Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A1064/A1064M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.2 Fertilizers Act (R.S. 1985, c. F-10).

.3 Fertilizers Regulations (C.R.C., c. 666).

.4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's instructions, printed product literature and data sheets for tree and shrub preservation materials and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide monthly written reports on maintenance during warranty period, to Departmental Representative identifying:

.1 Maintenance work carried out.

.2 Development and condition of plant material.

.3 Preventative or corrective measures required which are outside Contractor's responsibility.

.3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures.

1.4 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 manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect tree and shrub preservation materials.

.3 Replace defective or damaged materials with new.

1.5 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.

.1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.

.2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Departmental Representative prior to application.

.3 Apply fertilizer in early spring at manufacturer's suggested rate.

.4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through composting.

Part 2 Products

2.1 MATERIALS

.1 Fertilizer:

.1 To Canada Fertilizer Act and Fertilizers Regulations.

.2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.

.2 Board Cladding: to consist of 50 x 100 mm lumber secured around the perimeter of tree trunks with plastic strapping or other means which will not damage the tree.

.3 Tree Barriers: steel T-rail posts 40 x 40 x 5 x 2440 mm, at 1800 mm o.c., with wood slat snow fencing attached to posts with 9 gauge wire, 13 per post.

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 tree and shrub preservation 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 approval to proceed from Departmental Representative.

3.2 IDENTIFICATION AND PROTECTION

.1 Tree protection to be installed prior to the start of any on site work.

.2 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.

.3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.

.4 Ensure no root pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

3.3 TRUNK PROTECTION

.1 Install board cladding vertically around the perimeter of designated deciduous trees within the active work zone.

3.4 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

.1 Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.

.2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.

.3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Departmental Representative.

.4 Minimum acceptable depth to top of tunnel: 1000 mm.

.5 Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.

.6 Complete tunnelling and backfilling at tree within 2 weeks of beginning Work.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- 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 00- Cleaning.

.3 Waste Management: separate waste materials for in accordance with Section 01 74 19- Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM C117 - Standard Test Method 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 D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).
- .4 ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).
- .5 ASTM D4318 - Standard Test Methods for Liquid Unit, Plastic Unit and Plasticity Index of Soils.

.2 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.

1.2 SAMPLES

.1 At least two (2) weeks prior to commencing work, inform Departmental Representative of proposed source of granular materials.

.2 The Contractor shall provide a sieve analysis of the material for the Departmental Representative's review.

1.3 SUBMISSIONS

.1 Granular subbase analysis will be submitted to the Departmental Representative before being used.

.2 Preliminary review of the material as represented by the test results shall not constitute general acceptance of all material in the deposit or source of supply. Materials may be considered unsuitable even though particle sizes are within the limits of gradation sizes required, if particle shapes are thin or elongated or any other characteristic precludes satisfactory compaction, or if the material fails to provide a roadway suitable for traffic. Rejected material will not be paid for. The Departmental Representative has the right to request additional testing if there are any concerns with the proposed aggregate.

Part 2 Products

2.1 MATERIALS

.1 Granular sub-base material shall consist of crushed pit run or screened stone, gravel or sand.

.2 Granulations to be within limits specified when tested to ASTM C136 and ASTM C117 - sieve sizes to CAN/CGSB-8.1.

Sieve Size (mm)	Percent Passing (%)
100	100
80	100
40	60 – 90
20	40 – 70
10	25 – 60
5.0	15 – 25
2.5	10 – 35
0.63	5 – 23
0.08	0 – 5

.3 Other properties as follows:

.1 Minimum % Fracture, by weight (2 faces) – 20%

.2 Los Angeles Abrasion, max loss – 40%

.3 Liquid limit: to ASTM D4318, maximum 25

.4 Plasticity index: to ASTM D4318, maximum 6

.5 California Bearing Ratio, when compacted to 100% of ASTM D698 - 40 min.

Part 3 Execution

3.1 PREPARATION

.1 The Contractor shall maintain the subgrade to the specified section, free from ruts, waves and undulations until granular sub-base course material is placed. The subgrade shall be in a firm dry condition and must be approved by the Departmental Representative before placement. The depositing of granular sub-base on a soft, muddy or rutted subgrade will not be permitted.

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, mud, water or ice.

.5 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.6 Place material to full width in uniform layers not exceeding 150 mm thickness (compacted). Owner’s Representative may authorize thicker lifts (layers) if specified compaction can be achieved.

.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.8 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 to density of not less than 98% corrected maximum dry density 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 by 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 COMPACTION TESTING

.1 Compaction results shall be based on a minimum of one density test per 1,000 square metres of road. Additional tests may be called for by the Engineer as deemed necessary.

.2 Field density tests shall conform to ASTM D1556, ASTM D2167, or ASTM D2922 for comparison with a maximum density determined according to ASTM D698 Method A.

3.5 SITE TOLERANCES

.1 Finished sub-base surface shall be within 10 mm of elevation as indicated but not uniformly high or low.

3.6 INSPECTION

.1 Prior to application of the subsequent layer of roadway materials, the sub-base surface shall be true to cross-section and grade, shall conform to the density specified and shall show to detailed inspection no visible subsidence or heave under the wheels of a roller having a weight of 4.5 kilograms per millimetre of tread width.

.2 The Contractor shall supply and operate a loaded test vehicle of 8,200 kg axle load to test the subgrade for rutting, heaving and soft spots. Where proof rolling indicates areas are defective, the Contractor shall remove and replace the material with suitable compacted material. Proof rolling shall be considered incidental to the sub-base construction.

.3 Proof rolling should be completed under the supervision of qualified technical personnel. Recommendations pertaining to the repair of soft areas shall be provided at the time of inspection but may include sub-cutting the subgrade.

.4 Both the Departmental Representative and the Contractor shall closely observe this operation and note and mark out areas where weakness is indicated. Failures which develop in the sub-base shall be replaced at the Contractor's cost. After the repairs are completed the axle test shall be repeated until test is satisfactory.

.5 All costs incurred during the performance of this test shall be borne by the Contractor.

3.7 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM C117 - Standard Test Method 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 D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).
- .4 ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).
- .5 ASTM D4318 - Standard Test Methods for Liquid Unit, Plastic Unit and Plasticity Index of Soils.

.2 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.

1.2 SAMPLES

.1 At least two (2) weeks prior to commencing work, inform Departmental Representative of proposed source of granular materials.

.2 The Contractor shall provide a sieve analysis of the material for the Departmental Representative's review.

1.3 SUBMISSIONS

.1 Granular subbase analysis will be submitted to the Departmental Representative before being used.

.2 Preliminary review of the material as represented by the test results shall not constitute general acceptance of all material in the deposit or source of supply. Materials may be considered unsuitable even though particle sizes are within the limits of gradation sizes required, if particle shapes are thin or elongated or any other characteristic precludes satisfactory compaction, or if the material fails to provide a roadway suitable for traffic. Rejected material will not be paid for. The Departmental Representative has the right to request additional testing if there are any concerns with the proposed aggregate.

Part 2 Products

2.1 MATERIALS

.1 Crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

.2 Physical properties of Aggregates:

% Fracture, by weight (2 faces)	60 min.
Los Angeles Abrasion, loss, %	45 max.
Liquid Limit, %	25 max.
Plasticity Index, %	6 max.
Lightweight Particles, %	5 max.
California Bearing Ratio, when compacted to 100% of ASTM D698	55 min.

.3 Gradation to be within the following limits when tested to ASTM C-117 with sieve sizes to CAN/CGSBD 8-GP-2M, and to have a smooth curve without sharp breaks when plotted on a semi-log grading chart.

Sieve Size (mm)	Percent Passing by Weight
25	100
20	85 – 100
16	70 – 94
10	52 – 79
5	35 – 65
1.25	18 – 43
0.63	12 – 34
0.315	8 – 26
0.160	5 – 18
0.080	2 – 10

Part 3 Execution

3.1 PLACING

.1 Place granular base after sub-base is inspected and approved by Departmental Representative.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Place material on a clean unfrozen surface, properly shaped and compacted and free from mud, water, snow and ice.

.4 Place using methods which do not lead to segregation or degradation of aggregate. Use approved methods to create uniform windrow of material along a crown line or high side of a one-way slope.

.5 Place material to full width in layers not exceeding 150 mm in compacted thickness.

