

Part 1 Products

1.1 REFERENCES

- .1 ASTM C117, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C131, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136, Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D698, Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 2.49 kg Rammer and 304.8 mm Drop.
- .5 ASTM D4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .6 CAN/CGSB-8.1, Sieves Testing, Woven Wire.
- .7 CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.
- .8 ASTM D1557, Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 4.54 kg Rammer and 457 mm Drop.
- .9 ASTM D1883, Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

Part 2 Products

2.1 MATERIALS

- .1 Granular base material: in accordance with Section 02701 - Aggregates: General.

Part 3 Execution

3.1 SUBGRADE

- .1 Subgrade Preparation
 - .1 In areas where excavation is to subgrade or in any case less than 300 mm below that elevation, the subgrade will be scarified to a depth of 300 mm and the scarified material windrowed to the side.
 - .2 Subgrade to be finished to the road profile elevations.
 - .3 The exposed surface shall then be brought to its optimum moisture content and compacted to 100% of Standard Proctor Density ASTM D698.
 - .4 The windrowed material shall then be brought to its optimum moisture content, shaped to line and grade, and compacted to 100% of Standard Proctor Density ASTM D698.
- .2 Do not place granular base until finished sub-grade or sub-base surface is inspected and approved by Department Representative.

3.2 PLACING

- .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 aggregate.
- .3 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Department Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
- .4 Shape each layer to a smooth contour and compact to specified density before succeeding layer is placed.
- .5 Remove and replace that portion of a layer in which material becomes segregated during spreading.

3.3 COMPACTING

- .1 Compact to density not less than 100% of Standard Proctor Density ASTM D698 at optimum moisture content for base course.
- .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.
- .5 The top of the finished base shall exhibit a smooth, continuously dense surface.

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.

3.5 Quality Control

- .1 Testing Frequency.
 - .1 The material testing laboratory will take a minimum of one field density test on compacted granular base for each lift for each 1500 m² of road, 1000 m² of alley, 500 m² of walk, monolithic walk, curb ramp, alley crossing, commercial crossing, private crossing or median island strip according to ASTM D1556, ASTM D2167 or ASTM D2922 For comparison with maximum dry density

3.6 MAINTENANCE

- .1 Maintain finished base in a condition conforming to this section until succeeding material is applied or until acceptance by Department Representative.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM D140/D140M-, Standard Practice for Sampling Bituminous Materials.
 - .2 ASTM D633-, Standard Volume Correction Table for Road Tar.
 - .3 ASTM D1250-, Standard Guide for Use of the Petroleum Measurement Tables.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Samples:
 - .1 Sample asphalt tack coat material to: ASTM D140.
 - .2 Access on tank truck for Departmental Representative to sample asphalt material to be incorporated into Work to ASTM D140.

1.3 QUALITY ASSURANCE

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Deliver, store and handle materials in accordance with ASTM D140.

Part 2 Products

2.1 MATERIALS

- .1 Anionic emulsified asphalt: to CAN/CGSB 16.2, grade: SS 1 or SS 1h.
- .2 Cut-back asphalt; to AASHTO M081-92-UL, grade RC-70 or RC-250.
- .3 Water: clean, potable, free from foreign matter.

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/m⁵ with uniform pressure, and with allowable variation from any specified rate not exceeding 0.1 L/m⁵.
 - .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. 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 Dilute asphalt emulsion with water at 1:1 ratio for application.
 - .1 Mix thoroughly by pumping or other method approved by Departmental Representative.
- .3 Apply asphalt tack coat evenly to pavement surface at a rate between 0.25 to 0.90 L/m².
- .4 Apply asphalt tack coat only when air temperature greater than 10 degrees C and when rain is not forecast within 2 hours minimum of application.
- .5 Apply asphalt tack coat only on unfrozen surface.
- .6 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Departmental Representative.
- .7 Re tack contaminated or disturbed areas as directed by Departmental Representative.
- .8 Permit asphalt tack coat to set before placing asphalt pavement.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 ASTM International
 - .1 ASTM D140/D140M, Standard Practice for Sampling Bituminous Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-16.1, Cutback Asphalts for Road Purposes.
 - .2 CAN/CGSB-16.2, Emulsified Asphalts, Anionic Type, for Road Purposes.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Upon request from Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .1 Arrange points of delivery and quantity to be shipped with vendor
 - .2 Make deliveries during normal work hours.
 - .3 Include copy of orders and instructions respecting shipment upon request by Departmental Representative.
 - .4 Include suitable unloading facilities and unload asphalt as directed Departmental Representative.
 - .5 Provide, maintain and restore asphalt storage area.
- .3 Storage and Handling Requirements:
 - .1 Deliver, store and handle materials to ASTM D140.
 - .2 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIAL

- .1 Asphalt material: to CAN/CGSB-16.1 grade: MC-30. CAN/CGSB-16.2 grade: SS-1.
- .2 Sand blotter: clean granular material passing 4.75 mm sieve and free from organic matter or other deleterious materials.
- .3 Water: clean, potable, free from foreign matter.

