of Transportation and Infrastructure Standard Specifications (most recent version):
 - .1 NBDTI Standard Specification Item 614 – Hydroseeding
 - .2 NBDTI Standard Specification Item 616 - Mulching

Part 2 Products

2.1 MATERIALS

- .1 Roadside Mix with Mulch – Hydroseed “B”, per the most recent version of the NBDTI Standard Specifications Item 614.

Part 3 Execution

3.1 GENERAL

- .1 As per the requirements of the most recent version of the NBDTI Standard Specification Item 614, and in conformance with the Contract Documents.

END OF SECTION