.6 Shape each layer to a smooth contour and compact to the specified density before succeeding layer is placed.

.7 Remove and replace any portion of a layer in which material becomes segregated during spreading.

3.2 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density of not less than 98% corrected maximum dry density 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 by 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.

3.3 COMPACTION TESTING

.1 Compaction results shall be based on a minimum of one density test per 1,000 square metres of road. Additional tests may be called for by the Departmental Representative as deemed necessary.

.2 Field density tests shall conform to ASTM D1556, ASTM D2167, or ASTM D2922 for comparison with a maximum density determined according to ASTM D698 Method A.

3.4 SITE TOLERANCES

.1 Finished base surface shall be within 10 mm of elevation as indicated but not uniformly high or low.

3.5 INSPECTION

.1 Prior to application of the subsequent layer of roadway materials, the base surface shall be true to cross-section and grade, shall conform to the density specified and shall show to detailed inspection no visible subsidence or heave under the wheels of a roller having a weight of 4.5 kilograms per millimetre of tread width.

.2 The Contractor shall supply and operate a loaded test vehicle of 8,200 kg axle load to test the subgrade for rutting, heaving and soft spots. Where proof rolling indicates areas are defective, the Contractor shall remove and replace the material with suitable compacted material. Proof rolling shall be considered incidental to the base construction.

.3 Proof rolling should be completed under the supervision of qualified technical personnel. Recommendations pertaining to the repair of soft areas shall be provided at the time of inspection but may include sub-cutting the subgrade.

.4 Both the Departmental Representative and the Contractor shall closely observe this operation and note and mark out areas where weakness is indicated. Failures which develop in the base shall be replaced at the Contractor's cost. After the repairs are completed the axle test shall be repeated until test is satisfactory.

.5 All costs incurred during the performance of this test shall be borne by the Contractor.

3.6 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.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 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 asphalt tack coat and include product characteristics, performance criteria, physical size, finish and limitations.

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 Section 01 61 00- Common Product Requirements 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.

Part 2 Products

2.1 MATERIALS

.1 The bituminous material for tacking the existing asphalt surface shall be liquid asphalt. The asphalt types may vary from rapid curing (RC) type RC-30 to RC-250; from slow setting (SS) type SS-1 to SS-1H, depending on conditions to suit the base and time of season.

.1 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 Cleaning equipment shall consist of power brooms, flushers, and whatever hand scrapers may be necessary to remove all foreign material.

.3 The pressure distributor used for applying asphaltic material shall be equipped with pneumatic tires and shall be so designed and operated as to distribute the asphaltic material in a uniform spray without atomization, in the amount and between the limits of temperature specified. It shall be equipped with a fifth wheel speed tachometer

registering metres per second and so located as to be visible to the truck driver to maintain the constant speed required for uniform application at the specified rate.

.4 The pump shall be operated by a separate power unit, or by the truck power unit. It shall be equipped with a metre registering litres per minute passing through the nozzles and readily visible to the operator.

.5 Suitable means for accurately measuring the temperature of the asphaltic material shall be provided.

.6 The thermometer well shall be so placed as not to be in contact with a heating tube. The distributor shall be so designed that the normal width of application shall be not less than 2 m, with provision for the application of lesser width when necessary.

.7 If provided with heating attachments the distributor shall be so equipped and operated that the asphaltic material shall be circulated or agitated throughout the entire heating process.

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 tack 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 and after receipt of written approval to proceed from Departmental Representative.

3.2 APPLICATION

.1 Obtain Engineer's approval of existing surface before applying asphalt prime, tack or fog coats. Clean surface as required.

.2 Upon the prepared surface the asphalt shall be applied uniformly at a rate of from 1.0 to 1.50 litres/square metre (L/m^2) for asphalt primer, and at a rate of from 0.25 to 0.90 L/m^2 for tack coat and a rate not exceeding 0.5 L/m^2 for fog coat. The asphalt primer, tack or fog coat shall be applied only when the surface is dry or slightly damp, unless otherwise allowed by the Engineer in writing, or only when the air temperature in the shade is above 10°C. Hand apply asphaltic primer in areas not accessible with the distributor.

.3 The application temperature of the asphalt primer, tack or fog coat shall be as follows:

.1 Rapid Curing Asphalt:

RC-30	51 – 68°C
RC-70	74 – 88°C

RC-250	100 – 110°C

.2 Emulsified Asphalt:

SS-1	24 – 54°C
SS-1H	24 – 54°C

.3 Emulsified Asphalt Primer:

15 – 50°C

.4 Coat contact surfaces of curbs, gutters, headers, manholes and like structures with a thin uniform coat of asphalt material. Do not prime or tack surfaces that will be visible when paving is complete. Work adjacent to the roadway shall be completely protected from the application operation by a suitable covering. Any unnecessary splashing of the concrete shall be cleaned.

.5 Do not apply asphalt coat when air temperature is less than 5°C or when rain is forecast within 2 hours.

.6 The Contractor shall maintain the primed surface until the surface course has been placed. Maintenance shall include spreading any additional sand and patching any breaks in the primed surface with additional asphaltic material.

.7 The asphalt primer should preferably be entirely absorbed by the base course and therefore require no sand cover. If, however, the asphalt has not been completely absorbed 24 hours after application, just sufficient sand shall be spread over the surface to blot up excess asphalt and prevent it from being picked up by any traffic.

.8 Traffic shall not be permitted to travel on tack or fog coat until cured. The Contractor shall use flagmen, if required; provide and maintain signs, barricades, and keep all animals and pedestrians off newly primed surfaces until cured.

3.3 Traffic shall not be permitted to travel on prime coat until 6 hours after application or until it has cured. After this period of time, excess asphalt material remaining on the surface shall be blotted by sand before traffic is permitted to travel on the surface.

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 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM D140/D140M, Standard Practice for Sampling Bituminous Materials.

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 asphalt prime coat and include product characteristics, performance criteria, physical size, finish and limitations.

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 materials in accordance with Section 01 61 00- Common Product Requirements 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 Provide, maintain and restore asphalt storage area.

Part 2 Products

2.1 MATERIAL

.1 The bituminous material for priming the base course shall be liquid asphalt. The asphalt types may vary from medium curing (MC) type MC-30 to MC-250; from slow setting (SS) type SS-1 to SS-1H or a special emulsified asphalt primer S.E.P. 1 or S.E.P. 2 depending on conditions to suit the base and time of season. The type of asphalt suitable for this application shall be a 50:50 mixture of water and SS-1 applied at a rate of 1.5 L/m^2 providing the hot mix asphalt pavement is placed immediately after curing is complete.

.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 Cleaning equipment shall consist of power brooms, flushers, and whatever hand scrapers may be necessary to remove all foreign material.

.2 The pressure distributor used for applying asphaltic material shall be equipped with pneumatic tires and shall be so designed and operated as to distribute the asphaltic material in a uniform spray without atomization, in the amount and between the limits of temperature specified. It shall be equipped with a fifth wheel speed tachometer registering metres per second and so located as to be visible to the truck driver to maintain the constant speed required for uniform application at the specified rate.

.3 The pump shall be operated by a separate power unit, or by the truck power unit. It shall be equipped with a metre registering litres per minute passing through the nozzles and readily visible to the operator.

.4 Suitable means for accurately measuring the temperature of the asphaltic material shall be provided.

.5 The thermometer well shall be so placed as not to be in contact with a heating tube. The distributor shall be so designed that the normal width of application shall be not less than 2 m, with provision for the application of lesser width when necessary.

.6 If provided with heating attachments the distributor shall be so equipped and operated that the asphaltic material shall be circulated or agitated throughout the entire heating process.

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 and after receipt of written approval to proceed from Departmental Representative.

3.2 APPLICATION

.1 Obtain Departmental Representative's approval of existing surface before applying asphalt prime, tack or fog coats. Clean surface as required.

.2 Upon the prepared surface the asphalt shall be applied uniformly at a rate of from 1.0 to 1.50 litres/square metre (L/m2) for asphalt primer, and at a rate of from 0.25 to 0.90 L/m2 for tack coat and a rate not exceeding 0.5 L/m2 for fog coat. The asphalt primer, tack or fog coat shall be applied only when the surface is dry or slightly damp, unless otherwise allowed by the Departmental Representative in writing, or only when the air temperature

in the shade is above 10oC. Hand apply asphaltic primer in areas not accessible with the distributor.