2.2 EQUIPMENT

- .1 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 4 m.
 - .3 Applied at controlled rates from 0.2 to 5.4 L/m² with uniform pressure, and allowable variation from any specified rate not exceeding 0.1 L/m².
 - .4 Distributed in uniform spray without atomization at temperature required.
 - .2 Equipped with meter registering travel distance 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.
 - .1 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 Temperature to be measured to nearest 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.
- .2 Aggregate Spreader:
 - .1 Apply blotter sand to primed surfaces using roll type spreader, or rotating disc sander capable of applying aggregate at variable widths and at variable rates.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for asphalt prime coat installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 APPLICATION

- .1 Proceed with application of tack coat only after receipt of written approval of granular base surface from Departmental Representative.

- .1 Heat asphalt prime to temperature range specified by the Supplier for pumping and spraying.
- .2 Apply asphalt prime to granular base at rate as agreed upon by the Contractor and the Departmental Representative at the beginning of the project to ensure complete and uniform coverage without streaking.
- .3 Apply on dry surface unless otherwise directed by Departmental Representative.
- .2 Anionic emulsified asphalt:
 - .1 Dilute asphalt emulsion with clean water at 1:1 ratio for application.
 - .2 Mix thoroughly by pumping or other method approved by Departmental Representative.
 - .3 Apply diluted asphalt emulsion at rate directed by Departmental Representative.
 - .4 Apply diluted asphalt emulsion on damp surface unless otherwise directed by Departmental Representative.
- .3 Apply asphalt prime only on unfrozen surface at a rate between 0.50 to 1.50 L/m².
- .4 Apply asphalt tack coat only when air temperature is greater than 5 degrees C and when rain is not forecast within 2 hours minimum of application.
- .5 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt prime material.
- .6 Where traffic is to be maintained, treat no more than one-half width of surface in one application.
- .7 Prevent overlap at junction of applications.
- .8 Do not prime surfaces that will be visible when paving is complete.
- .9 Apply additional material to areas not sufficiently covered as directed by Departmental Representative.
- .10 Keep traffic off primed areas until asphalt prime has cured.
- .11 Permit prime to cure before placing asphalt paving.

3.3 USE OF SAND BLOTTER

- .1 If asphalt prime fails to penetrate within 24 hours, spread sand blotter material in amounts required to absorb excess material.
- .2 Allow sufficient time for excess prime to be absorbed as directed by Departmental Representative.
- .3 Apply second application of sand blotter as required.
- .4 Do not roll blotter sand.
- .5 Sweep and remove excess blotter material.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Association of State Highway and Transportation Officials (AASHTO)
 - .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 MS-2, Mix Design Methods for Asphalt Concrete and Other Hot Mix Types. ASTM International
 - .2 ASTM C88 05, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .3 ASTM C117, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .4 ASTM C123, Standard Test Method for Lightweight Particles in Aggregate.
 - .5 ASTM C127, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .6 ASTM C128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
 - .7 ASTM C131, Standard Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .8 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .9 ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.
 - .10 ASTM D995, Standard Specification for Mixing Plants for Hot Mixed, Hot Laid Bituminous Paving Mixtures.
 - .11 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - .12 ASTM D3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
 - .13 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 8.1, Sieves Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB 8.2, Sieves Testing, Woven Wire, Metric.