.3 The application temperature of the asphalt primer, tack or fog coat shall be as follows:

.1 Medium Curing Asphalt:

MC-30	51 – 68ºC
MC-70	74 – 88ºC
MC-250	100 – 110ºC

.2 Emulsified Asphalt:

SS-1	24 – 54ºC
SS-1H	24 – 54ºC

.3 Emulsified Asphalt Primer: 15 – 50ºC

.4 Coat contact surfaces of curbs, gutters, headers, manholes and like structures with a thin uniform coat of asphalt material. Do not prime or tack surfaces that will be visible when paving is complete. Work adjacent to the roadway shall be completely protected from the application operation by a suitable covering. Any unnecessary splashing of the concrete shall be cleaned.

.5 Do not apply asphalt coat when air temperature is less than 5oC or when rain is forecast within 2 hours.

.6 The Contractor shall maintain the primed surface until the surface course has been placed. Maintenance shall include spreading any additional sand and patching any breaks in the primed surface with additional asphaltic material.

.7 The asphalt primer should preferably be entirely absorbed by the base course and therefore require no sand cover. If, however, the asphalt has not been completely absorbed 24 hours after application, just sufficient sand shall be spread over the surface to blot up excess asphalt and prevent it from being picked up by any traffic.

.8 Traffic shall not be permitted to travel on tack or fog coat until cured. The Contractor shall use flagmen, if required; provide and maintain signs, barricades, and keep all animals and pedestrians off newly primed surfaces until cured.

.9 Traffic shall not be permitted to travel on prime coat until 6 hours after application or until it has cured. After this period of time, excess asphalt material remaining on the surface shall be blotted by sand before traffic is permitted to travel on the surface.

.10 Allow prime coat to properly cure before paving.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- 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 00- Cleaning.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 At least 2 weeks prior to commencing work, inform Departmental Representative of proposed source of aggregate materials and asphalt binder.

.3 The Contractor shall submit asphalt concrete mix design based on the Marshall Method and trial mix test results to the Departmental Representative for review at least 2 weeks prior to commencing work.

.4 The Contractor shall provide a sieve analysis of the aggregate material for the Departmental Representative's review.

.5 Asphalt concrete mix design and a minimum 60 kg sample of the mix shall be submitted to the Departmental Representative 48 hours prior to any mix being used.

.6 Preliminary review of the aggregate as represented by the samples shall not constitute general acceptance of all material in the deposit or source of supply. Materials may be considered unsuitable even though particle sizes are within the limits of the gradation sizes required, if particle shapes are thin or elongated or any other characteristic precludes satisfactory compaction or if the material fails to provide a pavement suitable for traffic. Rejected material will not be paid for. The Departmental Representative has the right to request additional testing if there are any concerns with the proposed aggregate mix design.

1.2 DEFINITIONS

.1 Overlay: Paving over an existing pavement for rehabilitation purposes and not as part of staged paving.

.2 Staged Paving: Paving where a lift or lifts that form part of the total pavement structure are deferred to a future date.

.3 Mix Types: Mixes are designated according to use as follows:

.1 Mix “A” Asphalt – surface course and overlay asphalt.

.2 Mix “B” Asphalt – base course asphalt.

Part 2 Products

2.1 MIX 'A' AND MIX 'B' ASPHALT

.1 The aggregate, mineral filler, asphaltic binder, and mix design for this project shall be in accordance with Section 307.00.00, 2015 City of Calgary Standard Specifications, Roads Construction. Refer to **Appendix C** for detailed specification.

Part 3 Execution

3.1 PREPARATION

.1 Patch and correct depressions and other irregularities to approval of the Departmental Representative before beginning paving operations. Prior to laying mix, clean surfaces of loose and foreign material and apply tack coat in accordance with Section 32 12 13.16 – Asphalt Prime and Tack Coats.

.2 All asphalt surfaces shall be clean pavement edges free from encroaching vegetation.

3.2 MIX TOLERANCES

.1 All mixture furnished shall conform to City of Calgary Standard Specifications, Roads Construction (latest issue) and meet specified tolerances.

3.3 MIXING PLANT

.1 The mixing plant and auxiliary equipment shall be as such to combine, dry and heat the mineral aggregate, heat the asphalt and accurately proportion the asphalt and aggregate to produce a uniform mixture in accordance with these specifications.

.2 All asphalt mixing plants shall be registered with Alberta Environmental Protection and shall be operated in accordance with the "Code of Practice for Asphalt Plants".

3.4 TRANSPORTATION OF MIX

.1 The mixture shall be transported from the mixing plant to the work in vehicles with tight metal bottoms previously cleaned of all foreign materials. The vehicle shall be suitably insulated and each load shall be covered with canvas or other suitable material of sufficient size to protect it from weather conditions. The inside surface of all vehicles may be lightly lubricated with a thin oil or soap solution prior to loading but excess lubricating will not be permitted.

.2 Any accumulation of asphaltic material which was collected in the box shall be thoroughly cleaned before loading with hot mix.

.3 Trucks shall be maintained perfectly clean of mud or any substance which could contaminate the working area.

3.5 EQUIPMENT

.1 Pavers:

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

.2 Roller:

.1 The rollers used for compaction shall be self-propelled steel-wheeled or rubber-tired rollers, providing at least 35 Newtons per millimeter width of tread. The roller shall be in good condition without backlash when reversed and shall be operated by competent rollermen. The wheels shall be kept properly moistened, but excess water or oil will not be permitted.

.3 Hand Tools:

.1 Lutes or rakes with covered teeth for spreading and finishing operations.

3.6 PLACING

.1 Obtain Departmental Representative's approval of base and existing surface and tack coat and prime coat prior to placing asphalt. Asphaltic concrete shall be laid in lifts to the design thickness applicable to the project. Lift thickness shall not exceed 60 mm.

.2 Place asphalt concrete to thicknesses, grades and lines indicated or directed by Departmental Representative.

.3 Placing Conditions:

.1 No asphalt shall be dispatched to the field unless local temperature, as issued by the Atmospheric Environmental Service, meets the requirements of the following table:

Depth of Asphalt	Minimum Air Temperature
Surface lift (<50 mm)	**15°C**
60 mm lift	**4°C and rising**

.2 A 2°C tolerance shall be permitted for plant start-up temperatures.

.3 No asphalt shall be placed on or against any surface, which is at a temperature of less than 5°C.

.4 When temperature of surface on which material is to be placed falls below 10°C, provide extra rollers as necessary to obtain required compaction before cooling.

.5 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 Mixtures shall be spread at temperatures which, when measured in the hopper of the spreader, are:

.1 115°C to 150°C for an air temperature above 15°C

.2 140°C to 160°C for an air temperature below 15°C

.5 In small areas where the use of mechanical finishing equipment is not practical, the mix may be spread and finished by hand, if so directed by the Departmental Representative. The material shall be distributed uniformly to avoid segregation of the coarse and fine aggregates. Broadcasting of material shall not be permitted. During the spreading operation, all material shall be thoroughly loosened and uniformly distributed by lutes or rakes. Material that has formed into lumps and does not break down readily shall be rejected.

.6 Areas which are deemed likely to have vehicles, the pavement edge should have pavement edge sloped to protect pavement edge from damage. These areas are required to be indicated in the field by the Departmental Representative.

3.7 ROLLING AND COMPACTION

.1 Before rolling is started, the surface shall be checked, inequalities in depth adjusted or sandy accumulations replaced and irregularities in alignment or grade along the outside edge shall be corrected.

.2 The rollers must be kept in continuous operation as nearly as practicable and all parts of the pavement shall receive substantially the same compaction. Rolling shall be done at a maximum speed of 5 km per hour.

.3 At least one roller shall be used for every 40 tonnes of asphaltic concrete laid per hour. Rolling shall start as soon as the pavement will bear the roller without checking or undue displacement, working from the low part or edge to the high part or edge continuously until no roller marks are left in the finished surface and no further compaction is possible. Where width permits the pavement shall be rolled diagonally in two directions. At all curbs, manholes and other appurtenances, and at all locations not accessible to the rollers, hand tampers shall be used to produce the same density as provided by the roller. Where the asphaltic concrete is laid in more than one lift, each lift shall be so compacted.

.4 Required Density: Each mat of hot mix placed shall be compacted to the following minimum density (% of Marshall density) for the type of paving, or as indicated in Special Provisions.

Minimum Density	Type of Paving
98%	**New paving and all stages in staged paving except 2nd stage mix B ≤ 40mm**
96%	**Second stage residential material ≤ 40mm**

3.8 JOINTS

.1 The mixture shall be laid so that all longitudinal joints are made while the first mat of the two being laid is still warm and shall be well bonded, sealed and finished to provide a continuous and smooth profile across the joint.

.2 Transverse joints shall be carefully constructed and thoroughly compacted to provide a smooth-riding surface. Joints shall be straight-edged to assure smoothness and true alignment. The vertical face shall be treated with freshly laid mixture raked against it, tamped with hot tampers and rolled. Heat shall be used as necessary to ensure a proper bond.

.3 Paving joints shall not be placed in the same vertical plane. Longitudinal joints shall be offset at least 75 mm and transverse joints in succeeding courses shall be offset at least 600 mm.

.4 Joints in the surface course shall be offset a minimum of 300 mm beyond the limit of proposed lane markings.

.5 Edges against which additional pavement is placed shall be vertically formed to true line. In making the joint along any adjoining edge such as curb, gutter or an adjoining pavement and after the hot mixture is placed by the finishing machine, enough material shall be carried back to fill any space left open.

.6 The exposed edges of all cold asphalt joints and the face of concrete gutter shall be cleaned and painted with a thin coat of hot asphalt cement. When the ambient air temperature is less than 10° Celsius, joints shall be heated using an infrared heater prior to painting with hot asphalt cement.

.7 Where a transverse joint is made with a cold asphalt mat, the joint shall be made on a vertically true line. Cold jointing shall be done in such a manner as to ensure a thorough and continuous bond between the cold and the hot mats.

.8 Cold asphalt shall be one where the surface temperature, taken within 600 mm of the edge of the mat, is less than 65° Celsius.

3.9 FINISH

.1 The finished pavement shall be true to the required profile and cross-section. Tests of pavement profile and thickness shall be made after the first layer of asphalt has been placed, and depressions or bumps in excess of 5 mm shall be corrected. The allowable tolerance for finished pavement shall be ±5 mm, and the surface shall show no depressions or bumps exceeding 3 mm under a straight-edge 3 m long placed parallel to the road centreline.

.2 Gravel or soil material adjacent to pavement edge shall be adequately placed and compacted directly alongside road edge as specified in road section details.

3.10 DEFECTIVE WORK

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

.2 Repair areas showing checking or hairline cracking.

3.11 TESTING AND INSPECTION

.1 The Departmental Representative or his representative shall retain core samples from the completed pavement, from which depth of pavement and density tests shall be made.

.2 One core shall be taken for approximately every 1500 m^2 of asphalt or at least once each day during placing operations. The following tests shall be carried out:

.1 Marshall stability (test for resistance of plastic flow of bituminous mixtures) using Marshall Apparatus as per ASTM D1559.

.2 Sieve analysis of extracted aggregates in accordance with ASTM C136 and entire washed sample in accordance with ASTM C117.

.3 Bulk specific gravity of compacted mixtures in accordance with ASTM D2726.

.4 Bitumen content of paving mixtures in accordance with ASTM D2172.

.5 Percent voids in the mineral aggregates (VMA) is to be calculated on the basis of ASTM D2726 Bulk Specific Gravity of the aggregate.

.6 Air voids in compacted mix in accordance with ASTM D3203.

.3 The Contractor shall repair all test holes with fresh, hot mix asphaltic concrete mixture, and thoroughly compact it to the required density with no additional compensation.

3.12 ACCEPTANCE

.1 Locations shall be cleared of all excess material resulting from the paving operation and any damage caused by the Contractor shall be repaired to the Departmental Representative's satisfaction within 3 days of the date of completion of the street or lane. Failure to clean-up or repair damage may result in other crews undertaking this work without notice to the Contractor and deducting the costs from money due to the Contractor.

.2 No traffic shall be allowed on the finished surface until it has cooled to atmospheric temperature.