Part 2 Products

2.1 MATERIALS

- .1 Performance graded asphalt cement: Mix Type M1 to AASHTO M320, Grade PG 52 - 34 when tested to AASHTO R29.
- .2 Aggregates: in accordance with requirements as follows:
 - .1 Crushed stone or gravel.
 - .2 Gradations: within limits specified when tested to ASTM C136 and ASTM C117.
 - .3 Table:

<u>Designation (mm)</u>	<u>Percent Passing (µm)</u>
12,500	100
10,000	83-92
8,000	
5,000	55-70
1,250	26-45
630	18-38
315	12-30
160	8-20
80	4-10

- .4 Aggregate Production:
 - .1 The Contractor shall split aggregates for above specified material into coarse and fine fractions
 - .2 Prior to crushing of the coarse fraction. The crushed coarse and the fine fractions shall be stockpiled separately.
 - .3 The Contractor shall select a screen size at which splitting will take place. Splitting of aggregates shall be controlled such that the coarse aggregate fraction, before crushing, shall contain no more than 5% passing the 5000 sieve for all mix types.
 - .4 Further splitting of the crushed coarse aggregate into separate stockpiles may be performed at the Contractor's option. No additional payment will be made for this work.
- .5 Production and addition of Blend Sand:
 - .1 When the aggregate being produced is destined for further processing through a mixing plant, the addition of any required blend sand shall take place at the mixing plant.
 - .2 Prior to the mix production, blend sand shall be separately stockpiled so that a representative sample can be obtained in order to establish a mix design.
 - .3 All blend sand shall be screened before being incorporated into the mix, to remove clay lumps, roots and other deleterious materials. All blend sand so screened shall pass the 5 000 sieve.
 - .4 Blend sand shall be dried if necessary to ensure a uniform feed.

- .5 All other aggregates requiring an addition of blend sand to meet the gradation requirements shall be adjusted at the crushing stage by means of a separate conveyor or other approved device capable of metering the blend sand at a specified uniform rate. The blend sand shall be added prior to or onto the crusher screen deck.
- .6 Production of Extra Manufactured Fines
 - .1 Manufactured fines are defined as that portion of the material passing the 5 000 sieve size which is produced by the crushing process.
 - .2 In the event the manufactured fines in the total combined aggregate do not meet the requirement for the specified Asphalt Concrete Mix Type, extra manufactured fines shall be produced by screening the pit-run material so that the screened material contains no more than 5% material passing a 5 000 sieve. This material shall be crushed and all material produced by this crushing process shall be placed in a separate stockpile and designated as Extra
- .7 Anti Stripping Agents
 - .1 Asphalt mix designs shall follow the Marshall method of Mix Design as described in design procedure TLT-301. The mix design, at the Design Asphalt Content, shall meet the requirements above, and the following.
 - .2 All mixes shall be evaluated for moisture susceptibility in accordance with AASHTO test procedure T-283, Resistance of Compacted Bituminous Mixture to Moisture Induced Damage, using either gyratory or Marshall compacted specimens. All specimens shall be formed using the same procedure. All mix design submissions shall include the test results as outlined in test procedure T-283, including the visual estimate of the degree of moisture damage.
 - .3 The target minimum value for Tensile Strength Ratio (TSR) shall be 75%. Mixes with a TSR value meeting the target minimum will be considered suitable for mix production and will not require the use of a liquid anti-strip additive. In such case, the Contractor may, at his option, elect to still use an anti-strip additive. All costs associated with the use of an anti-strip additive in these cases shall be at the Contractor's expense, and no separate or additional payment will be made by the Department.
 - .4 Mixes with a TSR value less than the target minimum shall be treated with a liquid anti-strip additive at an additive rate of not less than 0.4% and not greater than 0.8% by weight of binder, and re-tested for moisture susceptibility. The treated mix will be considered suitable for mix production if the TSR value is 60% or higher, and is improved over the untreated TSR value. If the TSR value for the treated mix is less than 60% or less than the untreated TSR value, the mix will be considered unsuitable and shall not be used for mix production.
 - .5 Liquid anti-strip additives acceptable for use are listed on the Alberta Transportation Products List. Warm Mix Asphalt (WMA) chemical products which display anti-stripping characteristics and are listed on the Alberta Transportation Products List will be treated as a liquid anti-strip additive for payment purposes.
 - .6 When a liquid anti-strip additive is used, the Contractor shall include the following information with the mix design submission:

- .1 Full details on the type of liquid anti-strip additive to be supplied, including product name, product manufacturer/supplier
- .2 Additive rate
- .3 TSR values for the treated and untreated mixes
- .7 When the liquid anti-strip additive is added to the asphalt cement at the mixing plant, a separate pumping and metering system calibrated and electronically interlocked with the operating controls of the mixing plant shall be used. The Contractor shall have the necessary procedures in-place to safely sample the treated asphalt including, where practicable, an in-line valve and sampling system.
- .8 Where moisture susceptibility test results indicate that the use of a liquid anti-strip additive is required, measurement of liquid anti-strip additive incorporated into the mix will be on a per kilogram basis. The Contractor shall supply the Departmental Representative with a copy of all invoices or bills of lading for the anti-strip additive.