CHART A
ASPHALT CONTENT
PAYMENT ADJUSTMENT FACTOR

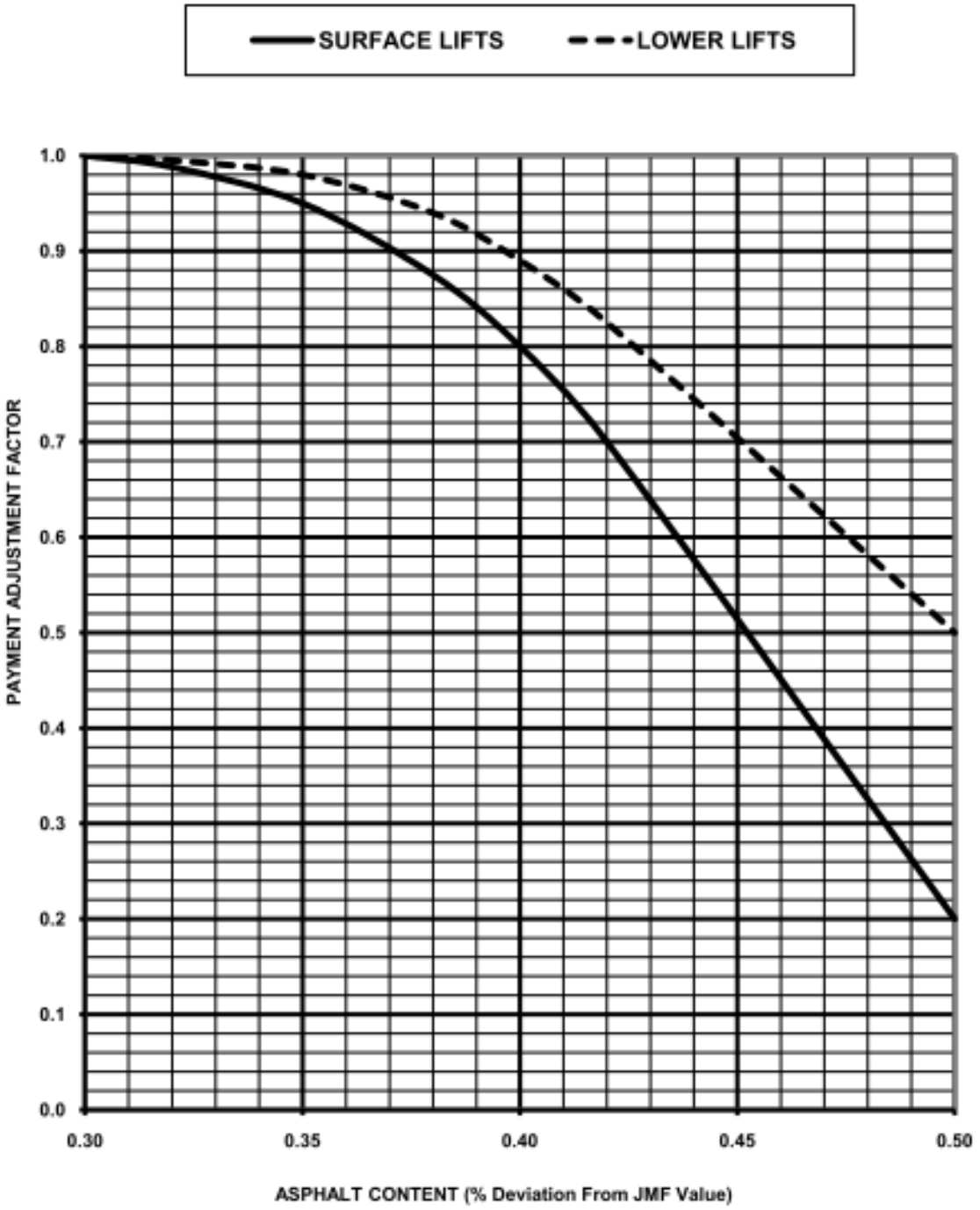


CHART B
COMPACTION
PAYMENT ADJUSTMENT FACTOR

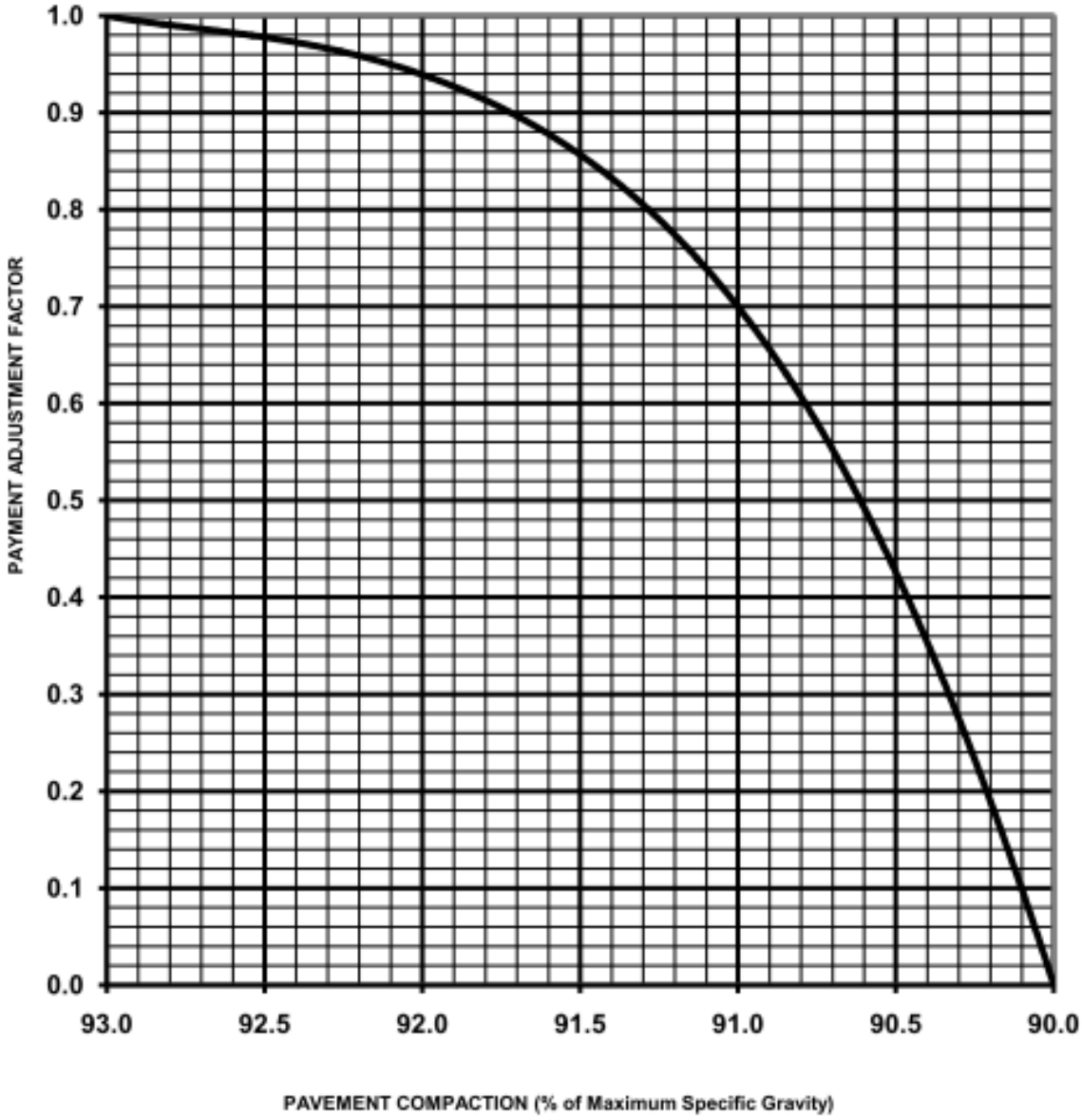


CHART C
AIR VOID CONTENT
PAYMENT ADJUSTMENT FACTOR

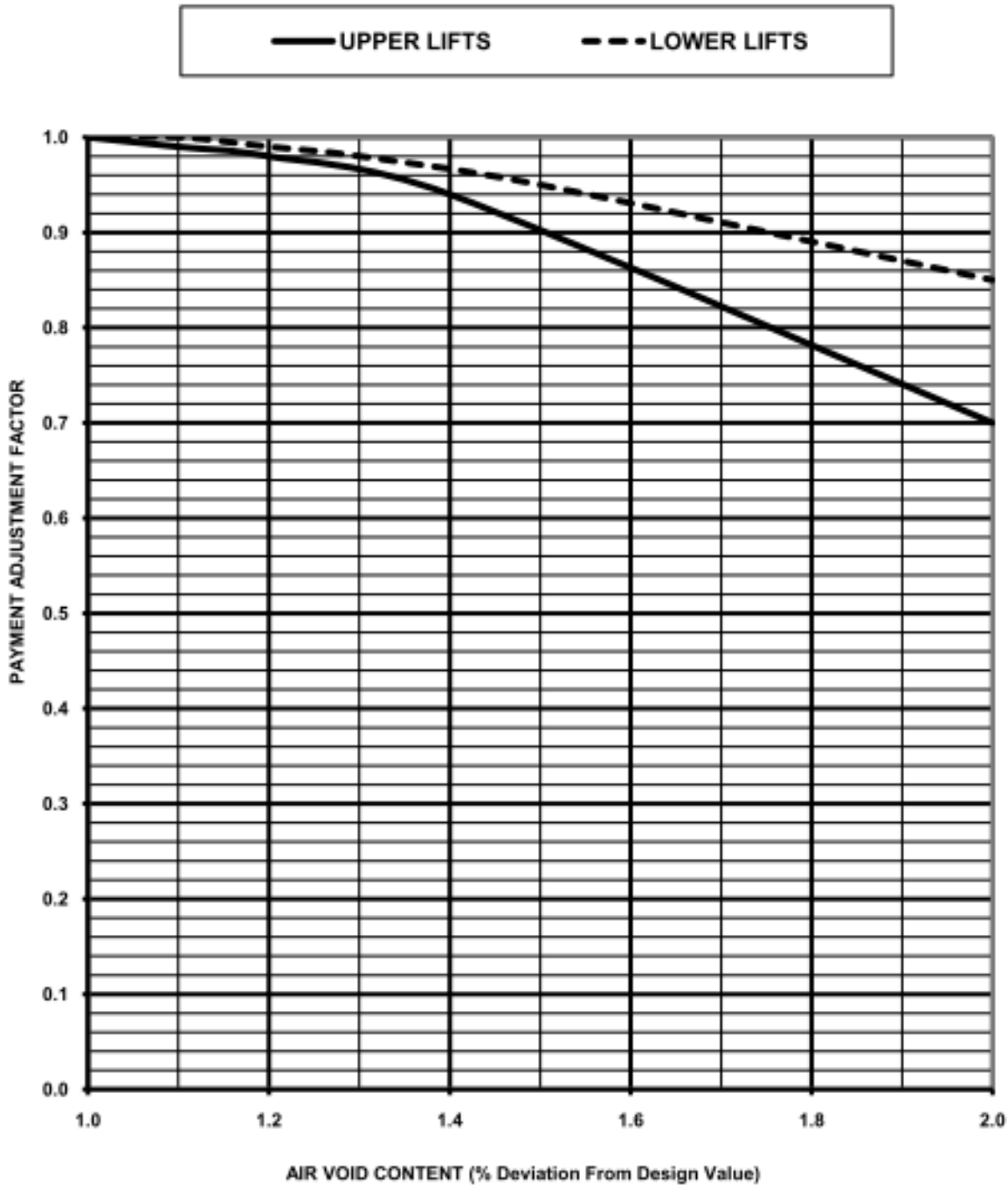
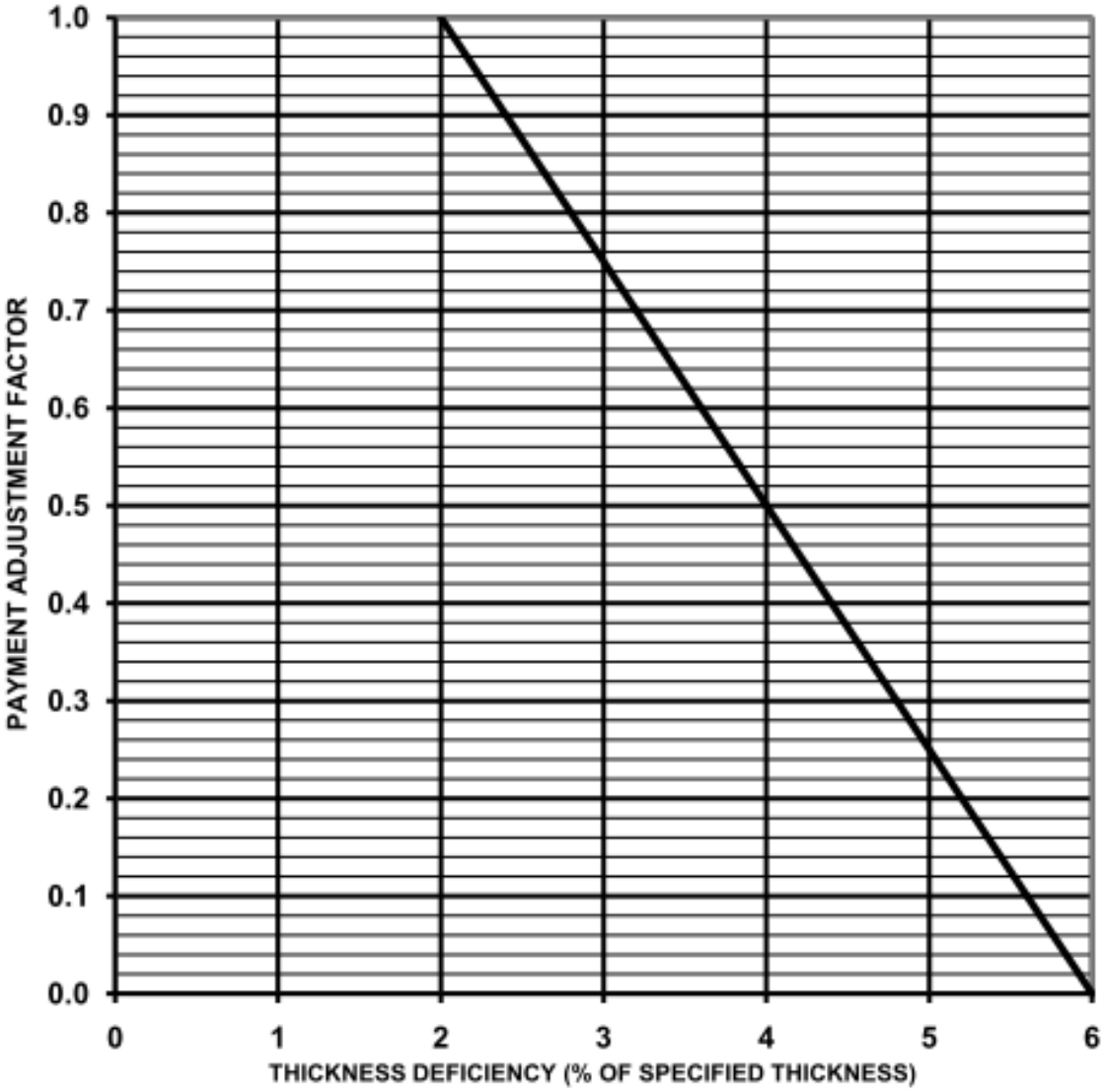


CHART D
AVERAGE THICKNESS
PAYMENT ADJUSTMENT FACTOR



END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C117, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136/C136M, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM C 309, Liquid Membrane Forming Compounds for Curing Concrete.

.4 ASTM D1751, Standard Specification For Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.5 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600 kN-m/m^3).

.2 CSA Group

.1 CSA-A23.1, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete, Including Update No. 1 2015.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals shall be in accordance with Section 01 33 00 - Submittal Procedures.

.2 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 2 weeks prior to commencing work.

.3 If materials have been tested by an accredited testing agency within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

Part 2 Products

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00 Cast-in-Place Concrete.

.2 Reinforcing steel: in accordance with Section 03 20 00- Concrete Reinforcing.

.3 Granular base material in accordance with Section 32 00 02 – Granular Base Course and the following requirements:

.1 Type 1 or 2 fill.

.2 Crushed stone or gravel.

.3 Gradations within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

.4 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water-soluble soap.

Part 3 Execution

3.1 SUBGRADE PREPARATION

.1 Subgrade preparation shall be in accordance with Section 32 00 01 Subgrade Preparation.

.2 Construct embankments using excavated material free from organic matter or other objectionable materials.

.3 Place fill in maximum 150 mm layers and compact to at least 98% of maximum dry density to ASTM D 698.

.4 Dispose of surplus and unsuitable excavated material as directed by the Department Representative.

3.2 GRANULAR BASE COURSE

.1 Obtain Departmental Representative's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base in maximum 300 mm layers to at least 100% of maximum density to ASTM D 698.

3.3 CONCRETE

.1 Obtain Departmental Representative’s approval of granular base prior to placing concrete.

.2 Do concrete work in accordance with Section 03 30 00 Cast-in-Place Concrete.

.3 Immediately after floating, give slab surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to center line.

.4 Provide slope on concrete to provide positive drainage.

.5 Provide edging as indicated with 10 mm radius edging tool.

.6 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Departmental Representative can be demonstrated. Hand finish surfaces when directed by Departmental Representative.

.7 Exterior concrete shall be designed as follows:

.1	Durability and Class of Exposure:	C-2
.2	Cement Type:	HS
.3	Minimum Compressive Strength:	32 MPa at 28 days
.4	Max W/C Ratio:	0.45
.5	Aggregate Size:	20 mm maximum
.6	Air Content Range:	5 – 8%

.8 Concrete shall conform to the requirements of CAN/CSA A23.1.

3.4 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals shown on the drawings.

.2 Install expansion joints as indicated on the drawings.

.3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.5 ISOLATION JOINTS

.1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

.2 Install joint filler in isolation joints in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Seal isolation joints with sealant approved by Department Representative.

3.6 CURING

.1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1/A23.2 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound.

.2 Where burlap is used for moist curing, two pre-wetted layers on concrete surface shall be placed and kept continuously wet during curing period.

.3 Apply curing compound evenly to form continuous film, in accordance with manufacturer's requirements.

3.7 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material as directed by Departmental Representative.

.1 Compact and shape to required contours as indicated.

3.8 FINISHES

.1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA A23.1/A23.2.

.2 Pavements, walks, curbs and exposed site concrete

.1 Screed plane surfaces and use wood floats.

.2 Provide round edges and joint spacing using standard tools.

.3 Trowel smooth to provide lightly brushed non-slip finish.

3.9 TOLERANCES

.1 The finished surfaces of all concrete work shall be true to the required cross-section with a tolerance of plus or minus 3 mm from the required elevation and dimensions. Surface of curbs, gutters or sidewalks shall not show any depressions or bumps exceeding 3 mm under a straight edge 3 m long placed parallel to the curb or sidewalk. Concrete not meeting the requirements specified shall be removed to the nearest joint and replaced at the Contractor's expense.

3.10 FIELD TESTS

.1 Tests shall be made of the concrete to ensure that it meets these specifications. Testing shall be done to conform to the following standard specifications:

Test	ASTM
Sampling of Fresh Concrete	C172
Test for Slump of Concrete	C143
Compression and Flexure Test	C31
Compressive Strength of Moulded Concrete Cylinders	C39
Measurement of Air Content	C173

.1 Three concrete cylinders shall constitute one test and shall be made from the same batch or load. They shall be stored undisturbed on site for 24 hours, covered with a plastic sheet to prevent loss of moisture. They shall then be delivered to an approved testing laboratory, and laboratory cured with one cylinder tested at seven days and the other two at twenty-eight days. A set of three cylinders shall be taken for every 100 m^3 of concrete poured, or as directed by the Departmental Representative. Test cylinders shall be 150 mm or 100 mm in diameter.

.2 When construction begins, the Departmental Representative reserves the right to request additional cylinders to be made in order to establish a concrete strength pattern as quickly as possible.

3.11 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material as shown on the drawings

.1 Compact and shape to required contours.

3.12 PROTECTION

.1 Keep all animals and pedestrians off the newly constructed sidewalks or curb until completely set. The Contractor shall also be responsible for keeping all vehicles off the work for a period of 5 days after the concrete has been finished.