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.
 - .2 Follow the manufacturer's recommended operation procedure.
- .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, 3 m in length, to test finished surface.

2.3 MIX DESIGN

.1 Mix Design and Job Mix Formula

.1 Engage a qualified testing laboratory to prepare a mix design and job mix formula for aggregate. The mix design and job mix formula shall be submitted five days prior to paving and receive the Department Representative approval prior to paving.

.2 Design of mix: by Marshall method to requirements below and as directed by Departmental Representative.

.3 Mix Properties:

	<u>M1</u>
Max size of aggregate (µm)	12,500
No. of Blows (each end of specimen)	75
Stability (K _n) (min.)	8.0
Flow (mm)	2 - 3.5
% Air Voids in Total Mix	3.5 - 4
% Retained Stability	70
Minimum Film Thickness	6.0

.1 Measure physical requirements as follows:

.1 Marshall load and flow value: to AASHTO T245.

.2 Compute void properties on basis of bulk specific gravity of aggregate to ASTM C127 and ASTM C128. Make allowance for volume of asphalt absorbed into pores of aggregate.

.3 Air voids: to ASTM D3203.

.2 Do not change job mix without prior approval of Department Representative. When change in material source proposed, new job mix formula to be approved by Department Representative.

.3 Return plant dust collected during processing to mix in quantities acceptable to Department Representative.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for asphalt paving in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Department Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

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 1 % by mass or to lesser moisture content if required to meet mix design requirements.
 - .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 Do not heat asphalt cement above 160 degrees C.
 - .9 Make available current asphalt cement viscosity data at plant. With information relative to viscosity of asphalt being used, Departmental Representative Representative to review temperature of completed mix at plant and at paver after considering hauling and placing conditions.
 - .10 Maintain temperature of materials within 5 degrees C of specified mix temperature during mixing.
 - .11 Mixing time:
 - .1 In batch plants, both dry and wet mixing times as directed by Department Representative. 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 as directed by Department Representative but not less than 45s.
- .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 Meter total flow of aggregate 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 and asphalt entering mixer remain constant.
 - .5 Allow for easy calibration of weighing systems for aggregates without having material enter mixer.

- .6 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 %.
- .7 Make provision for conveniently sampling full flow of materials from cold feed.
- .8 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate from cold feed prior to entering drum.
- .9 Provide system interlock stop on feed components if either asphalt or aggregate from bin stops flowing.
- .10 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.
- .11 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 hours.
- .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.
- .5 Addition of anti-stripping agent:
 - .1 Plant to be equipped with pug mill to thoroughly mix aggregates and lime prior to entering the plant.
 - .2 Plant to be equipped with suitable conveyor systems capable of supplying aggregates and lime at constant rate.
 - .3 Plant and equipment used for addition of lime to be equipped with covers to control loss of lime.
 - .4 Plant to be equipped to control rate of lime incorporation to within 1/4%.
 - .5 Add water to aggregate prior to entering pug mill.
 - .6 Add water to lime sufficiently in advance to permit time to slake prior to entering pug mill.

3.3 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Implement Erosion and Sedimentation Control Plan.
- .2 Apply tack coat in accordance with Section 32 12 13.16 Asphalt Tack Coats prior to paving.
- .3 Apply prime coat in accordance with Section 32 12 13.24 Asphalt Prime Coats prior to paving.
- .4 Prior to laying mix, clean surfaces of loose and foreign material.

3.4 TRANSPORTATION OF MIX

- .1 Transport mix to job site in vehicles cleaned of foreign material and plants as outlined in the National BMPs.
- .2 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.
- .3 Schedule delivery of material for placing in daylight, unless Department Representative approves artificial light for night placing.
- .4 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.
 - .1 Do not dribble mix into trucks.
- .5 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.
- .6 Deliver loads continuously in covered vehicles and immediately spread and compact.
 - .1 Deliver and place mixes at temperature within range as directed by Department Representative, but not less than 135 degrees C.

3.5 PLACING

- .1 Obtain Department Representative's approval of base tack coat prior to placing asphalt.
- .2 Place asphalt concrete to thicknesses, grades and lines as indicated.
- .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 hot mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
- .4 Place asphalt concrete in compacted lifts of thickness as follows:
 - .1 Minimum compacted lift thickness is 40 mm.
 - .2 Maximum compacted lift thickness is 80 mm.
- .5 Where possible do tapering and levelling where required in lower lifts.

- .6 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.
 - .7 Do not throw surplus material on freshly screeded surfaces.
- .7 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.

3.6 COMPACTING

- .1 Compaction
 - .1 Compact asphalt to no less than 98% of the 75-blow Marshall Density.
 - .2 After the asphaltic mixture has been spread to the uniform thickness required, it shall be compacted to requirement indicated in Table below. The Contractor shall be responsible for the selection of the type and number of units of compaction equipment. Compaction to the specified density shall be completed before the asphaltic mixture has dropped in temperature to 65°C.
 - .3 The Department Representative reserves the right to order discontinued the use of any equipment or construction procedure which does not or will not, in his opinion, produce proper results. If asphaltic concrete surface course mix is to be placed on a previously constructed soil cement base course, vibratory compaction equipment shall be discontinued after one complete pass with the vibratory roller.
 - .4 The Contractor shall provide a sidewalk roller, hand tampers and other compaction equipment as required for compaction in restricted areas.

- .5 The speed of compaction equipment shall not exceed 5 km/h and shall at all times be slow enough to avoid displacement of the hot mixture. Any displacements which occur as a result of reversing the direction of the roller, or from any other cause, shall at once be corrected by the use of rakes and the addition of fresh mixture where required. Rolling shall proceed continuously until all roller marks are eliminated and no further compression is possible. To prevent adhesion of the mixture to the roller, the wheels shall be kept moistened with water but excess water will not be permitted. Fuel oil, lubricating oil, or kerosene will not be permitted.
- .6 Along curbs, manholes and other structures not accessible to the rollers, the mixture shall be compacted thoroughly by means of hot tampers. The joints between these structures and the mixture shall be effectively sealed.

JOINTS

- .2 General:
 - .1 Remove surplus material from surface of previously laid strip.
 - .1 Do not deposit on surface of freshly laid strip.
 - .2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.
 - .3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
- .3 Transverse joints:
 - .1 Offset transverse joint in succeeding lifts by at least 1200 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.
- .4 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.
 - .3 Overlap previously laid strip with spreader by 50 to 80 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.
- .5 Construct butt joints at 30 degree skews from perpendicular or as indicated.

3.7 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.

3.8 THICKNESS TOLERANCE

- .1 Representative Cores: At the Department Representative's request, the quality assurance laboratory will take one or more sets of cores from asphalt pavement suspected to be deficient in total thickness, each set comprising 3 cores whose average thickness represents not more than 1000 m² of asphalt pavement.
- .2 Deficient Thickness: No payment shall be made for areas of pavement found deficient in thickness by 8 mm/50mm design lift thickness or more. Pavement deficient in thickness by 8 mm/50mm design lift thickness or more shall be removed and replaced at the cost of the Contractor.

3.9 DENSITY TOLERANCE

- .1 Sampling and Testing: The quality assurance laboratory will:
 - .1 Determine the density of laboratory compacted Marshall specimens at a minimum frequency of one Marshall density for every 1000 tonnes of hot-mix, or a day's production, whichever is less.
 - .2 Drill cores from compacted mat placed from same load of hot-mix from which Marshall specimens were taken, or from suspected compacted mat, or use of Nuclear Densometer and test for density.
- .2 Basis of Acceptance: Pavement compaction will be accepted on the basis of the ratio (in percent of the core density to the density of Marshall specimen. If cores were drilled from mat where no Marshall specimen was taken, acceptance will be based on the ratio of core density to the average density of all Marshall specimens to date.
- .3 Representative Cores: A single core is initially taken representing the quantity of hot-mix in not more than 1000 m² of mat, with a minimum of one core taken from a day's production. If the initial core density is below specified, that initial density is discarded, and 3 new cores will be taken from the same area. The average density of the 3 new cores represents that area.
- .4 Deficient Density: No payment shall be made for areas of pavement found not meeting the minimum 96.5% of the 75-blow Marshall density. Pavement not meeting the minimum density shall be removed and replaced.

3.10 DEFECTIVE WORK

- .1 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 surface course promptly and lay new material to form true and even surface and compact immediately to specified density.
- .2 Repair areas showing checking or rippling.
- .3 Repair areas showing segregation in accordance with Alberta Transportation Paving Guidelines and Segregation Rating Manual.
- .4 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Annex A - Technical Reference Guideline

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A90/A90M-09, Standard Test Method for Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - .3 ASTM A121-07, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
 - .4 A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM C618-08a, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
 - .6 ASTM A123/A123M-09, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for fences, posts and gates and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect material from damage.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Where specifications or standards differ with Annex A - Technical Reference Guideline, the latter is to take precedence.
- .2 Concrete mixes and materials: in accordance with Section 03 30 00- Cast-in-Place Concrete.
 - .1 Nominal coarse aggregate size: 20.
 - .2 Compressive strength: 32 MPa minimum at 28 days.
 - .3 Additives: fly ash to ASTM C618.
- .3 Chain-link fence fabric: to CAN/CGSB-138.1.
 - .1 Wire Size: 4.8 mm (min) (6 Gauge)
 - .2 Size of mesh: 50.8 mm
 - .3 Height of fence fabric: 2400 mm
 - .4 Barbed edges top and bottom
 - .5 Average mass of zinc coating to be not less than 610 g/m² of uncoated wire
 - .6 Breaking tensile strength to be 10,000 N·min.
- .4 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe.
 - .1 Posts shall be spaced a maximum of 2.5 m apart.
 - .2 Line post minimal size shall be 73 mm O.D. 8.6 kg/m.
 - .3 Strain post minimum size shall be 114.3 mm O.D. 15.92 kg/m. Strain posts shall be spaced not more than 60 m apart.
 - .4 Corner and gate post minimum size shall be 143.3 mm O.D. 21.0 kg/m.
- .5 Galvanized steel arms shall be provided on all posts where barbed concertina is to be installed, as shown on Plate SP-2-2, Annex A.
- .6 Bottom and top rails shall be 42.2 mm O.D. minimum, 3.4 kg/m.
- .7 Tie wires shall be 3.7 mm diameter (9 gauge) galvanized steel wire to secure chain link fabric to bottom rail, top rail and line posts at 300 mm spacing.
- .8 Intermediate rails shall not be used.
- .9 Tension bars used for holding the ends of the fence fabric at the location of strain posts and corner posts shall be 5 mm x 20 mm minimum x 2400 mm galvanized steel.
- .10 Tension bar bands shall be 3 mm x 20 mm minimum galvanized steel and spaced vertically at 300 mm o.c.
- .11 Where nuts and bolts are required for fastening, nuts shall face compound exterior and be torqued tight.
- .12 Where tension cables are used at corner, end, gate, strain posts, and fittings
- .13 shall be of galvanized steel.

- .14 Barbed tape concertina (B.T.C.) shall be galvanized tape 20 x 0.5 mm clenched around a 2.5 mm diameter spring steel galvanized core wire to form a concertina coil with a nominal exterior coil diameter of 710 mm. The coil, when installed, shall have a minimum diameter of 635 mm. The barbed concertina shall have 20 mm long blade type barbs measured from tip to tip of the blade, and barb clusters shall be spaced approximately 45 mm on centre (see Plate SP-2-3, Annex A). The concertina shall be formed by clipping adjacent loops of single helical coils together at a minimum of three (3) points on the circumference. Clips shall be galvanized. The resulting coil, when stretched, shall form a cylindrical pattern. The loop spacing shall not exceed 230 mm.
- .15 For concertina coil support at fence top, two barbed wires stretched and fixed to post arms shall be provided. Barbed wire shall consist of two strands of 12 gauge wire with 4 point barbs at 130 mm spacing, all galvanized.
- .16 Concertina coils are to be turned onto an internal intersecting fence for a distance of 2.5 m (See plate SP-2-6, Annex A). Where the threat of breach exists from either side of the intersecting fence, concertina coil shall be installed on each side.
- .17 The Concertina coils shall be supported and tied at 230 mm spacing onto each of the two barbed wires.
- .18 Gates: to CAN/CGSB-138.4.
 - .1 Refer to standard details.

2.2 FINISHES

- .1 Galvanizing:
 - .1 For chain link fabric: to CAN/CGSB-138.1 Grade 2.
 - .2 For pipe: 550g/m² minimum to A123-09.
 - .3 For barbed wire: to ASTM A121, Class 2.
 - .4 For other fittings: to ASTM A123/A123M.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for fence and gate installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Grading:
 - .1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.
 - .1 Provide clearance between bottom of fence and ground surface of no greater than 125 mm.

3.3 ERECTION OF FENCE

- .1 Do not remove existing fence and gate until new gate has been installed and accepted.
- .2 Erect fence along lines as indicated.
- .3 Excavate post holes 1,400 mm depth x 300 mm diameter.
- .4 Install end posts at end of fence and at buildings.
- .5 Install gate posts on both sides of gate openings.
- .6 Place concrete in post holes then embed posts into concrete to minimum 1000 mm depth
 - .1 Extend concrete 50mm above ground level and slope to drain away from posts.
 - .2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.
- .7 Install fence fabric after concrete has cured, minimum of 5 days.
- .8 Install overhang tops and caps.
- .9 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.
- .10 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.
- .11 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300mm intervals. Match existing fencing.
- .12 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450mm intervals.
 - .1 Give tie wires minimum two twists.
- .13 Install barbed wire strands and clip securely to lugs of each projection as required.

3.4 INSTALLATION OF GATES

- .1 Install gates in locations as indicated.
- .2 Set gate bottom no great than 125 mm above ground surface.

3.5 TOUCH UP

- .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas as indicated.
 - .1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
 - .1 PN1340-2005, Guidelines for Compost Quality.

1.2 DEFINITIONS

- .1 Compost:
 - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
 - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25)), and contain no toxic or growth inhibiting contaminants.
 - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

1.4 QUALITY ASSURANCE

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

Part 2 Products

2.1 TOPSOIL

- .1 Topsoil: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70% sand, minimum 7% clay, and contain 10% organic matter by weight.
 - .2 Contain no toxic elements or growth inhibiting materials.
 - .3 Finished surface free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

2.3 SOURCE QUALITY CONTROL

- .1 Advise Departmental Representative of sources of topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
 - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

Part 3 Execution

3.1 PREPARATION OF EXISTING GRADE

- .1 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .2 Remove debris, roots, branches, stones in excess of 50mm diameter and other deleterious materials.
 - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
 - .2 Remove debris which protrudes more than 75mm above surface.
 - .3 Dispose of removed material off site.
- .3 Cultivate entire area which is to receive topsoil to minimum depth of 100mm.
 - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement.
 - .1 100mm for sodded areas.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.3 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
 - .1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.4 ACCEPTANCE

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.5 SURPLUS MATERIAL

- .1 Dispose of materials except topsoil not required off site.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11- Cleaning.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Schedule sod laying to coincide with preparation of soil surface.
 - .2 Schedule sod installation when frost is not present in ground.
 - .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for sod and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.
- .4 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with supplier's recommendations.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
 - .1 Turf Grass Nursery Sod types:
 - .1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.

- .2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivar[s].
- .3 Number One Named Cultivars: Nursery Sod grown from certified seed.
- .2 Turf Grass Nursery Sod quality:
 - .1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.
 - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
 - .3 Mowing height limit: 35 to 65 mm.
 - .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Sod establishment support:
 - .1 Biodegradable starch pegs: 17 x 8 x 200mm.
- .3 Water:
 - .1 Supplied by Departmental Representative at designated source.
- .4 Fertilizer:
 - .1 To Canada "Fertilizers Act" and Fertilizers Regulations.
 - .2 Complete, synthetic, slow release with 65% of nitrogen content in water-insoluble form.

2.2 SOURCE QUALITY CONTROL

- .1 Obtain written approval from Departmental Representative of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sod installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13- Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Fine grade surface free of humps and hollows to smooth, even grade, surface to drain naturally.
- .4 Remove and dispose of weeds; debris; stones 50mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site.

3.3 SOD PLACEMENT

- .1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.
- .2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .4 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.4 SOD PLACEMENT ON SLOPES AND PEGGING

- .1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.
- .2 Start laying sod at bottom of slopes.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
 - .1 Clean and reinstate areas affected by Work.

3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Contractor is not responsible for mowing or water during warranty period.

3.7 ACCEPTANCE

- .1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare and dead spots.
 - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50mm.
 - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- .2 Sodded Commercial Grade Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
 - .1 Sodded areas are properly established.
 - .2 Extent of surface soil visible when grass has been cut to height of 60mm is acceptable.
 - .3 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.
 - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- .3 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.
- .4 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.
- .5 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

END OF SECTION