3.13 CLEANING

.1 Proceed in accordance with Section 01 74 00 – Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.14 CONCRETE DETERIORATION

.1 Concrete that shows surface scaling, deterioration or loss of cement or aggregate during the maintenance period will be rejected and require removal and replacement by the Contractor at no cost to Departmental.

3.15 SIDEWALK, CURB AND GUTTER FAILURES

.1 Replacement of affected sections shall be required when one or more of the following exist:

.1 Any crack greater than 3 mm in width with no vertical displacement or chipping or spalling edges.

.2 Any crack with vertical displacement or chipping or spalling edges.

.3 Any longitudinal crack greater than or equal to 1.5 mm in width.

.4 A displacement at a joint of greater than or equal to 12 mm.

.5 A dished surface of sidewalk and/or gutter.

.6 A reverse crossfall or crossfall greater than 8% or less than 0.7%.

.7 A random cracking of any size.

.8 Any feature considered detrimental to pedestrian safety or appearance of the sidewalk and/or curb and gutter.

.9 A corner cut exists.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Agriculture and Agri-Food Canada

.1 The Canadian System of Soil Classification.

.2 Canadian Council of Ministers of the Environment

.1 PN1340, Guidelines for Compost Quality.

.3 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

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) (50)), and contain no toxic or growth inhibiting contaminates.

.4 Composed bio-solids to: CCME Guidelines for Compost Quality.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality control submittals:

.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16.16- Construction Progress Schedule - Critical Path Method (CPM).

Part 2 Products

2.1 TOPSOIL

.1 Topsoil for sodded areas, planting beds: mixture of particulates, microorganisms 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 45 % sand, minimum 27 % clay, and contain 4 to 6 % 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

.1 Fertilizer:

.1 Fertility: major soil nutrients present in following amounts:

.1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.

.2 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.

.3 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.

.2 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.3 Ph value: 6.5 to 8.0.

.2 Peat moss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous, brown in colour.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded particle minimum size: 5 mm.

.3 Sand: washed coarse silica sand, medium to course textured.

.4 Organic matter: unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.5 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

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 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 to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.

.1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 75 mm above surface.

.3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.

3.3 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 15 mm below finished grade.

.4 Spread topsoil as indicated to following minimum depths after settlement.

.1 200 mm for seeded areas.

.2 185mm for sodded areas.

.3 500 mm for shrub beds.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.4 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.

3.5 ACCEPTANCE

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

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 00- 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 requirements in accordance with Section 01 31 19- Project Meetings.

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 fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures.

.3 Samples.

.1 Submit:

.1 Sod for each type specified.

.1 Install approved samples in 1 square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.

.2 0.5 kg container of each type of fertilizer used.

.2 Obtain approval of samples by Departmental Representative.

.4 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.

.5 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 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Contractor: to be a Member in Good Standing of Landscape Saskatchewan.

.2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

.3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.4 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 Named Cultivars: Nursery Sod grown from certified seed. It shall be composed of a minimum of 60% Kentucky Bluegrass (Poa pratensis). Sod mix to be approved by Departmental Representative prior to ordering.

.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 Commercial Grade Turf Grass Nursery:

.1 Mow sod at height directed by Departmental Representative within 36 hours prior to lifting, and remove clippings.

.2 Not more than 5 broadleaf weeds and up to 20% native grasses per 40 square metres.

.3 Sod establishment support:

.1 Wooden pegs: 17 x 8 x 200 mm.

.2 Biodegradable starch pegs: 17 x 8 x 200 mm.

.4 Water:

.1 Supplied by Departmental Representative at designated source.

.5 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 INSTALLERS

.1 Use installers who are Member in Good Standing of Landscape Saskatchewan.

3.2 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 approval to proceed from Departmental Representative.

3.3 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 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; in location as directed by Departmental Representative in accordance with Section 01 74 19- Waste Management and Disposal.

3.4 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.

3.5 SOD PLACEMENT ON SLOPES AND PEGGING

.1 Start laying sod at bottom of slopes.

.2 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1 m of drainage channels and ditches to following pattern:

.1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.

.2 Not less than 3-6 pegs per square metre.

.3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by Departmental Representative.

.4 Drive pegs to 20 mm above soil surface of sod sections.

3.6 FERTILIZING

.1 Fertilize during establishment and warranty periods.

3.7 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 00- Cleaning.

.1 Clean and reinstate areas affected by Work.

3.8 PROTECTION BARRIERS

.1 Protect newly sodded areas from deterioration with snow fence on rigid frame as directed by Departmental Representative.

.2 Remove protection after inspection as directed by Departmental Representative.

3.9 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance.

.1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

.2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.

.3 Maintain sodded areas weed free 95%.

.4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.5 Temporary barriers or signage to be maintained where required to protect newly established sod.

3.10 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 50 mm.

.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 60 mm 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.

.5 Fertilizing in accordance with fertilizer program has been carried out at least once.

.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.

3.11 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Water sodded areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.

.2 Repair and resod dead or bare spots to satisfaction of Departmental Representative.

.3 Cut grass and remove clippings that will smother grass as directed by Departmental Representative to height as follows:

.1 Turf Grass Nursery Sod:

.1 50 mm during normal growing conditions.

.2 Commercial Grade Turf Grass Nursery Sod:

.1 60 mm during normal growing conditions.

.3 Cut grass as directed by Departmental Representative, but at intervals so that approximately one third of growth is removed in single cut.

.4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.5 Eliminate weeds by mechanical means to extent acceptable to Departmental Representative.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Agriculture and Agri-Food Canada (AAFC).

.1 Plant Hardiness Zones in Canada.

.2 Canadian Nursery Landscape Association (CNLA).

.1 Canadian Standards for Nursery Stock.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.4 U.S. Environmental Protection Agency (EPA) / Office of Water.

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 DEFINITIONS

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling: obtain approval from Departmental Representative of schedule 7 days in advance of shipment of plant material.

.2 Schedule to include:

.1 Quantity and type of plant material.

.2 Shipping dates.

.3 Arrival dates on site.

.4 Planting Dates.

1.4 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 trees, shrubs, ground cover, fertilizer, and mulch and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures.

.3 Samples:

.1 Submit samples of mulch.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Contractor: to be a Member in Good Standing of Landscape Saskatchewan.

.2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

.3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Ornamental Maintenance designation.

1.6 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.

.1 Protect plant material from frost, excessive heat, wind and sun during delivery.

.2 Protect plant material from damage during transportation:

.1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.

.2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.

.3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.

.3 Storage and Handling Requirements:

.1 Immediately store and protect plant material which will not be installed within 1 hour in accordance with supplier's written recommendations and after arrival at site in storage location approved by Departmental Representative.

.2 Protect stored plant material from frost, wind and sun and as follows:

.1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.

.2 For pots and containers, maintain moisture level in containers.

.3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.

.3 Store and manage hazardous materials in accordance with manufacturer's written instructions.

1.7 WARRANTY

.1 For plant material as itemized on plant list the warranty period is extended to 12 months.

.2 Contractor hereby warrants that plant material as itemized on plant list will remain free of defects in accordance with General Conditions.

.3 End-of-warranty inspection will be conducted by Departmental Representative.

.4 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

Part 2 Products

2.1 PLANT MATERIAL

.1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.

.1 Source of plant material: grown in Zone.

.2 Plant material must be planted in zone specified as appropriate for its species.

.3 Plant material in location appropriate for its species.

.2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.

.3 Trees: with straight trunks, well and characteristically branched for species.

.4 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.

.5 Collected stock: maximum 40 mm in caliper, with well developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.

.1 During collection, ensure 10% maximum seed crop (or plants) are collected from healthy population of many individuals, and from several plants of same species.

.2 Leave remainder for natural dispersal and as food for dependent organisms.

2.2 WATER

.1 Free of impurities that would inhibit plant growth.

2.3 STAKES

.1 Wood, pointed one end, 38 x 38 x 2300 mm or T-bar, steel, 40 x 40 x 5 x 2440 mm.

2.4 WIRE TIGHTENER

.1 Type 1: galvanized steel.

2.5 GUYING WIRE

.1 Type 1: steel, 3 mm wire.

2.6 GUYING COLLAR

.1 Tube: plastic, 13 mm diameter, nylon reinforced.

2.7 TRUNK PROTECTION

.1 Wire mesh: galvanized, electrically welded 1.4 mm wire with 50 x 50 mm mesh and fastener.

.2 Plastic: perforated spiralled strip.

.3 Burlap: clean 2.5 kg/m^2

.4 Tar impregnated crepe paper and twine fastener.

2.8 MULCH

.1 Wood chip: varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.

2.9 FERTILIZER

.1 Synthetic commercial type as recommended by soil test report.

2.10 SOURCE QUALITY CONTROL

.1 Obtain approval from Departmental Representative of plant material prior to planting.

.2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for planting 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 approval to proceed from Departmental Representative.

3.2 PRE-PLANTING PREPARATION

.1 Proceed only after receipt of written acceptability of plant material from Departmental Representative.

.2 Remove damaged roots and branches from plant material.

.3 Locate and protect utility lines.

.4 Notify and acquire written acknowledgement from utility authorities before beginning excavation of planting pits for trees and shrubs.

.5 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 to adjacent properties and walkways, according sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS

.1 Preparation of planting beds in accordance with Section 32 91 19.13- Topsoil Placement and Grading.

.2 For individual planting holes:

.1 Stake out location and obtain approval from Departmental Representative prior to excavating.

.2 Excavate to depth and width as indicated.

.3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.

.4 Scarify sides of planting hole.

.5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

3.4 PLANTING

.1 For bare root stock, place 50 mm backfill soil in bottom of hole.

.1 Plant trees and shrubs with roots placed straight out in hole.

.2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.

.1 Do not pull burlap or rope from under root ball.

.3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.

.4 Plant vertically in locations as indicated.

.1 Orient plant material to give best appearance in relation to structure, roads and walks.

.5 For trees and shrubs:

.1 Backfill soil in 150 mm lifts.

.1 Tamp each lift to eliminate air pockets.

.2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.

.3 After water has penetrated into soil, backfill to finish grade.

.2 Form watering saucer as indicated.

.6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.

.7 Water plant material thoroughly.

.8 After soil settlement has occurred, fill with soil to finish grade.

3.5 TRUNK PROTECTION

.1 Install trunk protection on deciduous trees as indicated.

.2 Install trunk protection before installation of tree supports.

3.6 TREE SUPPORTS

.1 Install tree supports as indicated.

.2 Use single stake tree support for deciduous trees less than 3 m in height and evergreens less than 2 m in height.

- .1 Place stake on prevailing wind side and 150 mm minimum from trunk.
- .2 Drive stake 150 mm minimum into undisturbed soil beneath roots.
  - .1 Ensure stake is secure, vertical and unsplit.
- .3 Install 150 mm long guying collar 1500 mm above grade.
- .4 Thread Type 1 guying wire through guying collar tube.
  - .1 Twist wire to form collar and secure firmly to stake. Cut off excess wire.

.3 Use 3 guy wires and anchors for deciduous trees greater than 3 m in height and evergreens greater than 2 m in height.

- .1 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5 m above grade.
- .2 Guying collars to be of sufficient length to encircle tree plus 50 mm space for trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap. Spread lead wires equally proportioned about trunk at 120 degrees.
- .3 Install anchors at equal intervals about tree and away from trunk so guy wire will form 45 degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.
- .4 Attach guy wire to anchors. Tension wire and secure by multi-wraps.
- .5 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.
- .6 Saw tops off wooden anchors which extend in excess of 100 mm above grade or as directed by Departmental Representative.
- .7 Install flagging tape to guys as indicated.

.4 After tree supports have been installed, remove broken branches with clean, sharp tools.

3.7 MULCHING

.1 Ensure soil settlement has been corrected prior to mulching.

.2 Spread mulch as indicated.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.

.1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.

.1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.

.2 Remove weeds monthly.

.3 Replace or respread damaged, missing or disturbed mulch.

.4 For non-mulched areas, cultivate as required to keep top layer of soil friable.

.5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.

.6 Remove dead or broken branches from plant material.

.7 Keep trunk protection and guy wires in proper repair and adjustment.

.8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.9 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.

.1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.

.2 Reform damaged watering saucers.

.3 Remove weeds monthly.

.4 Replace or respread damaged, missing or disturbed mulch.

.5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.

.6 Apply fertilizer in early spring as indicated by soil test.

.7 Remove dead, broken or hazardous branches from plant material.

.8 Keep trunk protection and tree supports in proper repair and adjustment.

.9 Remove trunk protection, tree supports and level watering saucers at end of warranty period.

.10 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

.11 Submit monthly written reports to Departmental Representative identifying:

.1 Maintenance work carried out.

.2 Development and condition of plant material.

.3 Preventative or corrective measures required which are outside Contractor's responsibility.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00- 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 00- Cleaning.

3.11 CLOSEOUT ACTIVITIES

.1 Submit maintenance reports for trees, shrubs, and other plantings.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standard Institute (ANSI)

.1 ANSI A300 (Part 1), Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance - Standard Practices (revision and re-designation of ANSI A300-1995) (includes supplements).

.2 ANSI A300 (Part 2), Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices - Part 2 - Fertilization.

.3 ANSI A300 (Part 3), Tree Care Operations - Tree, Shrub and Other Woody Plant Maintenance: Standard Practices - Part 3 - Tree Support Systems (a. Cabling, Bracing, and Guying) (supplement to ANSI A300-1995).

.2 Canadian Nursery Landscape Association (CNLA).

.3 International Society of Arboriculture (ISA).

.4 Ontario Ministry of Agriculture, Food and Rural Affairs:

.1 Publication 483, Pruning Ornamentals.

1.2 DEFINITIONS

.1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.

.2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.

.3 Crown Raising: consists of removal of lower tree branches to provide clearance.

.4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.

.5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.

.6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

1.3 QUALITY ASSURANCE

.1 Certification: provide International Society of Arboriculture certification.

.2 Field Samples: do sample pruning in manner to enable Departmental Representative to identify:

.1 Knowledge of target areas including branch bark ridge and branch collars.

.2 Technique for selection process and pruning used to establish desired form and shape for each species.

.3 Acceptance of Work will be determined by Departmental Representative from field sample.

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Divert wood materials from landfill for composting as directed by Departmental Representative.

1.5 TOOL MAINTENANCE

.1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.

.2 Disinfect tools before each tree is pruned.

.3 On diseased plant material disinfect tools before each cut.

Part 2 Products

2.1 DISINFECTANT

.1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 GENERAL

.1 Prune in accordance with Pruning Ornamentals, and as directed by Departmental Representative. Where discrepancies occur between standard and specifications, specifications govern.

.2 Notify immediately Departmental Representative conditions detrimental to health of plant material or operations.

.3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.

.4 Prune each species when in full leaf.

.5 Retain natural form and shape of plant species.

.6 Do not:

.1 Flush cut branches.

.2 Crush or tear bark.

.3 Cut behind branch bark ridge.

.4 Damage branch collars.

.5 Damage branches to remain.

3.3 PRUNING

.1 Remove dead, dying, diseased and weak growth in order to promote healthy growth.

.2 Remove live branches that:

.1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.

.2 Are of weak structure including narrow crotches.

.3 Obstruct development of more important branches.

.4 Are broken.

.3 Remove live branches to re-establish natural species form including:

.1 One or more developing leaders.

.2 Multiple growth due to previous topping.

.3 Branches extending outward from natural form.

.4 Undesirable sucker growth.

.4 Remove loose branches, twigs and other debris lodged in tree.

.5 Remove vines.

.6 For branches under 50 mm in diameter:

.1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.

.2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.

.3 Do not cut lead branches unless directed by Departmental Representative.

.7 For branches greater than 50 mm in diameter:

.1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.

.2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.

.3 Make final cut adjacent to and outside branch collar.

.8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.

.1 Repair areas which are damaged, or remove damaged area back to next branch collar.

.9 Remove additional growth designated by Departmental Representative.

3.4 ROOT GIRDLING

.1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.

.2 Remove exposed portion of girdling root as directed by Departmental Representative after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.5 CARE OF WOUNDS

.1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.6 CLEAN-UP

.1 Proceed in accordance with Section 01 74 00 - Cleaning.

.2 Collect and compost/recycle whenever applicable pruned material and remove from site.

.3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION