F1737-181006/A

ASPHALT PARKING LOT 'C' ADDITION

FISHERIES AND OCEANS CANADA

Pêches et Océans Canada
Fisheries and Oceans Canada

*Refers to Standard Specifications as published in MMCD Platinum Edition Volume II

END OF SECTION

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
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38290

August 30/2018

PART 1 GENERAL

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1.2 Description of Project and Site Location

.1 Civil Construction Services are being sought for creation of new asphalt paved areas at the Institute of Ocean Sciences in Sidney, British Columbia. The Institute of Ocean Sciences is a Fisheries and Oceans Canada facility operated by its Real Property Branch.

1.3 Scope of Work

.1 Services Required: Department of Fisheries & Oceans Canada (DFO) will retain a Contractor for the provision of construction services for this project.

.2 Work includes, but is not limited to the supply and installation of the following general items:

.1 Remove existing asphalt, turf and curbs in areas noted on attached Civil and Electrical Drawings.

.2 Remove unsuitable subbase & install sub base aggregate backfill as required.

.3 Compact new sub base & top course gravel and proof roll.

.4 Asphalt paving & installation of concerte curb, boulevard restoration, and line painting, as well as all associated work shown on the Civil and Electrical Engineering Drawings.

.5 Install Lighting as per attached Electrical Drawings

.3 Work of this contract is located on DFO owned land and the premises shall be considered occupied by Canadian Coast Guard, PGC and DFO employees during the course of work. Any required access is to be coordinated through the DFO Project Manager Representative. The contractor shall be responsible for notifying the occupants in writing prior to the commencement of work (min. 48 hours' notice).

.4 Work will be phased so as to not interrupt the daily operations of the site. Contractor is to provide Traffic Management/Road Closure/Phasing Plan to owner for review before work commences.

1.4 Specifications and Standards

.1 The documents provided in this Contract are based on Master Municipal Constructin Documents Association (MMCD) Platinum Edition Volume II. The applicable Sections of the MMCD Standard Specifications have been reproduced as noted and attached to this contract for informatation.

.2 The contractor shall provide each component in accordance with the descriptions in the attached specifications, Civil Drawings, Electrical Drawings, as well as comply with the overall intent of the National Building Code, the MMCD, the British Columbia Building Code.

.3 Precedence: As noted in the drawings, where a discrepancy occurs in the Specifications.the most stringent specification will apply.

1.5 Milestones

.1 The following milestones (in calendar days) have been established for the implementation of this project. The Contractors detailed schedule should meet the milestones or match as closely as possible for each task.

Project Milestone	**Time-Frame**
Contract Award	Day 0
Pre-commencement Meeting	Award + 7 days
Contractor Shop Drawings/Submittals to DFO Contract Administrator	Award + 14 days
Contract Start Date	04 February 2019
Contract Completion Date (CCD-100%)	31 March 2019

.2 Following the approval of the Contractor's schedule by the DFO Contract Administrator, the Contractor shall notify the tenants of the work schedule, and take the necessary measures to complete the work within the scheduled time-frame

.3 Product submittals are required to ensure that the specified material and products are furnished and installed in accordance with design intent as expressed in the contract documents. Until submittals are reviewed and approved by the project authority, work involving relevant material or product may not proceed. Submittals will be reviewed by the project authority and responses provided within 3 working days.

1.6 Work Covered by Contract Documents

.1 Parking lot works as identified in the attached drawings (Parking Lot 'C'). Including removals, offsite disposal, grading & testing, new asphalt, landscaping works (including reconnecting any disturbed irrigation system components), etc. as outlined on the engineered drawings. It shall be the sole responsibility of the contractor to ensure site access is not disrupted during work. The Contractor will provide all labour, materials, and equipment required to complete the asphalt paving project in the identified areas on the provided drawings for the project.

1.7 Method and Source of Acceptance

.1 The Method of Inspection and Testing will be as noted in the applicable MMCD Standard Specification unless otherwise noted. The Certificate of Substantial Completion will be issued by the overseeing Civil Engineering firm and the DFO Contract Administrator.

1.8 Site Conditions

.1 Contractor to provide and maintain flag persons, traffic signals, barricades, detour signs required to give the public proper warning. Contractor supplied disposal bins are to have a closable lid, and remain closed when being loaded.

.2 Clean-up, temporary fencing, and storage: The Contractor shall provide, install and maintain all necessary control measures to ensure the work does not impact the adjacent environment or occupants, including silt and dust control. Provide secure temporary storage facilities and fencing for materials and equipment if necessary. Clean up debris daily from the work area and ensure all hazardous impediments are removed or adequately stored or protected. The jobsite shall be left clean, neat and in a safe condition at the completion of each workday to the satisfaction of the DFO representative.

.3 Adequate storage areas for material and equipment will be provided onsite for the Contractor for the duration of the project

.4 Contractor shall maintain site roads used by construction vehicles in a clean condition and free of mud, sand and construction debris. Roads will be swept at the end of each day, or multiple times a day as required.

.5 Smoking is not permitted on the worksite.

1.9 Security Requirements

.1 There is no security requirement for this contract.

1.10 Site Parking

.1 Site parking will be made available for official “Company Marked” Vehicles only. Personal vehicles will not be permitted onsite.

1.11 Change Management Procedures

.1 Any unforeseen changes in the project scope will be handled as follows:

i. The Contractor or the Departmental Representative identifies a change in scope and provides written notice to the other party detailing the reason, impact and cost of this proposed change.
ii. An agreement is negotiated on the change, or the change is rejected.
iii. The Departmental representative issues a change order via PWGSC.

1.12 Communications Management

.1 All onsite communications shall be directed to the DFO Contract Administrator.

.2 The Contractor will arrange project meetings, and will assume responsibility for setting meeting times.

1.13 Health and Safety

.1 The Contractor must provide their Health and Safety Policy for this project and provide to DFO Project Manager for review and acceptance prior to commencing work.

.2 .If the Contractor discovers conditions that pose an immediate significant threat to human health or the environment, the Contractor shall notify the DFO Contract Administrator immediately

.3 Perform work within normal work hours and in compliance with DFO Contract Administrator requirements.

.4 Work outside of normal hours is to be approved in advance by the DFO Contract Administrator.

1.14 Temporary Facilities

.1 Provide sanitary facilities for the work force in accordance with governing regulations and ordinances.

.2 Remove temporary facilities from site when directed by the DFO Contract Administrator.

1.15 General Instructions

.1 It is the Contractor’s responsibility to visit the site prior to submission of tenders and to become thoroughly acquainted with conditions at the site, and make whatever enquiries necessary to familiarize him with climate, tide levels, and other site conditions.

.2 The Contractor shall make his own arrangements subject to the approval of the DFO Contract Administrator, for access to the site, parking, storage, and staging areas.

.3 The Contractor shall be responsible for supply of water, electrical power, heat, sanitary, first aid and all other temporary services and facilities required for the Work. Where connection to the Owner's services is authorized, all connection points shall be restored to their original condition, or replaced by the Contractor to the Owner's satisfaction.

.4 The Contractor shall erect barriers, fences, warning signs, lights, and watch for the protection of persons and property on or adjacent to the site.

.5 The Contractor shall take special care to ensure his work does not damage adjacent structures or works.

.6 The Contractor shall handle all materials appropriately to prevent their damage. The Contractor will be responsible for correcting any damage due to his mishandling at his own expense.

1.16 Documents Required

.1 Maintain at job site, one copy each document as follows:

.1 Contract documents and specifications;
.2 Contract Drawings
.3 Addenda to Contract documents;
.4 Change Orders;
.5 Reviewed shop drawings, product data, and samples;
.6 Field test records;
.7 Inspection certificates;
.8 Manufacturer's certificates
.9 Other modifications to Contract;
.10 Copy of approved Construction Schedule;
.11 Health and Safety Plan and Other Safety Related Documents;
.12 Environmental Protection Plan and Spill Response Plan;
.13 Other documents as specified in this Contract.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label each record document as "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents and samples available for inspection by the Owner.

PART 2 PRODUCTS (NOT APPLICABLE TO THIS SECTION)

PART 3 EXECUTION (NOT APPLICABLE TO THIS SECTION)

END OF SECTION

1.0 GENERAL

.1 Section 01 55 00 addresses general requirements for temporary vehicle movement, site access and parking not incorporated into the final or permanent work, as well as traffic control during construction. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 Comply with General Conditions, Clause 4.4, Temporary Structures and Facilities.

.3 During progress of the Works, make adequate provision to accommodate normal traffic along streets and highways immediately adjacent to or crossing the Works so as to minimize inconvenience to the general public.

.4 Give minimum 48 h notice or as otherwise required by local bylaws to local police, fire departments, emergency services and municipal works authorities prior to beginning construction and comply in all respects with their requirements.

.5 Inform all owners or occupants of properties where access is affected in advance of proposed road and/or sidewalk closures.

1.1 Section 01 55 00 Includes

.1 Temporary Access Roads

.2 Temporary Parking Areas

.3 Traffic Control

1.2 Temporary Access Roads

.1 Provide and maintain temporary access roads at locations approved by the Contract Administrator.

1.3 Temporary Parking Areas

.1 Parking will be permitted on site provided it does not disrupt the performance of the work.

1.4 Traffic Control

.1 During progress of the Work, make adequate provision to accommodate normal traffic along streets and highways immediately adjacent to or crossing the Works so as to cause minimum of inconvenience to general public.

.2 Regulate traffic in general accordance with municipal requirements except where specified otherwise and in compliance with specific requirements stipulated herein.

.3 Comply with requirements of the "Traffic Control Manual for Work on Roadways", published by the British Columbia Ministry of Transportation, for regulation of vehicle and pedestrian traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.

.4 When working on travelled way:

.1 Place equipment in such position as to present a minimum of interference and hazard to the travelling public.

.2 Keep equipment units as close together as working conditions will permit and preferably on same side of travelled way.

.3 Do not leave equipment on travelled way overnight.

.5 Do not close any lanes of road or highway without prior approval of the Contract Administrator. Before re-routing traffic erect suitable signs and devices as approved by the Contract Administrator. Provide sufficient crushed gravel to ensure a smooth riding surface during work.

.6 Keep travelled way well graded, free of pot holes and of sufficient width that required number of lanes of traffic may pass.

.7 When directed by Contract Administrator, provide well graded, gravelled detours or temporary roads to facilitate passage of traffic around restricted construction area. Provide and maintain signs and lights and maintain roadway.

.8 Provide and maintain reasonable road access and egress to property fronting along or in vicinity of work under contract unless approved otherwise by Contract Administrator.

.9 Traffic Control Informational and Warning Devices

.1 Meet with Contract Administrator prior to commencement of work to prepare list of signs and other devices required for project.

.2 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work which may require road user response.

.3 Supply and erect signs, delineators, barricades and other miscellaneous warning devices in accordance with Municipal requirements.

.4 Place signs and other devices in additional locations as appropriate or as directed by the Contract Administrator.

.5 Continually maintain traffic control devices in use by:

.1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.

.2 Removing or covering signs which do not apply to conditions existing from day to day.

.10 Control of Traffic Using Flaggers

.1 Provide flag persons, trained and properly equipped for the following situations:

.1 When public traffic is required to pass working vehicles or equipment which may block all or part of travelled roadway.

.2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.

.3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncom

.4 Where temporary protection is required while other traffic control devices are being erected or taken down.

.5 For emergency protection when other traffic control devices are not readily available.

.6 In situations where complete protection for workmen, working equipment and public traffic is not provided by other traffic control devices.

.7 At each end of restricted sections where pilot cars are required.

.11 Provide pilot cars where public traffic must use particularly hazardous routes or where traffic is required to remain in one lane or change periodically from one lane to another or negotiate sections of construction at restricted speed. Equip pilot cars with orange flashing lights and signs clearly designating vehicles as pilot cars.

.12 Provide and maintain suitable detours or temporary access routes for pedestrian traffic, complete with suitable warning and advisory signs.

.13 Maintain existing conditions for traffic throughout period of contract except that, when required for construction under contract and when measures have been taken as specified herein and approved by Contract Administrator to protect and control public traffic, existing conditions for traffic may be restricted.

1.5 Payment

.1 Payment for all work performed under these Sections will be incidental to payment for work described in other Sections unless shown otherwise in the Schedule of Quantities and Prices.

1.6 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

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END OF SECTION 01 55 00

1.0 GENERAL

.1 Section 01 57 01 addresses general requirements for temporary controls and environmental protection. This section is not intended to identify all and/or specific requirements. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 Comply with General Conditions, Clause 20.4, Environmental Laws.

1.1 Section 01 57 01 Includes

.1 Temporary Erosion and Sediment Control

.2 Temporary Pest Control

.3 Environmental Protection

.4 Temporary Storm Water Pollution Control

1.2 Temporary Erosion and Sediment Controls

.1 Drainage

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not discharge water containing suspended materials into watercourses, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Federal, Provincial and Municipal requirements.

.2 Work Adjacent to Watercourses

.1 Work around watercourses shall be done in accordance with the most recent version of the "Land Development Guidelines" published by the Provincial Ministry of Environment.

.2 Do not operate construction equipment in

.3 Do not use watercourse beds for borrow material without approval from Federal, Provincial and Municipal authorities.

.4 Do not dump excavated fill, waste material or debris in or adjacent to watercourses.

.5 Design and construct temporary crossings to minimize erosion to watercourses.

.6 Do not skid logs or construction materials across watercourses.

.7 Avoid spawning beds when constructing temporary crossings of watercourses.

.8 Do not blast under water or within 100 m of spawning beds without approval from Federal, Provincial and Municipal authorities.

.3 Products for Temporary Erosion and Sediment Controls:

.1 Silt Barrier Fence:

.1 Silt fence to be manufactured from a woven, slit film geotextile material with a shiny to smooth surface texture designed to reduce velocity of runoff to point that suspended particles settle out due to reduction of hydraulic energy.

.2 Silt Barrier Fence Minimum Requirements:

PROPERTY	VALUE
Grab Tensile	500 N
Mullen Burst	1900 kPa
Elongation at Break	25% Maximum
Opening	600 µm maximum
U.V. Rating @ 500 hrs	90% Retained
Efficiency	> 75% minimum
Construction	Woven (tape)
Texture	Smooth, Shiny
Posts	4 x 4 cm, treated
Post Spacing (centres)	2 metre maximum
Permittivity	10 L/s/m^2
Above values are "Minimum Average Roll Values"	

.4 Execution for Temporary Erosion and Sediment Controls:

.1 Silt Barrier Fence Placement:

.1 Place silt barrier in a manner that will intercept runoff at or close to right angles to flow. In areas where problem is severe, erect two or more silt barriers parallel to each other, until required degree of control is achieved.

.2 Fence height as specified on Contract Drawings.

.3 Position posts in such a manner that Fence structure remains naturally taut and placed or driven a minimum of 500 mm into ground. Posts to always be positioned downstream.

.4 Where a 500 mm depth is impractical or Impossible to adequately secure or to brace posts to prevent overturning of fence due to sediment loading.

.5 Bury excess geotextile at bottom of silt fence minimum of 150 mm in trench located upstream such that no flow can pass under fence.

.6 Splice subsequent lengths of barrier only at support post locations. Splice by wrapping geotextile fabric completely around each of two abutting support posts, as detailed on Contract Drawings, such that the gap between abutting posts is completely covered by both sections of fabric.

.2 Silt Barrier Fence Quantities:

.1 Limit silt fence to handle area equivalent to maximum 100 m^2 per 3 m of fence.

.2 Do not use where site slope is steeper than 3:1, and water flow rates exceed 0.03 m^2/s per 3 m of fence.

.3 Silt barrier to have efficiency > 75%. Employ successive, parallel fences to achieve required degree of control.

.3 Silt Fence Maintenance:

.1 Maintain integrity of silt fences as long as necessary to contain sediment runoff. Inspect all temporary silt fences immediately after each rainfall and at least daily during prolonged rainfall. Immediately correct any deficiencies.

.2 In addition, make daily review of location of silt fences in areas where construction activities have changed natural contours and drainage runoff to ensure that silt fences are properly located for effectiveness. Where deficiencies exist, install additional silt fences. Should silt fence become damaged or otherwise ineffective while barrier is still necessary, repair or replace promptly.

.3 Remove sediment deposits when deposit reaches approximately one-third of height of silt fence or install second silt fence upslope.

.4 Do not remove silt fence until Contract Administrator directs that it be removed.

1.3 Temporary Pest Controls NOT USED

1.4 Environmental Protection

.1 Fires:

.1 Fires and burning of rubbish on site not permitted without approval of the Contract Administrator. All fires to conform to Provincial and Municipal regulations.

.2 Site Clearing and Plant Protection:

.1 Protect trees and plants on site and adjacent properties where shown on Contract Drawings.

.2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.3 Minimize stripping of topsoil and vegetation.

.4 Restrict tree removal to areas indicated or designated by Contract Administrator.

.3 Pollution Control:

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant to local authorities emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.5 Temporary Storm Water Pollution Controls NOT USED

1.6	**Payment**	.1	Payment for all work performed under this Section will be incidental to payment for work described in other Sections unless shown otherwise in the Schedule of Quantities and Prices.
1.7	**Inspection and Testing**	.1	Refer to General Conditions, Clause 4.12, Inspections.
1.8	**Clean Up**	.1	At completion of construction phase or as directed by Contract Administrator, remove and dispose of any silt accumulations, dress area to give a pleasing appearance, and vegetate all bare areas as specified in Supplementary Specifications or as shown on Contract Drawings.
2.0	**PRODUCTS**	NOT USED	
3.0	**EXECUTION**	NOT USED	

END OF SECTION 01 57 01

1.0 GENERAL

.1 Section 03 30 20 refers to those portions of the work that are unique to the construction of Portland cement concrete walks, curbs and gutters. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1	Roadway Excavation, Embankment and Compaction	Section 31 24 13
.2	Granular Base	Section 32 11 23
.3	Granular Subbase	Section 32 11 16.1
.4	Unit Paving	Section 32 14 01
.5	Cast-in-Place Concrete	Section 03 30 53
.6	Storm Sewers	Section 33 40 01
.7	Aggregates and Granular Material	Section 31 05 17

1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 - Reference Specifications – Site and Infrastructure.

1.3 Test Panels

.1 If specified in Contract Documents construct test panels to set standard for acceptance of finished surfaces.

1.4 Measurement and Payment

.1 Payment for excavation, embankment fill (subgrade fill) and subgrade preparation will be made under payment items in Section 31 24 13 - Roadway Excavation, Embankment and Compaction.

.2 Payment for granular base and granular subbase under curb and gutter to 300 mm beyond back of curb as shown on Standard Detail Drawings will be made under payment items in Section 32 11 23 - Granular Base and Section 32 11 16.1 - Granular Subbase, respectively.

.3 Payment for machine placed or precast concrete curbs and gutters excluding granular subbase and granular base includes supply and placing of the concrete curbs and gutters and will cover all straight and curve sections and will be made separately for each specified type.

.4 Payment for hand formed curb or curb and gutter will only be made when such hand forming is specifically ordered by Contract Administrator.

.5 Payment for concrete sidewalks, in-fill strips and walkways and all concrete ramps where shown on Contract Drawings includes supply and placing of the concrete and granular base under the concrete sidewalks, in-fill strips and walkways and will be made separately for each specified thickness and type of finish.

.6 Payment for driveway crossings including granular base as shown on Standard Detail Drawing C7 will be made on a unit basis (each crossing) for each specified thickness

.7 Payment for limestone chips infill strip includes the granular base similar to that required for concrete infill strip together with 75 mm of limestone chip overlay and compaction.

.8 Payment for adjustment of existing catchbasins and other utilities covers required for installation of curb and gutter and walks will be made for each item to be adjusted. Relocation, if required, will be paid for as newly installed items.

.9 Payment for perforated drainpipe adjacent to sidewalk or curb and gutter, where shown on Contract Drawings or where directed by Contract Administrator: will be made under payment items in Section 33 40 01 - Storm Sewers.

1.5 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections

2.0 PRODUCTS

2.1 Materials

.1 Borrow material: to Section 31 24 13 - Roadway Excavation, Embankment and Compaction.

.2 Granular subbase: to Section 31 05 17 - Aggregates and Granular Materials.

.3 Granular base: to Section 31 05 17 - Aggregates and Granular Materials.

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

.5 Concrete mixes and materials: to Section 03 30 53 - Cast-in-Place Concrete with the following criteria specific to this Section:

.1 Hand-formed and hand-placed concrete:

Slump:	80 mm.
Air entrainment:	5 to 8%.
Maximum aggregate size:	20 mm.
Minimum cement content:	35 kg/m3.
Minimum 28 day compressive strength:	32 MPa.

.2 Extruded concrete:

Slump:	0 - 25 mm.
Air entrainment:	6 to 9%.
Maximum aggregate size:	10 mm.
Fineness modulus:	2.1 to 2.4.
Minimum cement content:	335 kg/m3.
Minimum 28 day compressive strength:	32 MPa.

.6 Joint filler and Curing Compound: to Section 03 30 53 - Cast-in-Place Concrete.

3.0 EXECUTION

3.1 Subgrade Preparation

.1 Excavate or fill to design subgrade to Section 31 24 13 - Roadway Excavation, Embankment and Compaction.

.2 Compact as specified in Section 31 24 13 - Roadway Excavation, Embankments and Compaction.

3.2 Granular Subbase and Base

.1 Place subbase and minimum of 100 mm granular base material to design grade as shown on Contract Drawings, including Standard Detail Drawings.

.2 Compact subbase and base to minimum 95% Modified Proctor density.

.3 Obtain Contract Administrator's approval of compacted base prior to placing forms or control devices for extruding equipment.

3.3 Formwork

.1 Ensure steel forms of approved design and free from twists and warp.

.2 Ensure wood forms of select dressed lumber, straight and free from defects and thoroughly cleaned.

.3 Use flexible forms for all curves less than 60 m radius.

.4 After obtaining Contract Administrator's approval of compacted base, set forms to line and grade as shown on Contract Drawings, free from waves or irregularities in line or grade.

.5 Set special isolation forms as required around catchbasins, manholes, poles or other objects as shown on Contract Drawings or as directed by Contract Administrator.

.6 Forms to be to shape, lines and full dimensions of work being formed.

.7 Adequately brace forms to maintain specified tolerances after concrete is placed.

.8 Treat forms lightly with approved form release agent and remove surplus agent.

3.4 Inspection

.1 Immediately prior to placement of concrete, carefully inspect all formwork to ensure forms are properly set at required horizontal and vertical alignment, sufficiently rigid, clean, surface treated and ready for placement of concrete. Obtain Contract Administrator's approval of formwork and compacted base.

3.5 Concrete Placement

.1 Place concrete to Section 03 30 53 - Cast-in-Place Concrete and the following criteria specific to this Section.

.2 Do not place concrete during rain or on ponded water or frozen base.

.3 Do not place concrete when air temperature appears likely to fall below 5°C within 24 h, unless specified precautions are taken and approved by Contract Administrator.

.4 Schedule concrete placement to ensure sufficient daylight hours available to permit edging and finishing or provide adequate illumination.

.5 Moisten granular base immediately prior to placing concrete.

.6 Place concrete within 1.5 h of batching time

.7 Place concrete in forms, ensuring no segregation of aggregate and consolidate with approved mechanical vibrator or power screed.

.8 Place concrete in continuous operation until entire panel or section completed. Do not place fresh concrete on concrete which has achieved partial set.

.9 Incorporate all castings into concrete at time of placement

.10 Discontinue placement at expansion, construction or isolation joints only.

.11 Remove face forms as soon as practical to permit face finishing. Do not leave face forms in place overnight.

3.6 Extruded Sections

.1 Extruding machine to be fitted with approved template consistent with sections shown on Standard Detail Drawings.

.2 Extruded sections to be true to line, grade and cross-section.

.3 Finished appearance, quality and workmanship to comply with Contract Drawings, this Specification and Standard Detail Drawings.

.4 Where finished product does not conform to specifications, remove defective product and replace.

.5 Defective extruded work replaced with hand placed concrete to be paid at tendered price for extruded product.

3.7 Driveway Crossings and Wheel Chair Ramps

.1 Construct driveway crossings and wheel chair ramps where shown on Contract Drawings or to Standard Detail Drawings.

3.8 Tolerances

.1 Maximum horizontal deviation = 6 mm.

.2 Maximum vertical deviation = 6 mm.

.3 Maximum deflection from horizontal or vertical alignment to be 6 mm in 3 m.

3.9 Expansion Joints

.1 Form transverse expansion joints at both ends of curb returns and at a maximum spacing of 9 m for sidewalks, 9 m for curb and gutter, at each end of driveway crossings and at tangent points on circular work.

.2 Extend through full depth of concrete.

.3 Fill with 13 mm approved expansion joint material

.4 Bond break compound may be used in lieu of expansion joint between sidewalk and back of abutting curb and gutter or where applicable between sidewalk and back of abutting utility strip or sidewalk infill.

3.10 Control Joints

.1 In sidewalks, construct control joints at maximum 3 m intervals.

.2 In curb or curb and gutter construct control joints at maximum 3 m intervals and match with control joints in abutting sidewalk.

.3 Cut to minimum depth of concrete section as shown on Standard Detail Drawings C4 and C5.

.4 Use proper tool to make cut while concrete is still green or sawcut after concrete has hardened.

3.11 Isolation Joints

.1 Form isolation joints around all poles, hydrants, manholes and all structures or fixed objects located within the concrete section by using specified joint filling material.

.2 Form longitudinal isolation joints between sidewalk and abutting curb and gutter, abutting utility strips, abutting structures using 13 mm approved joint filling material

.3 Use 13 mm premoulded hardboard joint material to form isolation joints between sidewalks and abutting walls and structures.

3.12 Finishing

.1 Finish surface of concrete sidewalks and utility strips to smooth surface with magnesium or wood float and brush or broom to provide uniform non-skid surface.

.2 Broom or brush crossways or as otherwise required to match adjacent finish or as directed by Contract Administrator.

.3 Grooves or scoring (dummy joints) used for aesthetic purposes as shown on the Contract Drawings or as directed by Contract Administrator, to be marked with proper tools and set 15 mm deep.

.4 Finish driveway crossings and wheel chair ramps as shown on Standard Detail Drawings.

.5 Round edges with steel edging tool to a width of 50 mm around perimeter of each panel or as shown on Standard Detail Drawings.

.6 Ensure surface of hand-formed curb and gutter is smooth magnesium or wood float finish. Ensure extruded curb and gutter is smooth finished and hand floated as required to correct irregularities.

.7 Under no circumstances is concrete to be overworked by trowelling, dusted with dry cement or finished with a mortar coat.

.8 Ensure finished surface as specified.

3.13 Special Effects

.1 Unit paving: to Section 32 14 01 - Unit Paving.

.2 Exposed aggregate and coloured or stamped concrete as specified on Contract Drawings or in Supplementary Specifications.

3.14 Protection

.1 Protect freshly finished concrete from dust, rain or frost by using tarpaulins or other suitable protective coverings. Keep clear of finished surface.

.2 Place and maintain suitable barriers to protect finished concrete from equipment, vehicles or pedestrian traffic.

.3 Provide personnel as required to prevent vandalism until concrete has set.

.4 Do not run vehicles or construction equipment on concrete for at least 3 days.

3.15 Curing

.1 Apply approved curing compound to all exposed concrete surfaces at rate recommended by manufacturer or alternatively, use moist curing procedures for a minimum of 7 days.

.2 When temperature is below 5°C, maintain all concrete at temperature not less than 10°C for at least 72 h and protect from freezing for at least another 72 h or such time as required to ensure proper curing of concrete. Admixtures are not to be used for prevention of freezing.

3.16 Perforated Drain Pipe

.1 Where shown on Contract Drawings or where directed by Contract Administrator install perforated drain pipe adjacent to sidewalk or curb and gutter: to Section 33 40 01 - Storm Sewers.

3.17 Acceptance

.1 Before acceptance of finished concrete remove all irregular, cracked, vandalized or otherwise defective sections and replace in accordance with specifications.

.2 Minimum area of replacement of defective sidewalk is one panel section.

3.18 Adjustment of Existing Catchbasins

.1 Adjust existing catchbasins to specified alignment and elevation using concrete bricks and mortar or concrete adjusting rings.

.2 Remove all debris from inside catchbasin.

END OF SECTION 03 30 20

1.0 GENERAL

.1 Section 26 56 01 refers to those portions of the works that are unique to the supply and installation of roadway lighting. This section must be referenced to and interpreted simultaneously with all other sections pertinent to works described herein.

1.1 Related Work

.1	Traffic Control, Vehicle Access and Parking	Section 01 55 00
.2	Excavating, Trenching and Backfilling	Section 31 23 01
.3	Aggregates & Granular Materials	Section 31 05 17
.4	Hot-Mix Asphalt Concrete Paving	Section 32 12 16
.5	Concrete Reinforcement	Section 03 20 01
.6	Cast-in-Place Concrete	Section 03 30 53
.7	Precast Concrete	Section 03 40 01

1.2 References

.1 Abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.

.2 Frequent references herein to Ministry of Transportation Electrical and Signing Material Standards., Volume 1 are abbreviated as BCMOT E&SMS V1.

1.3 Shop Drawings

.1 Observe General Conditions, Clause 5, Shop Drawings.

.2 Submit two sets of shop drawings requested in Contract Documents to Contract Administrator at least 14 days prior to commencing work .

.3 Do not manufacture equipment requiring shop drawings until shop drawings approved by Contract Administrator.

.4 Shop drawings for pole structures, where required, to be sealed by a Professional Engineer.

1.4 Electrical Energy Supply

.1 To be supplied from utility company secondary distribution system at location(s) shown on Contract Drawings.

.2 Confirm exact service location with utility company and advise Contract Administrator thereof.

.3 Arrange with utility company for connection and disconnection of services. All connections and disconnections to be made by utility company.

1.5 Contractor Qualifications

.1 All electrical work to be performed by a Registered Electrical and Inspection Contractor under provisions of British Columbia Electrical Safety Act.

.2 Underground conduits to be installed by qualified personnel holding an Electrical Safety Branch Restricted Work Qualification (WQ) certificate group 2b (UR) underground raceway installer. (BC Provincial - Electrical Safety)

1.6 Permits and Tests

.1 Obtain and pay for all necessary permits prior to commencing work. Refer to General Conditions, Clause 20, Laws, Notices, Permits and Fees.

.2 Supply a copy of each permit to Contract Administrator.

.3 Supply all necessary instruments, meters, equipment, qualified personnel and make tests on electrical equipment and wiring where requested by Contract Administrator.

1.7 Work Regulations

.1 Electrical work to conform to latest edition of Canadian Electrical Code and any bulletins published by the BC Safety Authority.

.2 Work to conform to all applicable regulations of WorkSafe BC. If required, submit Notice of Project Form 52E49 prior to commencing construction.

.3 Confirm compliance with the following

.1 WorkSafe BC form 30M33 to be completed prior to working in vicinity of overhead power lines.

.2 Notice of construction projects, WorkSafe BC Industrial Health and Safety Regulations, Section 34.16(3).

1.8 Record Drawings

.1 Contractor to provide:

.1 Information on all changes, additions and deletions to Contract Drawings to reflect "as constructed" installation, including final locations of all equipment installed, per Section 01 33 01 Project Record Documents.

.2 All drawings to Contract Administrator no later than 14 days after Substantial Performance.

1.9 Measurement and Payment

.1 Supply and installation of roadway lighting will be paid as lump sum unless shown otherwise in Schedule of Quantities and Prices.

.2 Roadway lighting lump sum price(s) include all labour, equipment and materials required to complete installation as shown on Contract Drawings.

.1 Lump sum price(s) include, where specified, pick-up, delivery and installation of all materials supplied by Owner.

.2 Lump sum price(s) include all permits and fees for electrical inspections, testing, and all other costs associated with electrical work undertaken by others.

.3 Where existing utilities and underground structures are found to be in locations different than as shown on Contract Drawings, refer to General Conditions, Clause 11, Concealed or Unknown Conditions.

1.10 Inspection

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 General

.1 Supply all products necessary for completion of project unless otherwise noted in Supplementary Specifications.

.2 All products supplied to be new, and in accordance with Contract Documents. Products to meet or exceed Canadian Electrical Code (CEC) requirements and CSA Standards.

.3 All roadway lighting products to conform to BCMOT E&SMS V1 except where noted on the Contract Drawings.

.4 All similar products to be of one type and from one manufacturer.

.5 Alternative products to be approved by Contract Administrator prior to construction.

2.2 Conduit

.1 Rigid Metal Conduit (RC):

.1 Conduit, Couplings, Adaptors, Bends and Fittings: To CSA C22.2 No. 45.

.2 Cut ends to be reamed and all necessary bushings, locknuts, elbow and bends provided. All joints made with threaded couplers.

.2 Rigid PVC Conduit (RPVC):

.1 Conduit - Rigid polyvinyl chloride to conform to CSA C22.2 No. 211.1.

.2 Couplings, Adaptors, Bends and Fitting - Rigid polyvinyl chloride to conform to CSA C22.2 No. 85.

.3 Cement – CSA certified as recommended by RPVC manufacturer.

.3 Liquid Tight Non Metallic Flexible Conduit (FC): to conform to CSA C22.2 No. 227.2.1.

.4 Liquid Tight Metallic Flexible Conduit (FMC): To conform to CSA C22.2 No.56.

.5 Conduit Clamps: To conform to CSA C22.2 No. 18.4, hot dip galvanized malleable iron, sized to suit.

2.3 Trench Marker Tape

.1 Minimum 100 mm wide, minimum 3.5 mils thick, heavy duty polyethylene. Yellow with black letters displaying:
"CAUTION - ELECTRICAL LINE BURIED BELOW".

2.4 Plastic Junction Boxes

.1 Round type, small or large to conform to Section 201 Plastic Junction Boxes, BCMOT E&SMS V1.

2.5 Concrete Junction Boxes

.1 Concrete junction boxes to conform to Section 203 Concrete Vaults, Junction Boxes and Manholes, BCMOT E&SMS V1 with the following exceptions:

.1 No.'s 37 and 66 Concrete Junction Boxes: Refer to Standard Detail Drawing E2.2.

.2 Large concrete Junction Boxes: Refer to Standard Detail Drawings E2.3 and E2.4.

.3 Concrete Vaults: Refer to Standard Detail Drawings E2.5 and E2.6.

2.6 Concrete Bases

.1 Concrete bases per Section 03 40 01 – Precast Concrete, and Contract Drawings.

2.7 Poles and Anchor Bolts

.1 Traffic Signal, Luminaire and Sign Poles to conform to Section 301 - Traffic Signal, Luminaire and Sign Pole Structures, BCMOT E&SMS V1.

.2 Anchor Bolts to conform to Section 301 - Traffic Signals, Luminaire and Sign Pole Structures, BCMOT E&SMS V1 and to Standard Detail Drawings CE1.15, CE1.16 and CE1.17, except for pedestrian/cyclist pushbutton posts, which require 19mm diameter anchor bolts.

.3 Steel Service Bases: Fabrication to conform to Section 301 - Traffic Signals Luminaire and Sign Pole Structures, BCMOT E&SMS V1 and to Standard Detail Drawing E4.21.

.4 Steel Pedestrian/Cyclist Pushbutton Posts: Fabrication to Section 301 - Traffic Signal , Luminaire and Sign Pole Structures, BCMOT E&SMS V1 and to Standard Detail Drawings E6.3.

.5 Steel Decorative Poles: Fabrication to conform to Section 301 - Traffic Signal, Luminaire and Sign Pole Structures, BCMOT E&SMS V1 with the following requirements notes on Contract Drawings:

.1 Contract Drawings to show shape as: round, fluted, square or multi-sided.

.2 Contract Drawings to show Base Covers as: cast iron, heat treated aluminium or composite material.

.3 Contract Drawings to show Finish as powder coat for steel, cast iron and aluminium.

.4 Shop drawings of poles and base covers signed and sealed per 1.3 of this Section.

.5 Finish and colour specified on Contract Drawings.

.6 Concrete Poles: Base plate or direct bury type to conform to CSA A14.

.7 Aluminum Frangible Bases to conform to Section 304 – Aluminum Frangible Bases, BCMOT E&SMS V1.

.8 Breakaway Bases to conform to Section 305 – Breakaway Bases, BCMOT E&SMS V1.

2.8 Conductors and Cables

.1 Single Conductors: 600V, conductor size (AWG) as noted on contract drawings, stranded copper type with RW90 polyethylene insulation, to conform to CSA C22.2 No 38, 90°C, and colour coded per CEC.

.2 SOW Cables: Multi conductor cable, 600V, 90°C, colour coded stranded copper conductor, with rubber insulation, black hypalon or neoprene outer jacket to conform to CSA C22.2 No. 49. Number and size of conductors per Contract Drawings.

.3 Armoured Cables: Teck 90, 600V to CSA C22.2 No. 131, with stranded copper conductors with RW90 polyethylene insulation, ground conductor, PVC inner jacket, aluminium or galvanized steel interlocking armour, PVC outer jacket, FT4 flame rating (CSA C22.2 No. 0.3), heat and moisture resistant black outer jacket to -40°C. number and size of conductors per Contract Drawings.

.4 Aerial Conductors: Type NSF-2, 600V, one to three aluminium conductors with polyethylene insulation with PVC jacket and a neutral support conductor, to conform to CSA C22.2 No. 129.

2.9 Conductor Tags

.1 White or yellow rigid waterproof material, minimum 50mm x 50mm with a thickness of 0.5mm to attach to conductors with tie-raps. Label conductors using black indelible pen.

2.10 Conductor Connectors

.1 Boxes and Pole Hand holes:

.1 Screw-on Type: Twist on solder-less connectors, with shell rated at 105°C. Size to suit conductor gauge and number of conductors.

.2 Split Bolt: single or dual bolt, copper alloy construction. Size to suit conductor gauge and number of conductors.

.2 Controller Terminal Block: Compression spade type connectors.

.3 Ground Clamp: Copper with bolt down compression connection.

2.11 Fuses and Fuse Holders

.1 Fuse: 10 amp standard midget fuse (10mm x 38mm), Class CC to CSA C22.2 No. 248.4 and rated for up to 600V.

.2 Fuse holder – 30A-600V inline breakaway type fuse holders complete with crimp on or screw type wire connectors and 2 'L' type rubber insulating boots.

2.12 Grounding Equipment

.1 Ground Rods: 20 mm diameter 3m steel with hot forged point, hot-dipped galvanized.

.2 Ground plate to Standard Detail Drawing E7.10.

2.13 Receptacles

.1 Receptacles: 15A-120V corrosion resistant spec grade duplex to CSA C22.2 No. 42.

.2 Boxes: Cast FS type to CSA C22.2 No. 18.1.

2.14 Luminaires

.1 Flat Glass cobra head and sign luminaires to Section 501 Luminaires BCMOT E&SMS V1.

.2 Specifications for 150Watt luminaires shall apply to 100Watt and 70 Watt luminaires.

.3 Decorative luminaires per Contract Drawings

.4 Shop drawings and Manufacturers/ data sheets required for decorative luminaires.

.5 Decorative luminaires to have:

.1 Ballast starting current equal to or less than operating current.

.2 Features which facilitate lamp replacement.

.3 Vandal resistant features.

.4 Photo-control receptacle.

.5 Powder coat finish.

.6 Quick disconnect with ballast on tray.

2.15 Nuts, Bolts, Screws And Washers

.1 Nuts, bolts and washers 10mm or smaller: Type 18-8 or 316 stainless steel hex head.

.2 Nuts bolts and washers larger than 10mm:

.1 Nuts: Galvanized SAE grade 2 heavy hex.

.2 Bolts: Galvanized SAE grade 5.

.3 Washers: Galvanized.

.3 Screws: Stainless steel Robertson no. 10.

2.16 Cold Galvanizing Compound

.1 Cold galvanizing Compound: Spray type to have minimum of 93% zinc.

2.17 Extruded Aluminum Signs

.1 Sign Substrate: Alloy 6036-T6 to Alcan Shape No. 73247 with anodized finish to conform to ASTM B221M.

.2 Sheeting:

.1 Encapsulated lens (high Intensity): ASTM D4956-01 Type III.

.2 Prismatic lens (micro-prismatic): ASTM D4956-01 Type IV.

.3 T-Section Sign Supports: 102mm x 102mm x 9.5 mm thick aluminium 6061-T6, length to suit sign

.4 J Clips: Refer to Standard Detail Drawing E11.8.

2.18 Powder Coat Materials

.1 Base coat products for pole finish will be :

.1 DuraCoat Zinc Rich Epoxy Primer E-2024-2Z.

.2 Tiger Drylac Zinc Rich Epoxy Primer 69/90500-20.0.

.2 Topcoat products for pole finish will be:

.1 DuraCoat polyester TGIC EX Series.

.2 Tiger Drylac Series 49.

.3 Alternate products for pole finish may be approved by the Contract Administrator, based on a comparison of:

.1 Powder Properties.

.2 Curing Properties.

.3 Corrosion Protection Properties.

.4 Weather and UV Resistance Properties.

.5 Mechanical Properties.

.6 Independent Test Reports on Finished Product.

.4 Colours: within 3 DE (Deltas) of the colour specified.

3.0 EXECUTION

3.1 General

.1 Ensure all permits and approvals obtained.

.2 Lay out work as shown on Contract Drawings.

.3 Confirm location of all works to be installed with Contract Administrator.

.4 Take reasonable precautions necessary to prevent damage to existing utilities. Any damage to utilities must be repaired to satisfaction of Contract Administrator.

3.2 Excavating, Trenching and Backfilling

.1 Refer to Section 31 23 01 - Excavating, Trenching and Backfilling for conduits, boxes, bases, vaults, etc.

3.3 Concrete Bases

.1 Install concrete bases in accordance with Section 03 30 53 – Cast-In-Place Concrete and as shown on Standard Detail Drawings CE1.1 to CE1.20 and E1.1 to E1.7.

.2 Excavate for base ensuring minimum disturbance to surrounding soil.

.3 Concrete base installation tolerances to be as follows:

.1 Location to be within 150 mm of specified.

.2 Elevation to be within 10 mm of specified.

.3 Top surface variation from level shall not exceed 3 mm.

.4 Remove wooden formwork prior to backfilling cast-in-place bases. Round sonotube forms may be buried with exposed portions removed.

.5 Concrete bases to have a compressive strength of 30 MPa prior to pole installation.

.6 Backfill and compact around bases to 95% Modified Proctor density.

3.4 Junction Boxes and Vaults

.1 Install junction boxes and vaults as shown on Standard Detail Drawings E2.1 to E2.6.

.2 Install box and vaults on clear drain rock base.

.3 Set top of lid level with finished grade.

.4 Bond steel lids (Leave enough slack in wire for lid removal).

3.5 Underground Conduit

.1 Install R.PVC underground conduits in open trenches as shown on Standard Detail Drawings E3.1 and E3.2 unless shown otherwise on Contract Drawings

.2 Minimum cover over conduits to be 600 mm.

.3 Place trench marker tape above installed conduit in trench. Trench marker tape not required for conduits installed via trenchless technology.

.4 Where shown on Contract Drawings, install conduits under pavement to alignments and elevations specified, using a suitable trenchless technology

.5 Install pull string in all empty conduits and cap at both ends.

3.6 Poles and Related Equipment

.1 Install poles and related equipment as shown on Standard Detail Drawings E4.1 to E4.22 and E10.1 to E10.10.

.2 Where minimum pole to powerline clearances as shown on Standard Detail Drawing E7.14 cannot be maintained advise the Contract Administrator and defer further work pending instruction.

.3 Take all precautions necessary to ensure adequate protection of existing works and personnel during installation of poles.

.4 Coat anchor bolts with approved grease prior to pole installation.

.5 Install pole arms at right angles to street centreline unless shown otherwise on Contract Drawings. Orient pole handholes on opposite side to direction of traffic.

.6 Handle all poles and related hardware with care to prevent stress to components through bending or twisting. Use nylon sling to transport and erect components. Use of steel chains as slings not permitted. Repair any damage to components through overstress, scratching or denting and replace in accordance with Contract Documents.

.7 Mount pole shafts directly on concrete bases and, where necessary, plumb true using levelling shims.

.8 Tighten all nuts and bolts to 1/3 past snug tight. "Snug-tight" is tightness attained by a few impacts of an impact wrench or full effort of a person using a spud wrench.

.9 Coat all scratches in poles and all field drilled holes with cold galvanizing compound.

.10 Wrap poles with pre-painted or powder coat finish with protective material to prevent damage during shipping.

3.7 Electrical

.1 Install electrical underground dip service on utility pole as shown on Standard Detail Drawing E7.1.

.2 Mount electrical service panels in service base or on poles as shown on Standard Detail Drawing E7.2 to E7.9.

3.8 Wiring

.1 Install wiring in pole handholes as shown on Standard Detail Drawings E7.11and E7.12.

.2 Wiring to conform to requirements of Canadian Electrical Code.

.3 Make conductor splices in pole handholes. See Standard Detail Drawing E8.4 for splice details.

.4 Single conductor sizes and colours to be as specified on Contract Drawings.

.5 Label cables, conductors, and bundles in pole handholes, junction boxes, and vaults with wire tags. Mark tags with item and circuit No. or cable (ie; St.Ltg. (cct 1), Locate labels near conductor splices in easily visible locations.

.6 Run separate neutral and bonding conductor from base of pole to each luminaire.

.7 Neatly arrange and bundle wiring in, junction boxes, vaults, and pole handholes and service panels.

.8 Secure conductor splices with solderless type connectors. Where number and/or size of conductors exceeds capacity of solderless connector use split bolt connectors.

.9 Seal connections, with exception of detector loop to shielded cable splices:

.1 Wrap each conductor with self-holding tape.

.2 Wrap complete splice with self-holding tape.

.3 Completely cover complete splice with PVC tape.

.10 If conductor connections require use of split bolts or similar style devices due to wire size, completely cover splice with tape then Duct Seal to form a ball over connection. Duct Seal to be thick enough to prevent sharp ends of conductors and/or points of connector from protruding through taped connection. Once Duct Seal has been applied, tape splice with self-holding and PVC tape.

.11 Bond all, signal heads, receptacles, steel junction box lids and vault lids with a No. 12 RW90 conductor.

3.9 Pole Mounted Receptacles

.1 Install pole mounted receptacles as shown on Standard Detail Drawing E7.15.

.2 Install receptacles to elevation and orientation shown on Contract Drawings.

3.10 Luminaires and Photocells

.1 Install luminaires and photocells in accordance with manufacturer's instructions.

.2 Install luminaires level.

.3 Aim photocells North.

3.11 Grounding & Bonding

.1 All grounding and bonding to conform to Canadian Electrical Code and latest Electrical Safety Branch Amendments.

.2 Connect only one wire to any one ground bushing.

.3 Ground rigid steel conduits.

.4 Steel junction box lids.

3.12 Cold Galvanizing Compound Application

.1 Repair damage to galvanized surfaces with cold galvanizing compound.

.2 Apply cold galvanizing compound to manufacturer's instructions.

.3 Clean surfaces with a wire brush or grinder and chemically remove all welding flux, paint, grease, oil, rust, scale or foreign matter before coating.

.4 Limit application to dry conditions and ambient temperature over 10°C.

.5 Coat with two thick uniform coats without causing runs on finished surface.

3.13 Pole Finish Application

.1 Pole Finish: Hot dip galvanized.

.2 Cleaning: Brush blast to NACE SSPC-SP7 with a minimum profile of 0.5 mils.

.3 Finished product to be covered and shielded from dirt or moisture in transit to application site.

.4 Poles or components with any sign of flash rust will be cleaned by additional brush blasting.

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END OF SECTION 26 56 01

1.0 GENERAL

.1 Section 31 05 17 refers to those portions of the work that are unique to the supply and processing of aggregates. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1 Section 31 05 17 includes specifications for aggregates and granular materials referred to in the following sections:

.1	Shrub and Tree Preservation	Section 31 11 41
.2	Excavating, Trenching and Backfilling	Section 31 23 01
.3	Roadway Excavation, Embankment And Compaction	Section 31 24 13
.4	Granular Base	Section 32 11 23
.5	Granular Subbase	Section 32 11 16.1
.6	Unit Paving	Section 32 14 01
.7	Portland Cement Concrete Pavement	Section 32 13 13
.8	Waterworks	Section 33 11 01
.9	Storm Sewers	Section 33 40 01
.10	Pipe Culverts	Section 33 42 13
.11	Sanitary Sewers	Section 33 30 01
.12	Sewage Forcemains	Section 33 34 01

.2 Section 31 05 17 does not include specifications for aggregates to be incorporated into controlled density fill, hot-mix asphalt concrete paving, pavement crack filling, ready-mixed concrete or granular materials for landscaping purposes. These specifications are specified as follows:

.1	Controlled Density Fill	Section 31 23 23
.2	Hot-Mix Asphalt Concrete Paving	Section 32 12 16
.3	Pavement Crack Cleaning and Filling Prior to Overlay	Section 32 01 17.7
.4	Cast-in-Place Concrete	Section 03 30 53
.5	Topsoil and Finish Grading	Section 32 91 21
.6	Seeding	Section 32 92 20
.7	Hydraulic Seeding	Section 32 92 19
.8	Sodding	Section 32 92 23
.9	Planting of Trees, Shrubs and Ground Covers	Section 32 93 01

1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.

1.3 Approvals

.1 Inform Contract Administrator of proposed source and provide samples or access for sampling at least 2 weeks prior to commencing production.

.2 If materials from proposed source do not meet specified requirements, locate alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.3 Should a change of material source be proposed during work, advise Contract Administrator 2 weeks in advance of proposed change to allow sampling and testing.

.4 Acceptance of material does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified.

1.4 Measurement and Payment

.1 Payment for all work performed under in this Section will be included under payment for work requiring aggregates and granular materials in other Sections unless specifically shown otherwise as separate pay items.

1.5 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 Materials - General

.1 Gravel to be composed of inert, durable material, reasonably uniform in quality and free from soft or disintegrated particles. In absence of satisfactory performance records over a five year period for particular source of material, soundness to be tested according to ASTM C88 or latest revised issue. Maximum weight average losses for course and fine aggregates to be 30% when magnesium sulphate is used after five cycles.

.2 All crushed gravel when tested according to ASTM C136 and ASTM C117, or latest revised issue, to have a generally uniform gradation and conform to following gradation limits and 60% of the material passing each sieve must have one or more fractured faces. Determination of the amount of fractured material shall be in accordance with the Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "A", which determines fractured faces by count. The Plasticity Index for crushed gravel to not exceed 6.0.

2.2 Native Material

.1 To be any workable soil free of organic or foreign matter; any material obtained within limits of Contract may be deemed native material for purposes of payment if it is approved by the Contract Administrator. Native material is not acceptable if it is impracticable to control its water content or compact to specified density.

2.3 Pit Run Gravel

.1 To be well graded granular material, substantially free from clay lumps, organic matter and other extraneous material, screened to remove all stones in excess of maximum diameter specified in material description (300 mm Pit Run Gravel, 200 mm Pit Run Gravel, 100 mm Pit Run Gravel). Material to compact to specified density and conform to following gradations:

Sieve Designation	Percent Passing		
(300 mm dia)			(100)
(200 mm dia)	---		(100)
(100 mm dia)	---		(100)
75 mm	---		100
50 mm	70	-	100
25 mm	50	-	100
4.75 mm	22	-	100
2.36 mm	10	-	85
0.075 mm	2	-	8

.2 Recycled concrete free from contaminated and other extraneous material, conforming to the specified gradations may be used as pit run gravel.

2.4 Pit Run Sand

.1 To be well graded pit run sand, free from organic materials and conform to following gradations:

Sieve Designation	Percent Passing		
12.5 mm			100
4.75 mm	35	-	100
2.36 mm	20	-	70
1.18 mm	13	-	50
0.600 mm	8	-	35
0.300 mm	5	-	25
0.150 mm	2	-	15
0.075 mm	0	-	6

2.5 River Sand

.1 River sand to be free of organic material and conform to the following gradation:

Sieve Designation	Percent Passing
19 mm	100
4.76 mm	80 - 100
0.60 mm	20 - 100
0.42 mm	10 - 100
0.25 mm	0 - 80
0.15 mm	0 - 50
0.074 mm	0 - 4

2.6 Drain Rock

.1 To consist of clean round stone or crushed rock conforming to following gradations:

	Percent Passing	
Sieve Designation	Coarse	Fine (Torpedo Gravel)
25.0 mm	100	
19.0 mm	0 - 100	
9.5 mm	0 - 5	100
4.75 mm	0	50 - 100
2.36 mm		10 - 35
1.18 mm		5 - 15
0.600 mm		0 - 8
0.300 mm		0 - 5
0.150 mm		0 - 2
0.075 mm		0

.2 Drain rock to be used only where specified on Standard Detail Drawings or Contract Drawings. Use of drain rock other than as specified requires approval of Contract Administrator after examination of soils against which drain rock will be placed.

2.7 Granular Pipe Bedding and Surround Material

.1 Crushed or graded gravels: to conform to following gradations:

Sieve Designation	Percent Passing Type 1*	Type 2*
25.0 mm	100	100
19.0 mm	90 - 100	90 - 100
12.5 mm	65 - 85	70 - 100
9.5 mm	50 - 75	
4.75 mm	25 - 50	40 - 70
2.36 mm	10 - 35	25 - 52
1.18 mm	6 - 26	15 - 38
0.600 mm	3 - 17	6 - 27
0.300 mm		3 - 20
0.075 mm	0 - 5	0 - 8

***Type 1**: *standard gradation*
***Type 2**: *to be used only in dry trench conditions and with Contract Administrator's prior approval*

Recycled concrete free from contaminated and other extraneous material, conforming to the Type 1 gradations, may be used as pipe bedding and surround material.

.2 Other permissible materials: only where shown on Contract Drawings or directed by Contract Administrator shall drain rock, pit run sand, river sand or approved native material be used for bedding and pipe surround.

2.8 Select Granular Sub-base

.1 To be well graded granular material, substantially free from lumps and organic matter, screened if required to conform to following gradations:

Sieve Designation	Percent Passing
75 mm	100
25 mm	50 - 85
0.150 mm	0 - 15
0.075 mm	0 - 8

2.9 Crushed Granular Sub-base

.1 To be 75 mm crushed gravel conforming to following gradations:

Sieve Designation	Percent Passing		
80 mm			
75 mm			100
38 mm	60	-	100
25 mm		-	
19 mm	35	-	80
12.5 mm		-	
9.5 mm	26	-	60
4.75 mm	20	-	40
2.36 mm	15	-	30
1.18 mm	10	-	20
0.6 um	5	-	15
0.3 um	3	-	10
0.18 um		-	
0.15 um		-	
0.075 um	0	-	5

2.10 Granular Base

.1 To be 19 mm crushed gravel conforming to following gradations:

Sieve Designation	Percent Passing		
19 mm			100
12.5 mm	75	-	100
9.5 mm	60	-	90
4.75 mm	40	-	70
2.36 mm	27	-	55
1.18 mm	16	-	42
0.600 mm	8	-	30
0.300 mm	5	-	20
0.075 mm	2	-	8

.2 Where shown on the contract drawings or directed by the Contract Administrator, Type 2_19 mm crushed gravel conforming to following gradations is permissible:

Sieve Designation	Type 2 Percent Passing		
25mm			100
19mm	80	-	100
9.5mm	50	-	85
4.75mm	35	-	70
2.36mm	25	-	50
1.18mm	15	-	35
0.300mm	5	-	20
0.075mm	0	-	5

2.11 Recycled Aggregate Material

.1 Aggregates containing recycled material may be utilized if approved by the Contract Administrator. In addition to meeting all other conditions of this specification, recycled material should not reduce the quality of construction achievable with quarried materials. Recycled material should consist only of crushed portland cement concrete; other construction and demolition materials such as asphaltic pavements, bricks, plaster, etc. are not acceptable.

2.12 Pit Fines, Overburden and Cyclone sand

.1 **Pit Fines**: Fine aggregate which is a by-product of gravel washing and screening, conforming to the following:

Sieve Designation	Percent Passing		
4.76mm		100	
0.42mm	80	-	100
0.074mm	0	-	4

.2 **Cyclone Sand** Inorganic fine sand produced as a by-product of gravel processing and conforming to the following:

Sieve Designation	Percent Passing		
4.76mm		100	
0.42mm	80	-	100
0.25mm	50	-	100
0.15mm	0	-	70
0.074mm	0	-	20

.3 **Overburden** Inorganic, silty, native material as a by-product of gravel mining and conforming to the following:

Sieve Designation	Percent Passing		
150.mm	100		
76.00mm	85	-	100
4.76mm	45	-	100
0.42mm	25	-	100
0.074mm	20	-	60

3.0 EXECUTION

3.1 Handling

.1 Handle and transport aggregates to avoid segregation, contamination and degradation

.2 Do not use intermixed or contaminated materials. Remove and dispose rejected materials within 48 h of rejection.

END OF SECTION 31 05 17

1.0 GENERAL

.1 Section 31 11 01 refers to those portions of the work that are unique to clearing and grubbing. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1	Environmental Protection	Section 01 57 01
.2	Shrub and Tree Preservation	Section 31 11 41
.3	Site Grading	Section 31 22 01
.4	Excavating, Trenching and Backfilling	Section 31 23 01
.5	Roadway Excavation, Embankment and Compaction	Section 31 24 13

1.2 Definitions

.1 Clearing consists of cutting off trees, brush and heavy vegetative growth to not more than a specified height above ground and disposing of felled trees, brush, vegetative growth, including all underbrush, deadwood and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing flush with existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than a specified height above ground designated trees and disposing of felled trees and debris.

.4 Grubbing consists of excavation and disposal of stumps and roots to not less than a specified depth below existing ground surface.

1.3 Protection of Existing Features

.1 Prevent damage to all adjacent natural growth, landscaping, buildings, structures and underground and overhead utilities. Make good all damage to satisfaction of Contract Administrator.

.2 Apply specified tree paint to cuts or scars suffered by vegetation designated to remain.

1.4 Measurement and Payment

.1 Payment for all clearing and grubbing items includes removal and disposal of all branches, stumps, timbers and vegetation remains.

.2 Payment for all clearing and grubbing items will be based on the areas or isolated trees to be cleared and grubbed as shown on Contract Drawings or as directed by Contract Administrator.

1.5 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

.1 Prior to clearing, verify limits of clearing with Contract Administrator, and determine any restrictions regarding preservation of existing trees, shrubs, natural features or improvements within or adjacent to specified limits of clearing.

3.1 Clearing

.1 Clear trees, shrubs, uprooted stumps and surface debris not designated to remain.

.2 Cut off trees, brush, and scrub at a height of not more than 300 mm above ground. In areas to be subsequently grubbed, ensure height of stumps left from clearing operations not more than 1000 mm above existing ground.

.3 Upon written authorization from Contract Administrator, cut off unsound branches of trees designated to be preserved and fall isolated trees overhanging area to be cleared.

.4 Preserve all shrubs, trees or other cultivated plants specified for replanting.

3.2 Close-Cut Clearing

.1 Cut off trees, shrubs, stumps and other vegetation at ground level.

3.3 Isolated Trees

.1 Cut off isolated trees as shown on Contract Drawings or as directed by Contract Administrator at height of not more than 300 mm above existing ground.

.2 Grub out isolated tree stumps.

3.4 Grubbing

.1 Grub out stumps and roots to not less than 200 mm below existing ground surface.

3.5 Removal and Disposal

.1 Unless specified otherwise in Supplementary Specifications all timber becomes property of Contractor.

.2 Dispose of cleared and grubbed material as work progresses and do not accumulate.

.3 Fires and burning of rubbish on site not permitted without approval of the Contract Administrator. All fires to conform to Provincial and Municipal regulations.

.4 Dispose cleared and grubbed materials to approved off-site disposal area. Complete and submit required documents under Provincial Contaminated Sites Legislation before removing material.

.5 Where specified, chip or mulch and spread cleared and grubbed vegetative material on site.

3.6 Finished Surface

.1 Leave ground surface in condition suitable for immediate grading operations or stripping of topsoil if so specified.

END OF SECTION 31 11 01

1.0 GENERAL

.1 Section 31 22 01 is a "Landscaping" Section and refers to those portions of the work that are unique to preparation of subgrade, by rough grading and filling, to provide a base that will allow placing of growing medium (topsoil) to specified depths. **THIS SECTION DOES NOT APPLY TO GRADING PRIOR TO PLACEMENT OF PAVED OR CONCRETED SURFACES**. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 This section is based on the "British Columbia Landscape Standard" published by the B. C. Society of Landscape Architects and the B. C. Nursery Trades Association. This standard is intended to set a level of quality which is to be equalled or bettered in the construction documents for each project. Guidance of a registered British Columbia Landscape Architect is recommended.

1.1 Related Work

.1	Topsoil and Finish Grading	Section 32 91 21
.2	Seeding	Section 32 92 20
.3	Hydraulic Seeding	Section 32 92 19
.4	Sodding	Section 32 92 23
.5	Planting of Trees, Shrubs and Ground Covers	Section 32 93 01

1.2 References

.1 British Columbia Landscape Standard.

.2 Canadian System of Soil Classification.

1.3 Site Conditions

.1 Examine site with Contract Administrator and obtain approval of previous work prior to commencing site grading.

.2 Comply with General Conditions, Clause 4.3, Protection of Work, Property, and the Public and General Conditions, Clause 4.5, Errors, Inconsistencies or Omissions in the Contract Documents.

1.4 Measurement and Payment

.1 Measurement for topsoil stripping including stockpiling for re-use will be made from before and after cross sections of stripped area as determined by Contract Administrator.

.2 Payment for rough site grading includes cut and fill excavation and its on-site redistribution and compaction to design elevations and grades with off-site disposal of surplus materials to be paid for separately.

Measurement for rough site grading will be made for the entire area graded including excavating and filling.

.3 Measurement for Contract Administrator approved or Contract Drawing specified fill materials including compaction will be based on weigh tickets provided to Contract Administrator as loads are delivered.

.4 Measurement for removal and disposal of soft or unsuitable subgrade material including overlying top soil will be made by loose truck box volume as determined by Contract Administrator. Specified backfill and compaction will be paid under 1.4.3 of this Section.

.5 Preparation including compaction where applicable of subgrade prior to placing of topsoil or fill material will only be carried out upon specific instruction of Contract Administrator.

.6 Measurement for loading, hauling from stockpile and re-use of excavated material at locations away from the stockpile as specified or as directed by Contract Administrator will be based on measurements made before and after excavation from stockpiled location.

.7 Measurement for off-site disposal of surplus material from rough site grading will be made by loose truck box volume.

.8 Payment for topsoil stripping including disposal will be treated as common excavation under Section 31 24 13 - Roadway Excavation, Embankment and Compaction - 1.8.5.

1.5 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 Materials

.1 Fill material: in case of deficit of in-place or specified materials, all additional materials necessary to bring site up to specified grade to comply with material specified in appropriate Section or shown on Contract Drawings.

.2 Obtain approval from Contract Administrator for excavated or graded material to be used as fill for grading work. Protect approved material from contamination.

.3 Fill material to be placed under areas to be landscaped, i.e., with grass, sod, groundcover, shrubs and trees, to be non-toxic to plant and animal life in part or in concentration (leachate).

3.0 EXECUTION

3.1 Stripping of Topsoil

.1 Strip all organic material to specified limits and specified depth. Stockpile for re-use as shown in Contract Documents. Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected. Remove all debris and unusable material as specified in the Contract Documents.

.2 Surface drainage: provide suitable temporary ditches or other approved means of handling drainage prior to excavation and during construction to protect construction area and adjacent and other affected properties. Provide siltation controls to protect natural watercourses or existing drainage facilities.

3.2 Grading

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as shown on Contract Drawings.

.2 Compact subgrade to a consistent 80% Modified Proctor Density in compliance with ASTM D1557.

.3 Excavate soft and unstable areas below subgrade that cannot be compacted to this standard and fill with approved fill material, except in locations where special environmental conditions have been identified. In such cases, comply with Supplementary Specifications and details shown on Contract Drawings.

.4 Remove and dispose to approved off-site disposal area, all debris, roots, branches, stones, building material, contaminated subsoil, visible weeds and anything else that may interfere with proper growth and development of planned finished landscaping.

.5 Place fill materials to elevations and sections shown on Contract Drawings. Place in maximum 200 mm lifts and compact each lift to 80% Modified Proctor Density.

.6 Scarify areas showing excessive compaction to minimum depth of 150 mm and compact to 80% Modified Proctor Density immediately before placing growing medium (topsoil).

.7 Ensure gradients within ranges shown in Table 1, except where Contract Drawings show variation from this standard.

.8 Grade transitions of subgrade smooth and even, such that ponding cannot occur on subgrade surface.

TABLE 1: Maximum and Minimum Gradients in

Location	Minimum	Maximum
Lawn and Grass	50:1 (2%)	3:1
Grass Swales (without additional erosion protection)	50:1 (2%)	10:1 (10%)
i) Slope along inverts	6:1 (Preferred)	3:1
ii) Side Slopes		
Unmowed Areas	100:1 (1%)	2:1*
Planted Areas	50:1 (2%)	2:1*

* Unless directed otherwise by Contract Administrator

3.3 Tolerances

.1 Accuracy of subgrade elevations to be within tolerances shown in Table 2.

TABLE 1: Maximum and Minimum Gradients in

Location	Minimum	Maximum
Lawn and Grass	50:1 (2%)	3:1
Grass Swales (without additional erosion protection)	50:1 (2%)	10:1 (10%)
iii) Slope along inverts	6:1 (Preferred)	3:1
iv) Side Slopes		
Unmowed Areas	100:1 (1%)	2:1*
Planted Areas	50:1 (2%)	2:1*

* Unless directed otherwise by Contract Administrator

3.4 Surplus Material

.1 Remove surplus material unsuitable for fill, grading or landscaping from site and dispose at approved disposal area.

3.5 Topsoil and Finish Grading

.1 See Section 32 91 21 - Topsoil and Finish Grading for placement and finish grading of growing medium (topsoil).

END OF SECTION 31 22 01

1.0 GENERAL

.1 Section 31 22 16 .1 refers to those portions of the work that are unique to reshaping and compacting existing subgrade. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1	Traffic Control, Vehicle Access and Parking	Section 01 55 00
.2	Roadway Excavation, Embankment and Compaction	Section 31 24 13
.3	Aggregates and Granular Materials	Section 31 05 17
.4	Dust Control	Section 31 15 60

1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.

1.3 Samples

.1 Samples may be required.

1.4 Measurement and Payment

.1 Payment for reshaping existing subgrade includes adjustment of moisture content, compaction and disposal of excess material.

.2 Payment for removal of unsuitable subgrade includes disposal off-site. Replacement of unsuitable subgrade removed will be treated as new sub-base material under Section 32 11 16 - Granular Subbase - 1.4.1. Measurement will be made by loose truck box volume of the sub-base brought to site and incorporated into work.

.3 Payment for additional embankment materials will be made under Section 31 24 13 - Roadway Excavation, Embankment and Compaction - 1.8.7.

1.5 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 Materials

.1 Additional embankment material (subgrade fill) to be in accordance with Section 31 24 13 - Roadway Excavation, Embankment and Compaction and Section 31 05 17 - Aggregates and Granular Materials.

3.0 EXECUTION

3.1 Scarifying and Shaping

.1 Scarify subgrade in accordance with width and depth shown on Contract Drawings

.2 Pulverize and break down scarified material to 50 mm maximum soil clod size. Stones larger than 75 mm to be removed.

.3 Blade and trim pulverized material to elevation and cross-section dimensions shown on Contract Drawings.

.4 Where deficiency of material exists, add and blend in specified new material.

.5 Dispose excess material off-site.

3.2 Compaction

.1 Compaction equipment to be capable of obtaining required densities in materials on project. Where existing subgrade constructed of imported material, compact to density not less than 95% Modified Proctor density in compliance with ASTM D1557. Contract Administrator may accept satisfactory proof rolling as evidence of acceptable compaction of existing native subgrade.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted subgrade surface.

.3 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.

3.3 Repair of Soft Areas

.1 Correct soft areas by removing unsuitable material to depth and extent as directed by Contract Administrator. Replace with specified material and compact to specified density.

3.4 Finished Tolerances

.1 Reshape compacted surface to within plus or minus 15 mm of specified grade and cross-section but not uniformly high or low.

.2 Ensure finished subgrade has no irregularities exceeding 15 mm when checked with a 3 m straight edge placed in any direction.

.3 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 Maintenance

.1 Maintain reshaped surface in condition conforming to this Section until succeeding material is applied or until reshaped subgrade is accepted by Contract Administrator.

END OF SECTION 31 22 16.1

1.0 GENERAL

.1 Section 31 24 13 refers to those portions of the work that are unique to roadway excavation, embankment construction and compaction. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1	Environmental Protection	Section 01 57 01
.2	Shrub and Tree Preservation	Section 31 11 41
.3	Clearing and Grubbing	Section 31 11 01
.4	Rock Removal	Section 31 23 17
.5	Aggregates and Granular Materials	Section 31 05 17
.6	Dust Control	Section 31 15 60
.7	Geosynthetics	Section 31 32 19
.8	Pipe Culverts	Section 33 42 13
.9	Topsoil and Finish Grading	Section 32 91 21
.10	Excavating, Trenching and Backfilling	Section 31 23 01
.11	Site Grading	Section 31 22 01

1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.

1.3 Definitions

.1 Excavation classes: only two classes of excavation will be recognized:

.1 Rock excavation: To Section 31 23 17 - Rock Removal - 1.3.

.2 Common Excavation: To Section 31 23 01- Excavating, Trenching and Backfilling - 1.3.

.2 Native Topsoil: To Section 32 91 21 - Topsoil and Finish Grading.

.3 Waste material: material unsuitable for use in work or surplus to requirements.

.4 Borrow material: material obtained from areas outside limits of work and required for construction of embankments or for other portions of work.

.5 Embankment (subgrade fill): material derived from usable excavation and placed above original ground or stripped surface up to subgrade elevation.

.6 Imported embankment fill: approved granular material, supplied by Contractor and obtained from off-site sources, to be used for embankment fill up to subgrade elevation.

.7 Pavement structure: combination of layers of unbound or stabilized granular subbase, base, and asphalt or concrete surfacing.

.8 Subgrade elevation: elevation immediately below pavement structure.

1.4 Protection of Work Property and Public

.1 Comply with General Conditions, Clause 4.3, Protection of Work Property and the Public.

1.5 Blasting

.1 All blasting operations to comply with Section 31 23 17 - Rock Removal.

1.6 Disposal

.1 Refer to Section 31 23 01 - Excavating, Trenching and Backfilling - 1.7 for re-use and off-site disposal requirements.

1.7 Permits and Approvals

.1 Comply with General Conditions, Clause 20, Laws, Notices, Permits and Fees before commencing any excavation.

1.8 Measurement and Payment

.1 Payment for clearing and grubbing will be made under pay items in Section 31 11 01 – Clearing and Grubbing - 1.4.

.2 Payment for topsoil stripping including stockpiling will be made under pay item in Section 31 22 01 - Site Grading - 1.4.1. and 1.4.6. Topsoil stripping and disposal will be treated as common excavation under this Section.

.3 Payment for rock removal will be made under pay items in Section 31 23 17 - Rock Removal - 1.6.

.4 Payment under this item will only apply to removal of the components included in this item under a separate operation as shown on the Drawings or as directed by the Contract Administrator. No payment will be made under this item for removal of these components as part of the operation for common excavation, and such removal will be treated as common excavation.

.5 Payment for common excavation includes removal of existing pavements, curbs and gutters, sidewalks, utilities strips, driveways, pipes and conduits which are removed as part of the operation for common excavation.

Measurement for common excavation:

.1 Where the average thickness of excavation is 0.5 metre or more, in-place volume will be calculated for payment from cross-sections at sufficient and equal intervals taken by Contract Administrator in areas of excavation.

.2 Initial cross-sections will be taken after clearing and grubbing and stripping of topsoil, and immediately prior to excavation.

.3 Final cross-sections will be taken upon completion of excavation to lines and levels required prior to placing of other materials over the excavated surface.

.4 Where the average thickness of excavation is less than 0.5 metre, volume will be established from loose truck box volume as determined by Contract Administrator.

.5 Payment for on-site re-use includes compaction of the re-used materials.

.6 Payment for double hauling (stockpiling and subsequent relocation from stockpile) of excavated material as specified or as directed by Contract Administrator will be based on measurements made before and after excavation from the stockpiled location.

.7 Payment for imported embankment fill will be based on weigh tickets provided to Contract Administrator as loads are delivered to site and incorporated into the work and includes compaction.

.8 Measurement for peat excavation and off-site disposal will be made by loose truck box volume in watertight truck box.

.9 Payment for subgrade preparation includes finish grading of the subgrade, removal of surplus materials, adjustment of moisture content and compaction as specified.

.10 Payment for replacement of areas of unsuitable subgrade revealed during proof rolling will include all remedial work, materials and requirements specified in this Section.
Payment will be based on quantity of suitable sub-grade delivered to site and incorporated into the work as given by weigh tickets provided to Contract Administrator.

.11 No payment will be made for:

.1 Extra handling of windrowed materials blended on embankment slopes.

.2 Removal and correction of soft or unstable material put in place by Contractor.

.12 All costs incurred as a result of unauthorized excavation beyond neat lines or limits of excavation shown on Standard Detail Drawings, or, where applicable, Contract Drawings including remedial backfilling, will be the Contractor's responsibility.

.13 Payment for gravel berm includes base preparation, berm materials and formation of berm as shown on Contract Drawing and compaction, using the low permeability granular material specified.

1.9 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 General

.1 Unless shown otherwise on Standard Detail Drawings or, where applicable, Contract Drawings materials specified in 2.2 of this Section are approved for their respective uses.

2.2 Specified Materials

.1 Backfill for embankment fill (subgrade fill) to be:

.1 Approved native or imported granular material.

.2 Pit run gravel.

.3 Pit run sand.

.4 River sand.

.2 Pit fines, cyclone sand and overburden may be utilized if approved by the Contract Administrator, but will not be acceptable if moisture content is too high to permit compaction to the specified density.

2.3 Materials

.1 Refer to Section 31 05 17 - Aggregates and Granular Materials for specifications for approved granular materials.

.2 Refer to Section 31 32 19 - Geosynthetics for specifications for geotextile material.

3.0 EXECUTION

3.1 General

.1 Clear and grub limits of excavation and/or embankment fill in accordance with Section 31 11 01 - Clearing and Grubbing.

.2 Strip all organic material to specified limits and specified depth or as directed by Contract Administrator. Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected. Remove all debris. Stockpile and place topsoil as specified.

.3 Surface drainage:

.1 Provide suitable temporary ditches or other approved means of handling drainage prior to excavation and during construction to protect construction area and adjacent and other affected properties. Provide siltation controls to protect natural watercourses or existing municipal drainage facilities.

.2 Comply with Section 01 57 01 - Environmental Protection.

3.2 Excavation

.1 Notify Contract Administrator sufficiently in advance of excavation operations for initial cross-sections to be taken.

.2 Notify Contract Administrator whenever unsuitable materials are encountered in cut sections and remove unsuitable materials to depth and extent as directed by Contract Administrator.

.3 If, during excavation, material appearing to conform to classification for rock is encountered, notify Contract Administrator in sufficient time to enable measurements to be made to determine volume of rock.

.4 Rock excavation: Rock excavation to Section 31 23 17 - Rock Removal.

3.3 Inspection of Native Surface

.1 Prior to placing embankment fill, proof roll graded native surface using fully loaded single or dual axle dump truck. Contract Administrator may authorize use of other acceptable proof rolling equipment. Remove soft or other unstable material. Replace with approved embankment fill and compact replacement fill to minimum 95% Modified Proctor density in compliance with ASTM D1557. (All following references to density imply compliance with ASTM D1557).

3.4 Placing

.1 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.

.2 Begin spreading material on crown line or high side of one-way slope.

.3 Place materials using methods which do not lead to segregation or degradation.

.4 Place material to full width in uniform layers and compact to specified densities.

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

.6 Remove and replace that portion of any layer in which material becomes segregated during spreading.

.7 Where shown on Contract Drawings or as directed by Contract Administrator, scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.

.8 Where fill material consists principally of rock:

.1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.

.2 Individual rock fragments not exceeding 1.5 m in horizontal dimension permitted provided their vertical dimension does not exceed one third of fill section depth.

.3 Carefully distribute rock material to fill voids with smaller fragments to form compact mass.

.4 Fill surface voids at subgrade level with rock spalls or selected material to form an earth-tight surface.

.5 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of subgrade elevation.

3.5 Compaction

.1 Compaction equipment to be capable of obtaining required densities in materials on project.

.2 Compact to density of not less than 95% Modified Proctor density.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted layers.

.4 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.

.6 Finish slopes to neat condition, true to line and grade.

.1 Remove boulders encountered in cut slopes and fill resulting cavities.

.2 Hand finish slopes that cannot be finished satisfactorily by machine.

3.6 Finished Tolerances

.1 Ensure finished subgrade surface within plus or minus 15 mm of specified grade and cross-section but not uniformly high or low.

.2 Ensure finished subgrade surface has no irregularities exceeding 15 mm when checked with a 3 m straight edge placed in any direction.

.3 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.7 Proof Rolling

.1 For proof rolling use fully loaded single or dual axle dump truck.

.2 Contract Administrator may authorize use of other acceptable proof rolling equipment.

.3 Proof roll top of embankment fill upon completion of fine grading and compaction.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of unsuitable subgrade:

.1 Remove unsuitable embankment material to depth and extent directed by Contract Administrator.

.2 Replace with approved embankment material and compact in accordance with this section.

3.8 Place Topsoil

.1 Place, spread and grade topsoil as shown on Contract Drawings.

.2 Restore planted areas with topsoil, ground cover, and plants or shrubs to match existing planted areas as shown on Contract Drawings.

3.9 Maintenance

.1 Maintain finished embankment fill in condition conforming to this section until succeeding material is applied or until granular base is accepted by Contract Administrator.

END OF SECTION 31 24 13

1.0 GENERAL

.1 Section 32 01 11 refers to those portions of the work that are unique to the removal of pavement markings and pavement cleaning. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1 Traffic Control, Vehicle Access And Parking — Section 01 55 00

.2 Painted Pavement Markings — Section 32 17 23

1.2 Measurement and Payment

.1 Payment for cleaning pavement surfaces includes cleaning all protruding sealing compounds, dust, contaminants, loose and foreign materials, oil and grease as directed by Contract Administrator.

.2 Measurement will be based on the surface area of pavement cleaned

.3 Payment for removal of pavement markings will be made as a lump sum for complete removal of all the permanent pavement markings over areas shown on Contract Drawings.

2.0 PRODUCTS

2.1 Materials

.1 Abrasives and solvents used for removal of paint, oil, grease, rubber deposits: proprietary products specially designed for pavement cleaning, as specified in Contract Documents.

3.0 EXECUTION

3.1 Removals

.1 In areas designated by Contract Administrator, remove rubber tire deposits and paint markings by sand or water blasting, rotary grinding, heater planing or other method approved by Contract Administrator.

.2 Exercise care to avoid dislodging of coarse aggregate particles, excessive removal of fines, damage to bituminous binder or damage to joint and crack sealers.

.3 When using heater planing equipment do not heat pavement surfaces above 120°C.

.4 Dispose removed pavement markings as specified in Contract Documents.

3.2 Pavement Surface Cleaning

.1 Remove excess sealing compound where it protrudes from pavement cracks at locations indicated by Contract Administrator. Dispose of removed crack sealing compound as directed in Contract Documents; or as specified by Contract Administrator.

.2 Remove, dust, contaminants, loose and foreign materials, oil and grease, in areas designated and by method approved by Contract Administrator.

.3 Use rotary power brooms supplemented by hand brooming as required.

.4 Keep drainage system clear of loose and waste materials.

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END OF SECTION 32 01 11

1.0 GENERAL

.1 Section 32 11 16.1 refers to those portions of the work that are unique to the supply and placement of granular subbase materials. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1	Traffic Control, Vehicle Access and Parking	Section 01 55 00
.2	Roadway Excavation, Embankment and Compaction	Section 31 24 13
.3	Aggregates and Granular Materials	Section 31 05 17
.4	Dust Control	Section 31 15 60
.5	Cold Milling	Section 32 01 16.7
.6	Full Depth Reclamation	Section 32 01 16.8

1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.

1.3 Samples

.1 Samples may be required.

1.4 Measurement and Payment

.1 Limit of payment for subbase under 1.4.3 will be 300 mm as shown on Standard Detail Drawing R1 – Paved Shoulders.

.2 Measurement for granular subbase of variable thickness will be for actual quantity placed based on weigh tickets provided to Contract Administrator as loads are delivered.

.3 Measurement for granular subbase for each specified thickness will be for the actual area placed.

.4 Payment for 1.4.1 and 1.4.2 of this Section includes supply of the granular subbase material, adjustment of moisture content and compaction.

.5 Payment for removal of unsuitable subgrade including disposal off-site will be made under Section 31 22 16.1 - Reshaping Existing Subgrade – 1.4.2.

1.5 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12. Inspections.

2.0 PRODUCTS

2.1 Specified Materials

.1 Material for road subbase to be:

- .1 Select granular subbase.
- .2 75 mm pit run gravel
- .3 75mm minus crushed gravel.
- .4 Pit run sand.

.5 Approved native material.

.6 Other approved materials.

.7 River Sand.

.2 Refer to Section 31 05 17 - Aggregates and Granular Materials for material specifications.

.3 Other granular materials: granular materials approved for road base or pipe bedding also acceptable for road subbase subject to approval of Contract Administrator.

3.0 EXECUTION

3.1 Inspection of Underlying Subgrade Surface

.1 Ensure underlying subgrade surface true to cross-section and grade and compacted to specified density. Contract Administrator may accept satisfactory proof rolling as evidence of acceptable compaction of undisturbed native subgrade. Do not place granular subbase until subgrade is inspected and approved by Contract Administrator.

3.2 Placing

.1 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.

.2 Begin spreading subbase material on crown line or high side of one-way slope.

.3 Place granular subbase materials using methods which do not lead to segregation or degradation of aggregate.

.4 Place material to full width in uniform layers not exceeding 300 mm compacted thickness. Contract Administrator may authorize thicker layers if specified compaction can be achieved.

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

.6 Remove and replace portion of any layer in which material has become segregated during spreading.

3.3 Compaction

.1 Compaction equipment to be capable of obtaining required densities in materials on project.

.2 Compact to density not less than 95% Modified Proctor density.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted subbase.

.4 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.

3.4 Finished Tolerances

.1 Ensure finished subbase within plus or minus 15 mm of specified grade and cross-section but not uniformly high or low.

.2 Ensure finished subbase surface has no irregularities exceeding 15 mm when checked with a 3 m straight edge placed in any direction.

.3 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 Proof Rolling

.1 For proof rolling use fully loaded single or dual axle dump truck.

.2 Contract Administrator may authorize use of other acceptable proof rolling equipment.

.3 Proof roll at level in subbase as required. If alternative proof rolling equipment is authorized, Contract Administrator will determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of unsuitable subgrade:

.1 Remove subbase and subgrade material to depth and extent as directed by Contract Administrator.

.2 Backfill excavated subgrade with approved embankment material and compact in accordance with Section 31 24 13 - Roadway Excavation, Embankment and Compaction.

.3 Replace subbase material and compact in accordance with this section.

.6 Where proof rolling reveals areas of unsuitable subbase, remove unsuitable materials to depth and extent directed by Contract Administrator and replace with new materials in accordance with this section at no extra cost.

3.6 Maintenance

.1 Maintain finished subbase in condition conforming to this section until succeeding base is constructed, or until granular subbase is accepted by Contract Administrator.

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END OF SECTION 32 11 16.1

1.0 GENERAL

.1 Section 32 11 23 refers to those portions of the work that are unique to the supply and placement of granular base materials. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1	Traffic Control, Vehicle Access and Parking	Section 01 55 00
.2	Aggregates and Granular Materials	Section 31 05 17
.3	Granular Subbase	Section 32 11 16.1
.4	Dust Control	Section 31 15 60
.5	Reference Specifications – Site and Infrastructure	Section 01 42 00
.6	Roadway Excavation, Embankment and Compaction	Section 31 24 13
.7	Cold Milling	Section 32 01 16.7
.8	Full Depth Reclamation	Section 32 01 16.8
.9	Concrete Walks, Curbs and Gutters	Section 03 30 20
.10	Reshaping Existing Subgrade	Section 31 22 16.1

1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.

1.3 Samples

.1 Samples may be required.

1.4 Measurement and Payment

.1 Limit of payment for granular base under this and sub-section 2 below will be up to 300 mm beyond back of curb as shown on Standard Detail Drawings. Granular Base for sidewalk and walkway construction is included in payment for sidewalk under Section 03 30 20 – Concrete Walks, Curbs and Gutters. Measurement for granular base of variable thickness will be for actual quantity placed based on weigh tickets provided to Contract Administrator as loads are delivered.

.2 Measurement for granular base for each specified thickness will be for the actual area placed.

.3 Payment for 1.4.1 and 1.4.2 of this Section includes supply of the granular base material, adjustment of moisture content and compaction.

.4 Payment for removal of unsuitable subgrade including disposal off-site prior to direct placement of granular base will be made under Section 31 22 16.1 - Reshaping Existing Subgrade.

1.5 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 Granular Base

.1 Material for road base to be:

.1 19 mm crushed gravel.

.2 Refer to Section 31 05 17 - Aggregates and Granular Materials for +material specifications.

3.0 EXECUTION

3.1 Inspection of Underlying Subbase

.1 Ensure underlying subbase surface true to cross-section and grade, and of the specified material compacted to 95% Modified Proctor density in compliance with ASTM D1557. Do not place granular base until finished subbase surface is inspected and approved by Contract Administrator.

3.2 Placing

.1 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow or ice.

.2 Begin spreading base material on crown line or on high side of one-way slope.

.3 Place base material using methods which do not lead to segregation or degradation of aggregate.

.4 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Contract Administrator may authorize thicker layers if specified compaction can be achieved.

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

.6 Remove and replace portion of any layer in which material has become segregated during spreading.

3.3 Compaction

.1 Compaction equipment to be capable of obtaining required densities in materials on project.

.2 Compact to density not less than 95% Modified Proctor density.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.4 Apply water as necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers.

3.4 Finished Tolerances

.1 Ensure finished base surface within plus or minus 10 mm of specified grade and cross-section but not uniformly high or low.

.2 Ensure finished surface has no irregularities exceeding 10 mm when checked with a 3 m straight edge placed in any direction.

.3 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 Proof Rolling

.1 For proof rolling use fully loaded single or dual axle dump truck.

.2 Contract Administrator may authorize use of other acceptable proof rolling equipment.

.3 Proof roll top of base upon completion of fine grading and compaction.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of unsuitable subgrade:

.1 Remove base, subbase and subgrade material to depth and extent directed by Contract Administrator.

.2 Backfill excavated subgrade with approved embankment material and compact in accordance with Section 31 24 13 - Roadway Excavation,Embankment and Compaction.

.3 Replace subbase material and compact in accordance with Section 32 11 16.1 - Granular Subbase.

.4 Replace base material and compact in accordance with this Section.

.6 Where proof rolling reveals areas of unsuitable base or subbase, remove unsuitable materials to depth and extent directed by Contract Administrator and replace with new materials in accordance with Section 32 11 16.1 - Granular Subbase and this Section at no extra cost.

3.6 Maintenance

.1 Maintain finished base in condition conforming to this section until succeeding material is applied or until granular base is accepted by Contract Administrator.

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END OF SECTION 32 11 23

1.0 GENERAL

.1 Section 32 12 13.1 refers to those portions of the work that are unique to the supply and application of asphalt tack coat. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1	Traffic Control, Vehicle Access, and Parking	Section 01 55 00
.2	Hot-Mix Asphalt Concrete Paving	Section 32 12 16
.3	Cold Milling	Section 32 01 16.7
.4	Pavement Surface Cleaning and Removal of Pavement Markings	Section 32 01 11

1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications – Site and Infrastructure.

1.3 Samples

.1 Provide access on tanker for Contract Administrator to sample asphalt material to be incorporated into work, in accordance with ASTM D140.

1.4 Asphalt Material Certification

.1 Upon request by Contract Administrator, submit manufacturer's test data and certification that asphalt tack coat material meets requirements of this section.

1.5 Measurement and Payment

.1 Payment for asphalt tack coat will be for surface area of all portions of existing pavement to be tack coated in preparation for placement of hot-mix asphalt concrete.

1.6 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 Materials

.1 Emulsified asphalt: to CAN/CGSB-16.2, grade SS-1.

3.0 EXECUTION

3.1 Equipment

.1 Refer to Section 32 12 13.2 – Asphalt Prime - 3.1.

3.2 Application

.1 Obtain Contract Administrator's approval of surface before applying asphalt tack coat.

.2 Dilute asphalt emulsion with water at 1:1 ratio for application. Mix thoroughly by pumping or other method as required.

.3 Apply tack coat to pavement surface at rate as required but do not exceed 0.7 L/m^2 when diluted with water at 1:1 ratio.

.4 Apply only on clean, dry surface.

.5 Paint contact surfaces of curbs, gutters, manholes and like structures with thin, uniform coat of asphalt tack coat material.

.6 Do not apply asphalt tack coat when air temperature is less than 5°C or when rain is forecast within 2 h of application.

.7 Apply tack coat only to surfaces that are expected to be overlayed on same day.

.8 Evenly distribute excessive deposits of tack coat by brooming.

.9 Where traffic is to be maintained, treat no more than one half of width of surface in one application.

.10 Keep traffic off tacked areas until tack coat has cured.

.11 Re-tack contaminated or disturbed areas.

.12 Permit tack coat to cure before placing asphalt paving.

END OF SECTION 32 12 13.1

1.0 GENERAL

.1 Section 32 12 16 refers to those portions of the work that are unique to the supply and placement of hot-mix asphalt concrete paving. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1	Traffic Control, Vehicle Access and Parking	Section 01 55 00
.2	Aggregates and Granular Material	Section 31 05 17
.3	Reshaping Granular Roadbed	Section 31 22 16
.4	Asphalt Prime	Section 32 12 13.2
.5	Asphalt Tack Coat	Section 32 12 13.1
.6	Full Depth Reclamation	Section 32 01 16.8
.7	Excavating, Trenching and Backfilling	Section 31 23 01

1.2 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00. Reference Specifications – Site and Infrastructure.

1.3 Material Certification

.1 Upon request, submit manufacturer's test data and certification that asphalt cement meets requirements of this section.

1.4 Submission of Mix Design

.1 Submit asphalt concrete mix design and trial mix test results to Contract Administrator for review at least one week prior to commencing work.

1.5 Measurement and Payment

.1 Payment for asphaltic concrete paving includes all construction joint preparation, supply and placing of the asphaltic concrete, compaction, adjusting and cleaning frames, covers and lids of all castings affected and taped temporary pavement markings.
Measurement for asphaltic concrete paving for the specified design mixes for lower and upper courses will be for asphalt concrete actually incorporated into work based on weigh tickets provided to Contract Administrator as loads are delivered.

.2 For measurement and payment purpose, Contract Administrator may order cores to be taken from finished paving to determine finished paving thickness. Three cores will be taken from paving areas up to 1,500m^2 each. Cores for each area will be averaged to determine overall thickness for that area.
If average thickness of cores indicates that pavement thickness varies from the thickness specified, Contract Administrator may do one of following:

.1 if thickness is less than that specified, Contract Administrator may require an overlay to be placed in deficient areas with no additional payment for the overlay and any other work necessary to place such overlay.

.2 if thickness is greater than specified, Contract Administrator may accept the work, if the excess thickness is acceptable; and calculate the amount of excess paving and, for payment purpose, reduce the quantity of asphaltic concrete paving placed accordingly.

.3 Payment for asphaltic concrete sidewalks, driveways, in-fill strips and specified permanent patching paving includes all construction joint preparation, supply and placing of the asphaltic concrete, compaction and adjusting and cleaning frames, covers and lids of all castings affected.
Measurement for asphaltic concrete sidewalks, driveways, in-fill strips and specified permanent patching will be made separately for each of specified thicknesses which may be checked by Contract Administrator as given in 1.5.2 of this Section.

.1 if thickness is less than that specified, Contract Administrator may require an overlay to be placed in deficient areas with no additional payment for the overlay and any other work necessary to place such overlay.

.2 if thickness is less than specified, Contract Administrator may calculate amount of asphaltic concrete deficiency and, for payment purpose, reduce the item amount in pro-rata accordingly.

.3 if thickness is greater than specified, Contract Administrator may accept the work, if the excess thickness is acceptable; or may require the work to be removed and replaced with appropriate thickness, all without additional payment.

.4 Payment for extruded asphalt concrete curb will be made separately for each type of curb specified and will include the asphaltic concrete, all preparatory work and placing by extrusion.

.5 No additional payment will be made for work described in this Section for surface restoration if payment is already included under work described in other Sections.

.6 Payment for all the above-described asphaltic concrete work placed by hand will only be made for such work specifically ordered by Contract Administrator.

.7 Payment for saw cutting asphaltic concrete or Portland cement concrete pavement will only be made for permanent reinstatement and other specific work shown on Contract Drawings or as directed by Contract Administrator and will not include saw cutting prior to trench excavation for pipe laying work.

.8 Payment for permanent reinstatement of pavement includes all work under Section 31 23 01 - Excavating, Trenching and Backfilling - 3.6.7, but not saw cutting edges of pavements.

1.6 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

.2 Testing laboratory to be approved by Contract Administration.

2.0 PRODUCTS

2.1 Materials

.1 Asphalt cement: to CGSB-16.3-M90, Grade 80 - 100.

.2 Reclaimed asphalt pavement (RAP): Crush and screen so that 100% of reclaimed asphalt pavement material passes 37.5 mm screen before mixing.

.3 Aggregates: to Section 31 05 17 - Aggregates and Granular Materials and following requirements:

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

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

Sieve Designation		Percent Passing				
		*Lower Course #1	*Lower Course #2	*Upper Course #1	*Upper Course #2	*Fine Mix
25.0	mm	100	--	--	--	--
19.0	mm	--	100	100	--	--
12.5	mm	70 - 85	84 - 99	84 - 99	100	--
9.5	mm	--	73 - 88	73 - 88	--	100
4.75	mm	40 - 65	50 - 68	50 - 68	55 - 75	80 - 100
2.36	mm	32 - 53	35 - 55	35 - 55	38 - 58	64 - 89
1.18	mm	26 - 44	27 - 46	27 - 46	28 - 47	48 - 76
0.600	mm	18 - 36	18 - 36	18 - 36	20 - 36	32 - 60
0.300	mm	10 - 26	10 - 26	10 - 26	10 - 26	16 - 42
0.150	mm	4 - 17	4 - 17	4 - 17	4 - 17	6 - 23
0.075	mm	3 - 8	3 - 8	3 - 8	3 - 8	4 - 10

***Footnote to asphalt mix-type selection:**
Lower Course #1: Arterial and collector, lower course only.
Lower Course #2: Local, lower course only.
Upper Course #1: Arterial and collector, upper course only.
Upper Course #2: Local, surface course only.
Fine Mix: Skim patch on existing asphalt surface.

.3 Coarse aggregate is aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C136.

.4 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from coarse aggregate.

.5 Do not use aggregates having known polishing characteristics in mixes for upper courses.

.6 Sand equivalent: to ASTM D2419. Min: 40

.7 Magnesium Sulphate soundness: to ASTM C88.
Max % loss by mass after five cycles:

.1 Coarse aggregate: 15

.2 Fine aggregate: 18

.8 Los Angeles abrasion: Grading B, to ASTM C131.
Max % loss by mass:

.1 Coarse aggregate, upper course: 25

.2 Coarse aggregate, lower course: 35

.9 Absorption: to ASTM C127.
Max % by mass:

.1 Coarse aggregate, upper course: 1.75

.2 Coarse aggregate, lower course: 2.00

.10 Loss by washing: to ASTM C117.
Max % passing 0.075 mm sieve:

.1 Coarse aggregate, upper course: 1.5

.2 Coarse aggregate, lower course: 2.0

.11 Flat and elongated particles: (with length to thickness ratio greater than 3):
Max % by mass:

.1 Coarse aggregate, upper course: 10

.2 Coarse aggregate, lower course: 10

.12 Crushed fragments: at least 60% of particles by mass within each of following sieve designation ranges, to have at least 2 freshly fractured faces. Material to be tested according to ASTM C136 and ASTM C117.

Determination of amount of fractured material will be in accordance with Ministry of Transportation and Highways' Specification I-11, Fracture Count for Coarse Aggregate, Method "B", which determines fractured faces by mass.

Passing		Retained On
25mm	to	12.5mm
12.5mm	to	4.75mm

.13 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

.4 Mineral filler:

.1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.

.2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.

.3 Mineral filler to be dry and free flowing when added to aggregate.

2.2 Mix Design

.1 Submit job mix formula to Contract Administrator for review and approval.

.2 Mix may contain up to a maximum 20% by mass of RAP without a special mix design. Contract Administrator may approve higher proportion of RAP if Contractor demonstrates ability to produce mix meeting requirements of specification.

.3 Design of mix: by Marshall method to requirements below.

.1 Compaction blows on each face of test specimens: 75

.2 Mix physical requirements:

Property		Pavement Course	
Marshall Stability at 60°C	kN min.	6.4	lower course
		5.5	upper course
		5.5	fine
Flow Value	mm	2 – 4	
Air Voids in Mixture	%	3 - 6	lower course
		3 - 5	upper course
		3 - 5	fine
Voids in Mineral Aggregate	% min.	13	lower course 1
		14	lower course 2
		14	upper course 1
		15	upper course 2
		15	fine
Index of Retained Stability	% min.	75	

.3 Measure physical requirements as follows:

.1 Marshall load and flow value: to ASTM D1559.

.2 Air voids: to ASTM D3203.

.3 Index of Retained Stability: measure in accordance with Marshall Immersion Test (ASTM D1559).

.4 Do not change job-mix without prior approval of Contract Administrator. Should change in material source be proposed, new job-mix formula to be submitted to Contract Administrator for review and approval.

3.0 EXECUTION

3.1 Plant and Mixing Requirements

.1 Batch and continuous mixing plants:

.1 To ASTM D995.

.2 Heat asphalt cement and aggregate to mixing temperature. Do not heat asphalt cement above 160°C.

.3 Before mixing, dry aggregates to a moisture content not greater than 0.5% by mass or to a lesser moisture content if required to meet mix design requirements.

.4 Contract Administrator will monitor temperature of completed mix at plant and at paver after considering hauling and placing conditions.

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

.6 Feed cold aggregates to plant in proportions that will ensure continuous operations.

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

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

.9 Where RAP is to be incorporated into mix:

.1 Feed from separate cold feed bin specially designed to minimize consolidation of material. Provide 37.5 mm scalping screen on cold feed to remove oversized pieces of RAP.

.2 Ensure positive and accurate control of RAP cold feed by use of hydraulic motor or electric clutch and equip with anti-rollback device to prevent material from sliding backward on feed belt.

.3 Combine RAP and new aggregates in proportions as specified. Dry mix thoroughly, until uniform temperature within plus or minus 5°C of mix temperature is achieved prior to adding new asphalt cement. Do not add new asphalt cement where temperature of dry mix material is above 160°C.

.10 Maintain temperature of materials within plus or minus 5°C of specified mix temperature during mixing.

.11 Mixing time:

.1 In batch plants, dry mix for not less than 10 s. Continue wet mixing as long as necessary to obtain a thoroughly blended mix but not less than 30 s or more than 75 s.

.2 In continuous mixing plants, mixing time as required but not less than 45 s.

.2 Dryer drum mixing plant:

.1 Where RAP to be incorporated into mix, dryer drum mixer to be designed to prevent direct contact of RAP with burner flame or with exhaust gases hotter than 180°C.

.2 Feed aggregates to burner end of dryer drum by means of a multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.

.3 Feed RAP from separate cold feed bin designed to minimize reconsolidation of material.

.4 Meter total flow of aggregate and RAP by electronic weigh belt system with an indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate and RAP and asphalt entering mixer remain constant.

.5 Provide for easy calibration of weighing systems for aggregates and RAP without having material enter mixer.

.6 Make provision for conveniently sampling full flow of materials from the cold feed.

.7 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate and RAP from cold feed prior to entering drum.

.8 Provide a system interlock which will stop all feed components if either asphalt or aggregate from any bin stops flowing.

.9 Accomplish heating and mixing of asphalt mix in a drum dryer-mixer. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt. Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with a printing recorder that can be monitored by plant operator. Submit printed record of mix temperatures at end of each week, if required.

.10 Mixing period and temperature to produce a uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer to be less than 0.5%.

.3 Temporary storage of hot mix:

.1 Provide mix storage of sufficient capacity to permit continuous operation, maintained at specified temperatures and designed to prevent segregation.

.2 Do not store asphalt mix in storage bins in excess of 12 h.

.4 Mixing tolerances:

.1 Permissible variation in aggregate gradation from job mix (percent of total mass):

.1	4.75 mm sieve and larger	5.5
.2	2.36 mm sieve	4.5
.3	0.600 mm sieve	3.5
.4	0.150 mm sieve	2.5
.5	0.075 mm sieve	1.5

.2 Permissible variation of asphalt cement from job mix, 0.3%.

.3 Permissible variation of mix temperature at discharge from plant, 5°C.

3.2 Equipment

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

.2 Rollers: sufficient number of rollers of type and weight to obtain specified density of compacted mix.

.3 Vibratory rollers:

.1 Minimum drum diameter: 1200 mm.

.2 Maximum amplitude of vibration (machine setting): 0.5 mm for lifts less than 40 mm thick.

.4 Haul trucks: of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

.1 Boxes with tight metal bottoms.

.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.

.3 In cool weather or for long hauls, insulate entire contact area of each truck box.

.4 Trucks which cannot be weighed in a single operation on scales supplied will not be accepted.

.5 Hand tools:

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

.2 Tamping irons having mass not less than 12 kg and a bearing area not exceeding 310cm2 for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by Contract Administrator, may be used instead of tamping irons.

.3 Straight edges, 3.0 m in length, to test finished surface.

3.3 Preparation

.1 Reshape granular roadbed in accordance with Section 31 22 16 - Reshaping Granular Roadbed, Section 32 13 16.1 - Roller Compacted Concrete Paving and Section 32 01 16.8 - Full Depth Reclamation, if required.

.2 When paving over existing asphalt surface, clean pavement surface in accordance with Section 32 01 11 - Pavement Surface Cleaning and Removal of Pavement Markings. When levelling course is not required, patch and correct depressions and other irregularities to approval of Contract Administrator before beginning paving operations.

.3 Adjust existing castings to new elevations and protect from asphaltic mix.

.4 When matching new pavement with existing pavement make vertical cut between existing pavement and new pavement as shown on Contract Drawings.

.5 Apply prime coat and/or tack coat in accordance with Section 32 12 13.2 - Asphalt Prime and/or Section 32 12 13.1 - Asphalt Tack Coat prior to paving.

.6 Prior to laying mix, clean surfaces of loose and foreign material.

3.4 Transportation of Mix

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with light oil, limewater, soap or detergent solution, at least once a day or as required. Elevate truck bed and thoroughly drain. No excess solution will be permitted.

.3 Schedule delivery of material for placing in daylight, unless Contract Administrator approves artificial light.

.4 Deliver material to paver at a uniform rate and in an amount within capacity of paving and compacting equipment.

.5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within specified range. Temperature of mix upon placement shall not be less than 125°C.

3.5 Placing

.1 Obtain Contract Administrator's approval of base, existing surface, tack coat, or prime coat prior to placing asphalt.

.2 Place asphalt concrete to thicknesses, grades and lines as shown on Contract Drawings.

.3 Placing conditions:

.1 Place asphalt mixtures only when air temperature is above 5°C. Place overlay pavement only when air temperature is above 10° C.

.2 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.

.3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

.4 Place asphalt concrete in compacted lifts of thickness as shown on Contract Drawings:

.1 Levelling course(s) to thicknesses required but not exceeding 100 mm each.

.2 Lower course in layers not to exceed 100 mm each.

.3 Surface course in layers of maximum 60 mm each.

.5 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.

.6 Spread and strike off mixture with self propelled mechanical finisher.

.1 Construct longitudinal joints and edges true to line markings. Position and operate paver to follow established line closely.

.2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.

.3 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.

.4 Correct irregularities in alignment left by paver by trimming directly behind machine.

.5 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.

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

.7 When hand spreading is used:

.1 Approved wood or steel forms, rigidly supported to assure correct grade and cross section, may be used. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly. Do not broadcast material.

.3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

.5 Provide heating equipment to keep hand tools free from asphalt. Avoid high temperatures which may burn material. Do not use tools at a higher temperature than temperature of mix being placed.

3.6 Compaction

.1 Roll asphalt continuously to average density not less than 97% of 75 blow Marshall density in accordance with ASTM D1559 with no individual test less than 95%.

.2 General:

.1 Provide at least two rollers and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller to be pneumatic tired type.

.2 Start rolling operations as soon as placed mix can bear weight of roller without undue displacement of material or cracking of surface.

.3 Operate roller slowly initially to avoid displacement of material. For subsequent rolling do not exceed 5 km/h for static steel- wheeled rollers and 8 km/h for pneumatic- tired rollers.

.4 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 20 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing should not exceed compacted lift thickness.

.5 Overlap successive passes of roller by at least one half width of roller and vary pass lengths.

.6 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.7 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.8 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.9 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.

.10 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

.11 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

.3 Breakdown rolling:

.1 Commence breakdown rolling immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine. Exceptions may be made when working on steep slopes or super-elevated sections.

.4 Use only experienced roller operators for this work.

.4 Second rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.

.5 Finish rolling:

.1 Accomplish finish rolling with steel wheel rollers while material is still warm enough for removal of roller marks.

.2 Conduct rolling operations in close sequence.

3.7 Joints

.1 General:

.1 Remove surplus material from surface of previously laid strip. Do not dispose on surface of freshly laid strip.

.2 Construct joints between asphalt concrete pavement and portland cement concrete pavement as specified.

.3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Offset transverse joint in succeeding lifts by at least 600 mm.

.2 Cut back to full depth vertical face and tack face with thin coat of asphalt prior to continuing paving.

.3 Compact transverse joints to provide a smooth riding surface.

.3 Longitudinal joints:

.1 Offset longitudinal joints in succeeding lifts by at least 150 mm.

.2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100°C prior to paving of adjacent lane. If cold joint can not be avoided, tack face of adjacent lane with thin coat of asphalt prior to continuing paving.

.3 Overlap previously laid strip with spreader by 100 mm.

.4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with a lute or rake.

.5 Roll longitudinal joints directly behind paving operation.

.6 When rolling with static roller, shift roller over onto previously placed lane in order that 100 to 150 mm of drum width rides on newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until thoroughly compacted neat joint is obtained.

.7 When rolling with vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.

.4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint so that joint is smooth and without visible breaks in grade. Location of feather joint as specified.

.5 Construct butt joints at locations and to details as shown on Contract Drawings.

.6 Wherever practical, locate joints under future traffic markings (paint lines).

3.8 Pavement Patching

.1 Ensure temporary and permanent pavement patching done by handwork conforms to all standards specified for machine placed asphaltic concrete.

.2 Subbase and base preparation as specified in Section 32 11 16.1 - Granular Subbase and Section 32 11 23 - Granular Base respectively, unless shown otherwise on Contract Drawings.

3.9 Sidewalks, Driveways and Curbs

.1 Hot-mix asphalt concrete sidewalks, driveways and curbs as shown on Contract Drawings.

.2 Machine place where practical.

.3 Ensure placement by handwork conforms to all standards specified for machine placed asphaltic concrete.

.4 Other than requirements relating specifically to Portland cement concrete, ensure hot-mix asphalt concrete sidewalks and curbs comply with all requirements of Section 03 30 20 - Concrete Walks, Curbs and Gutters.

.5 Ensure hot-mix asphalt concrete driveways comply with all requirements of Section 32 12 16 - Hot-Mix Asphalt Concrete Paving.

3.10 Finished Tolerances

.1 Ensure finished asphalt surface within 6 mm of design elevation but not uniformly high or low.

.2 Ensure finished asphalt surface does not have irregularities exceeding 6 mm when checked with a 3 m straight edge placed in any direction.

.3 Water ponding not permitted.

.4 Against concrete gutter, finished asphalt surface to be higher than the gutter by not more than 6mm.

3.11 Defective Work

.1 Correct irregularities which develop before completion of rolling by loosening upper mix and removing or adding material as required.

.2 If irregularities or defects remain after final compaction, remove upper course promptly and lay new material to form a true and even surface and compact immediately to specified density.

3.12 Clean-Up

.1 Remove lids or covers from all castings and clean any prime, tack coat or hot-mix asphaltic concrete from frames, lids and covers of all castings.

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END OF SECTION 32 12 16

1.0 GENERAL

.1 Section 32 17 23 refers to those portions of the work that are unique to the application of taped temporary and permanent painted pavement markings. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.1 Related Work

.1 Traffic Control, Vehicle Access and Parking — Section 01 55 00

.2 Pavement Surface Cleaning and Removal of Pavement Markings — Section 32 01 11

1.2 Scope

.1 Pavement Markings: Miscellaneous taped temporary and permanent pavement paint markings including pedestrian cross walk, merge and diverge markings, stop lines, solid and broken line road lane markings including edge lines of merge and diverge markings etc., shown on Contract Drawings. Thermoplastic marking may be specified as an option on the Contract Drawings.

1.3 References

.1 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in - Section 01 42 00- Reference Specifications – Site and Infrastructure.

1.4 Samples

.1 Submit to Contract Administrator following material sample quantities (where applicable) at least 2 weeks prior to commencing work.

.1 Two 1 L samples of each type of paint.

.2 One 1 kg sample of glass beads.

.3 Sampling to CGSB 1-GP.

.4 One sample of each colour of Thermoplastic material to be used.

.2 Mark samples with name of project and location, manufacturer's name and address, name of paint, CGSB specification number, formulation number and batch number.

1.5 Measurement and Payment

.1 Payment for taped temporary pavement markings shown on Contract Drawings will be included under Section 32 12 16 - Hot Mix Asphalt Concrete Paving - 1.5.1 and Section 32 13 13 - Portland Cement Concrete Paving - 1.4.3.

.2 The lump sum payment for permanent painted pavement markings covers supplying all materials and completing all the permanent painted pavement markings shown on Contract Drawings..

.3 The lump sum payment for permanent thermoplastic pavement markings covers supplying all materials and completing all the permanent thermoplastic pavement markings shown on Contract Drawings.

.4 Payment for permanent hazard marker traffic control signs includes all the materials, work and incidentals shown on Contract Drawings or as directed by Contract Administrator.

1.6 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 Materials

.1 Refer to Contract Documents for specified or approved manufacturers or trade names.

.2 Alternative products may be used providing they meet or exceed the relevant specifications and are approved by Contract Administrator.

.3 Paint:

.1 To CGSB 1-GP-74M, alkyd traffic paint.

.2 To CGSB 1-GP-149M, alkyd reflectorized traffic paint.

.3 Colour: to CGSB 1-GP-12C, yellow 505-308, black 512-301, white 513-301.

.4 Thinner: to CGSB 1-GP-5M.

.5 Glass beads:

.1 Overlay type: to CGSB 1-GP-74M.

.6 Temporary pavement marking tape:

.1 Material composition shall be at the discretion of the manufacturer subject to the approval of the Contract Administrator. Each formulation shall be identified by a code number.

.2 No retained water when tested by ASTM D570

.3 Specific gravity of the supplied product shall be within 3% of that specified for the selected formulation.

.4 Material shall not deteriorate upon contact with de-icing chemicals, gasoline, diesel fuel or grease dropped by traffic.

.5 Material shall not break down, deteriorate, scorch or discolour, if held within the application temperature range specified by the manufacturer for a period of four hours and it must be able to be reheated from room temperature to the application temperature four (4) times without showing any of these detrimental effects.

.6 When applied at the temperature recommended by the manufacturer and at a film thickness of 2 to 4mm, the material shall set solid and show no tracking under traffic after elapsed times as follows:

.1 Two (2) minutes at an air temperature of 10° C, relative humidity less than 75%, and road surface temperature from 10° C to 20° C.

.2 Five (5) minutes at an air temperature of 32° C, relative humidity less than 75%, and road surface temperature from 35° C to 50° C.

.3 The drying time under conditions intermediate between the two air temperatures shall be interpolated using a straight line model.

.7 The quantity, type, and gradation of the component reflecting glass spheres premixed in the thermoplastic material shall be at the discretion of the manufacturer, but shall provide retro-reflection levels specified below.

.8 The colour of the marking to be brilliant white or yellow as specified. The brightness value shall exceed 70% for white and 45% for yellow obtained with a Gardner Multi-purpose Reflectometer when measuring 0° - 45° daylight luminous directional reflectance with the green filter.

.9 The material shall have a softening point not less than 103° C when tested in accordance with ASTM D36 (AASHTO M 249)

3.0 EXECUTION

3.1 Equipment Requirements

.1 Paint applicator to be pressure type mobile distributor capable of applying paint in single, double and dashed lines. Applicator to have positive shut-off and to be capable of applying marking components uniformly, at rates specified, and to dimensions shown on Contract Drawings.

.2 Distributor to be capable of applying reflective glass beads as an overlay on freshly applied paint.

3.2 Condition of Surfaces

.1 Ensure pavement surface free from surface water, frost, ice, dust, oil, grease and other foreign materials.

3.3 Application

.1 Temporary Markings:

.1 Application and removal to manufacturer's instructions.

.2 Temporary traffic lines and stop bars shall be placed immediately following laying of the asphalt pavement.

.3 The traffic line shall be a 100 mm x 300 mm strip of prefabricated reflective yellow tape having an adhesive backing and shall be placed at 10 metre intervals along the centre of pavement.

.4 The stop bar shall be 2 - 100 mm continuous strips of prefabricated reflective white tape having an adhesive backing and placed across the travel lanes at traffic control intersections.

.5 Remove the tape when instructed.

.2 Painted Markings:

.1 Lay out pavement markings.

.2 Unless approved otherwise by Contract Administrator, apply paint only when air temperature is above 10°C and no rain is forecast.

.3 Apply traffic paint evenly at rate of 3 m^2/L.

.4 Do not thin paint unless approved by Contract Administrator.

.5 Symbols and letters to conform to dimensions shown on Contract Drawings.

.6 Ensure paint lines of uniform colour and density with sharp edges.

.7 Thoroughly clean distributor tank before refilling with paint of different colour.

.8 Apply glass beads at rate specified in supplemental specifications.

.9 Apply other marking materials specified in Contract Documents.

.10 Ensure all pavement markings in accordance with latest edition of TAC Manual of Uniform Traffic Control Devices.

.3 Thermoplastic Markings:

.1 Pavement shall be clean and dry and free of sand, gravel, loose dust and foreign matter.

.2 Temperature of surface to be marked shall not be less than 50° C.

.3 Thermoplastic material shall be heated in the melter to a temperature of 382° C.

.4 Thermoplastic material thickness shall be:
Lane lines 0.090" (2.286 mm)
Stop bars and crosswalks 0.125" (3.157 mm

.5 Testing of material thickness to be determined by placing metal plate of known thickness in the area to be painted. Once applied the sample is removed and the material plus metal plate is measured.

.6 Immediately following application glass spheres shall be dropped onto the molten surface. Spheres to be applied at a rate of 300 grams per square meter of line area.

3.4 Tolerance

.1 Ensure painted markings within plus or minus 10 mm of specified dimensions.

3.5 Protection of Completed Work

.1 Protect pavement markings until painted markings dry.

END OF SECTION 32 17 23

1.0 GENERAL

.1 Section 32 91 21 refers to those portions of the work that are unique to the supply and placement of growing medium (topsoil) and subsequent finish grading. In this Section, the term "growing medium" is used in place of the generic and commonly used term "topsoil". The term "topsoil" in this Section is used where appropriate to identify imported or on-site natural material conforming to 2.4 of this Section. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 This section is based on the "British Columbia Landscape Standard" published by the B. C. Society of Landscape Architects and the B. C. Nursery Trades Association. This standard is intended to set a level of quality which is to be equalled or bettered in the construction documents for each project. Guidance of a registered British Columbia Landscape Architect is recommended.

1.1 Related Work

.1	Site Grading	Section 31 22 01
.2	Seeding	Section 32 92 20
.3	Hydraulic Seeding	Section 32 92 19
.4	Sodding	Section 32 92 23
.5	Planting of Trees, Shrubs and Ground Covers	Section 32 93 01

1.2 References

.1 British Columbia Landscape Standard.

.2 Canadian System of Soil Classification.

1.3 Source Quality Control

.1 Advise Contract Administrator of sources of growing medium to be utilized 7 days in advance of starting work.

.2 Contractor is responsible for soil analysis and requirements for amendments to supply growing medium as specified.

1.4 Measurement and Payment

.1 Payment for growing medium and imported topsoil will be made separately for each type of growing medium and imported topsoil specified, and includes supply of materials, on-site handling, placement to thickness specified, application of fertilizers and finish grading. Payment for growing medium will be by actual area provided and payment for imported topsoil will be based on loose truck box volume.

.2 Payment for placement and spreading of native topsoil previously stockpiled on site will be made under Section 31 22 01 – Site Grading - 1.4.6.

.3 Payment for excavation of native topsoil and re-use on site will be made under Section 31 22 01 – Site Grading - 1.4.2.

1.5 Inspection and Testing

.1 Refer to General Conditions, Clause 4.12, Inspections.

2.0 PRODUCTS

2.1 General

.1 In this Section, a range of measurable physical and chemical properties are set out as being acceptable in a growing medium. Compliance with this Section is to be determined by testing for those properties. When imported or on-site soil is used, it is to be tested and modified as necessary by admixture of other components to bring its properties within ranges set in 2.10 of this Section for growing medium.

2.2 Applications

.1 Three different growing medium types are described in this Section for different applications:

.1 Low traffic lawn areas, trees and large shrubs.

.2 High traffic lawn areas, having regular pedestrian traffic. This growing medium has relatively high structural strength but will require more care due to lower water and nutrient capacity.

.3 Growing medium for planting areas, such as for shrub and ground cover areas and in planters. This growing medium is similar to that for low traffic lawn areas, but has higher organic content and slightly lower pH. This may be achieved by adding peat moss to growing medium for low traffic lawn areas.

2.3 Native Topsoil

.1 On-site native topsoil may be used, provided it meets standard set for imported topsoil and can be modified to meet requirements set out for specified growing medium.

.2 If testing shows on-site soil to be suitable for landscaping, a sufficient quantity of stripped topsoil to be stockpiled where shown on Contract Drawings or in areas specified for stockpiling.

.3 Do not handle topsoil while in a wet or frozen condition or in any manner in which structure is adversely affected.

2.4 Imported Topsoil

.1 Imported topsoil to be friable loam, neither heavy clay nor of very light sandy nature, containing a minimum of 4% organic matter for clay loams and 2% for sand loams, to a maximum of 20% by volume. To be free from subsoil, roots, noxious grass, weeds, toxic materials, stones over 30 mm, foreign objects, and with an acidity range (pH) of 5.5 to 7.5. To be free from crabgrass, couchgrass, equisetum or noxious weeds or seeds or parts thereof.

.2 Freedom from rock or debris to be such that 95 - 100% of particles pass a 25 mm sieve and 85 - 100% pass a 9.5 mm sieve.

.3 Population of any single species of plant pathogenic nematode to not exceed 1000 per litre of growing medium.

2.5 Peat Moss

.1 Peat moss to be Horticultural grade, partially decomposed fibrous or cellular stems and leaves of Sphagnum Mosses with texture varying from porous to spongy fibrous, fairly elastic and substantially homogeneous with pH value not less than 3.5 and not greater than 4.5, free of decomposed colloidal residue, wood, sulphur and iron, brown in colour and medium to coarse shredded, suitable for horticultural purposes.

.2 Salinity: saturation extract conductivity to not exceed 2.0 millimhos/cm at 25°C.

.3 Organic content: to be no less than 90% based on dry weight as determined by ash analysis.

.4 Nitrogen: to be no less than 0.8% based on dry weight.

.5 Particle size:

.1 95 - 100% passing a 9.5 mm sieve.

.2 0 - 15% passing a 0.500 mm sieve.

2.6 Sand

.1 Sand to be hard, granular sharp sand to CSA A82.50, well washed and free of impurities, chemical or organic matter.

.2 Particle size in sand to be:

.1 95 - 100% passing a 4.75 mm sieve.

.2 0 - 40% passing a 0.500 mm sieve.

.3 0 - 5% passing a 0.050 mm sieve.

2.7 Manure

.1 Manure to be well-rotted farm animal manure, rotted to extent that liquids have been eliminated, and material is crumbly, free from weed seeds, rocks, sticks, rubble and containing not more than 40% sawdust, straw or shavings.

.2 Manure to be free of harmful chemicals such as any used to artificially hasten decomposition, and to have salt content that gives an electrical conductivity reading of less than 0.5 mmho/cm.

.3 Manure to contain not less than 1.0% nitrogen based on dry weight.

.4 All particles in manure to pass a 6.35 mm sieve.

.5 Manure to be free of viable seed, maximum two plants per litre of manure.

2.8 Wood Residuals

.1 Where wood residuals such as fir or hemlock sawdust are present in growing medium, their quantities and properties to be such that total Carbon to total Nitrogen ratio is a maximum of 40:1.

.2 Cedar or redwood sawdust to not be present in growing medium.

2.9 Fertilizers

.1 Chemical Fertilizers:

.1 Fertilizers to be standard commercial brands, meeting requirements of Canada Fertilizer Act.

.2 All fertilizers to be in granular, pelleted or prill form, and to be dry, free-flowing and free from lumps.

.3 Fertilizers to have a guaranteed N-P-K analysis.

.4 Fertilizer to be packed in standard waterproof containers, clearly marked with name of manufacturer, weight and analysis.

.5 Fertilizer to be stored in weatherproof storage place and in such a manner that it will stay dry and its effectiveness is not impaired.

.6 Fertilizers to include, but not be limited to, those shown in Table 1.

TABLE 1: Fertilizers

Name	Minimum Proportion by Weight	Main Element
Ammonium Nitrate	33.5%	N
Ammonium Sulfate	21.0%	N
Superphosphate (0-20-0)	8.5%	P (20% P_2O_5)
Superphosphate (0-45-0)	19.5%	P (45% P_2O_5)
Potassium Sulfate	41.5%	K (50% K_2O)
Potassium Chloride (muriate)	50.0%	K (60% K_2O)
Potassium Nitrate	13.0%	N
	36.5%	K (44% K_2O)
Iron Sulfate	20.0%	Fe, as metallic
Gypsum	23.0%	Ca
Rock or oyster shell lime, limestone flour	40.0%	Ca
Dolomite Lime	20.0%	Ca
	13.0%	M
Bonemeal	20.0%	Phosphoric Acid
	3.0 %	N

(Bonemeal, Gypsum and limes to be finely ground, to 12 mesh or finer).

2.10 Growing Medium

.1 Growing medium is any soil, soil substitute, or mixture whose chemical and physical properties fall within ranges required by this Section for a particular application.

.2 Growing medium to be free of plants or their roots, sticks, building materials, wood chips (in excess of 10 mm in maximum dimensions), chemical pollutants, and other extraneous materials not contributing to generally desirable physical and chemical properties for landscaping purposes.

.3 Growing medium to require not more than 0.5 kg/m^2 of dolomite lime to reach required pH level.

.4 Fertility (nitrogen, phosphorous and potassium) and pH: may be modified after growing medium is placed, by incorporation of lime and fertilizers, or by incorporating these chemicals when mixing and screening.

.5 Salinity: saturation extract conductivity to not exceed 3.0 millimhos/cm at 25°C.

.6 Boron: concentration in saturation extract to not exceed 1.0 ppm.

.7 Sodium: sodium adsorption ratio (SAR) as calculated from analysis of saturation extract to not exceed 8.0.

.8 Total Nitrogen: to be 0.2% to 0.4% by weight.

.9 Available Phosphorous: to be 50 to 70 ppm.

.10 Available Potassium: to be 50 to 100 ppm.

.11 Cation Exchange Capacity: to be 30 to 50 meq.

.12 Carbon to Nitrogen Ratio: to be not more than 40:1.

.13 Acidity: to be within pH range shown in Table 2 for intended application.

.14 Texture: particle sizes and proportions of each size particle to be within ranges shown in Table 2 for intended application.

.15 Organic Content: to be within range shown in Table 2 for intended application.

.16 Drainage of growing medium can be measured only after growing medium in place. Mixing and handling or growing medium to be done in such a manner that minimum saturated hydraulic conductivity shown in Table 2 is achieved.

.17 Tolerances: samples of growing medium taken just before planting to have above properties to within tolerances of ±20%, except for salinity, which is to be less than stated limit.

TABLE 2: Properties of Growing Medium for Different Applications			
Properties	**Low Traffic Lawn Areas, Trees and Large Shrubs**	**High Traffic Lawn Areas**	**Planting Areas, Planters, Shrub and Groundcover Areas**
TEXTURE: Particle size classes by Canadian System of Soil Classification	Percent of Dry Weight Mineral Fraction (%)		
Gravel greater than 2 mm less than 75 mm	0 - 10	0	0
Sand greater than 0.05 mm less than 2 mm	50 - 70	80 - 90	50 - 70
Silt greater than 0.002 mm less than 0.05 mm	10 - 30	5 - 20	10 - 30
Clay less than 0.002 mm	7 - 20	2 - 5	7 - 20
ACIDITY (pH)	6.0 - 6.5	6.0 - 6.5	5.0 - 6.0
DRAINAGE: Minimum saturated hydraulic conductivity (cm/hr) in place	2.0	7.0	2.0
ORGANIC CONTENT: Percent of Dry Weight (%)	5 - 10	3 - 5	25 - 30

3.0 EXECUTION

3.1 Stripping of Topsoil

.1 Strip existing topsoil in accordance with Section 31 22 01 - Site Grading.

3.2 Preparation of Subgrade

.1 Prepare subgrade in accordance with Section 31 22 01 - Site Grading.

.2 Verify that grades are correct. If discrepancies occur, notify Contract Administrator and do not commence work until instructed by Contract Administrator.

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

.4 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material to approved off-site disposal area.

.5 Coarse cultivate entire area which is to receive growing medium to minimum depth of 150 mm immediately before placing growing medium. Cross cultivate areas where equipment used for hauling and spreading has compacted soil.

3.3 Processing Growing Medium

.1 Ensure commercial processing and mixing of growing medium components are done thoroughly by mechanized screening process. Do not mix by hand. Ensure resulting product is homogeneous mixture having required properties throughout.

.2 Ensure moisture content of peat moss at time of mixing not less than 50% to 75%. Peat moss to form a ball when squeezed and retain shape upon release of pressure. Insufficient moisture will result in peat moss not holding together, while excessive moisture is evident when ball formed is pliable with a clear water sheen on surface.

.3 Do not prepare or handle growing medium in a wet or frozen condition.

3.4 Placing Growing Medium

.1 When subgrade accepted by Contract Administrator commence placing growing medium.

.2 Place growing medium over prepared subgrade and allow to settle or compact by light rolling such that it is firm against deep footprints. Do not compact growing medium more than necessary to meet this requirement.

.3 Ensure growing medium is moist (25% to 75% of field capacity) but not wet when placed, and do not handle if frozen or so wet that its structure will be altered.

.4 Manually spread growing medium around trees, shrubs and obstacles.

.5 Table 3 sets out minimum depths of growing medium after settlement for various types of subgrade.

TABLE 3: Minimum Growing Medium Depths

Application	Minimum Depths		
	Over Prepared Subsoil		Over Structures
	Where subsoil has medium (loamy) texture	Where subsoil has coarse (sandy) or fine (clay) texture	
Low traffic lawn areas:			
i) irrigated	100 mm	150 mm	150 mm
ii) not irrigated	100 mm	150 mm	225 mm
High traffic lawn areas:	100 mm	150 mm	-----
Planting medium:			
i) ground cover areas	150 mm	300 mm	225 mm
ii) shrub areas - small shrubs	300 mm	450 mm	300 - 500 mm
iii) shrub areas - large shrubs	450 mm	600 mm	500 - 900 mm
iv) tree pits	225 mm on sides and bottom of rootball	300 mm on sides and bottom of rootball	See Section 02950

3.5	**Applying Fertilizers**	.1	Add fertilizers to bring growing medium fertility within ranges set out in this Section.
		.2	Add lime (if required) and potassium (if required) to growing medium at time of screening. Add all other fertilizers (such as nitrogen, phosphorus and micronutrients) to growing medium by thorough cultivation after medium is in place (if required).
		.3	Spread fertilizers evenly over growing medium with suitable mechanical spreader.
		.4	Ensure fertilizers are fully incorporated to minimum depth of 150 mm, except in lawn areas, where they are to be incorporated to depth of 50 mm.
		.5	Minimum one week separation between application of lime and fertilizers other than lime.
3.6	**Finished Grading**	.1	Fine grade growing medium after placing to specified areas to ensure positive surface drainage.
		.2	Finish surface smooth, uniform, firm against deep footprinting with a fine loose surface texture.
3.7	**Acceptance**	.1	Contract Administrator will inspect and test growing medium in place and determine acceptance of material, depth of growing medium and finish grading. Approval of growing medium material subject to soil testing and analysis.
3.8	**Restoration of Stockpile Sites**	.1	Restore stockpile sites as specified in Contract Documents.
3.9	**Clean-up**	.1	Dispose of surplus materials and all construction debris off-site.

END OF SECTION 32 91 21

1.0 GENERAL

.1 Section 32 92 20 refers to those portions of the work that are unique to the supply and application of grass seed by mechanical dry seeding or hand seeding. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

.2 This section is based on the "British Columbia Landscape Standard" published by the B. C. Society of Landscape Architects and the B. C. Nursery Trades Association. This standard is intended to set a level of quality which is to be equalled or bettered in the construction documents for each project. Guidance of a registered British Columbia Landscape Architect is recommended.

1.1 Related Work

.1	Site Grading	Section 31 22 01
.2	Topsoil and Finish Grading	Section 32 91 21
.3	Hydraulic Seeding	Section 32 92 19
.4	Sodding	Section 32 92 23
.5	Planting of Trees, Shrubs and Ground Covers	Section 32 93 01

1.2 References

.1 British Columbia Landscape Standard.

.2 Canadian System of Soil Classification.

1.3 Scheduling

.1 Schedule all operations to ensure optimum environmental protection, grading, growing medium placement, planting, seeding or sodding operations as outlined in these Specifications. Organize scheduling to ensure a minimum duration of on-site storage of plant material, minimum movement and compaction of growing medium, and prompt mulching and watering operations. Coordinate work schedule with scheduling of other trades on-site.

.2 Coordinate and schedule such that no damage occurs to materials before or after placement. In particular, requirements of living plant material to be met.

.3 Plan, schedule and execute work to ensure a supply of water for landscape purposes in adequate amounts and at adequate pressures for satisfactory irrigation of all plants.

1.4 Handling and Storage

.1 Store all grass seed and nurse crop seed, mulch, fertilizers and related materials, where required, in dry, weatherproof storage place and protected from damage by heat, moisture, rodents or other causes until time of seeding. Do not remove or deface labels or other identification.

1.5 Drainage Control

.1 Provide for proper water management and drainage of site during construction. Include silt traps, erosion control measures, temporary water collection ditches, as well as their adequate maintenance during construction period.

1.6 Samples

.1 Provide samples of all materials required, handle and ship in such a manner that they are representative of material or product sampled.

1.7	**Site Examination**	.1	Do not carry out landscaping work in areas or over surfaces that are not properly prepared. Examine site before starting work to verify all surfaces are properly prepared.
1.8	**Measurement and Payment**	.1	Payment for seeding includes supply and mechanical or hand application of grass seed and maintenance to meet Conditions of Total Performance per 3.7 of this Section. Measurement for payment will only be made for surface actually seeded. Areas of blending into existing grass or sod will not be measured for payment.
1.9	**Inspection and Testing**	.1	Refer to General Conditions, Clause 4.12, Inspections.
2.0	**PRODUCTS**		
2.1	**Grass Seed**	.1	Grass seed to meet requirements of Canada Seed Act for Canada No. 1 seed. Where specified, all nurse crop seed to meet requirements of Canada Seed Act for Canada No. 1 seed.
		.2	Seed mixtures to be approved by Contract Administrator and to be suited to climate, terrain, establishment and maintenance conditions under which they are to be grown.
		.3	Seed to have minimum germination rate of 75% and minimum purity of 97%, except where otherwise required by professional selecting seed mixture.
		.4	Seed to be packed and delivered in original containers clearly showing: .1 Name of supplier. .2 Analysis of seed mixture. .3 Percentage of pure seed. .4 Year of production. .5 Net weight (mass). .6 Date and location of bagging.
		.5	Mixture to be mixed and supplied by recognized seed house.
2.2	**Water**	.1	Free of impurities that would inhibit germination and growth or may be harmful to environment.
		.2	Contractor to supply.
2.3	**Fertilizer**	.1	To Section 32 91 21 - Topsoil and Finish Grading – 2.9.
3.0	**EXECUTION**		
3.1	**Finish Grade Preparation**	.1	Do not perform work under adverse field conditions such as frozen soil, excessively wet or dry soil or soil covered with snow, ice or standing water.
		.2	Verify that grades are correct. If discrepancies occur, notify Contract Administrator and do not commence work until instructed by Contract Administrator.

.3 Remove and dispose of weeds; debris; soil contaminated by oil, gasoline and other deleterious materials; to approved off-site disposal area.

.4 Loosen surfaces of areas that are excessively compacted by means of thorough scarification, discing or harrowing, to minimum 150 mm depth.

.5 Finish grade smooth to extent required for class of seeding to be carried out, firm against footprints, loose textured, and free of all stones, roots, branches, etc. larger than diameter required for removal for class of seeding to be carried out.

3.2 Seeding - General

.1 Scheduling: carry out seeding during periods that are most favourable for establishment of healthy stand of grass. Seed only during calm weather and on soil that is free of frost, snow and standing water, when seasonal conditions are likely to ensure successful germination and continued growth of all varieties of seed in grass mix.

.2 Methods: apply seed by Method A - Mechanical Dry Seeding or Method B - Hydraulic Seeding unless otherwise specified. Ensure hydraulic seeding in accordance with Section 32 92 19 - Hydraulic Seeding. Hand seeding is not recommended. Hand seed only when site conditions preclude above two methods.

.3 Rates of Application: rates of application of fertilizers, seed mixtures, mulch and other components to be based on analysis of season, climate, terrain, soil, and establishment and maintenance conditions affecting project.

3.3 Application for Mechanical Dry Seeding

.1 Measure all grass seed, nurse crop seed, water, fertilizer, and mulch accurately before application.

.2 Apply required fertilizer to and work well into topsoil by discing, raking, or harrowing at rate required.

.3 Apply seed at rate required by means of approved mechanical dry seeder which accurately places seed at specified depth and rate and rolls in single operation.

.4 Apply seed in two intersecting directions, except where conditions dictate seeding in one direction only.

.5 Apply mulch with seed or immediately following seeding with approved mulcher. No area to be seeded in excess of that which can be mulched on same day.

.6 Apply mulch to form even, uniform mat over entire area.

.7 Use agricultural, water ballast type roller, not less than 500 mm diameter smooth steel drum, width not less than width of landscape seeder. Adjust ballast to suit site conditions.

.8 Blend applications 150 mm into adjacent grass areas or previous applications to form uniform surfaces.

3.4 Application for Hand Seeding

.1 Do not use hand seeding method unless approved by Contract Administrator.

.2 Use all procedures specified in 3.3 of this Section, except as modified by specifications as follows:

.1 Use "Cyclone" type manually operated seeder. Adjust ballast to suit site conditions.

.2 Embed seed into soil to depth of 10 mm. Not less than 85% of seed to be placed at specified depth and covered by soil.

.3 Consolidate mechanically seeded areas by rolling area with manually operated, water ballast, landscaping type, smooth steel drum roller, immediately after seeding. Adjust ballast to suit site conditions.

3.5 Clean-up

.1 Remove all materials and other debris resulting from seeding operations from job site.

3.6 Grass Maintenance

.1 Begin maintenance for seeded areas immediately after seeding has been completed, and continue until issuance of Certificate of Total Performance.

.2 Include all measures necessary to establish and maintain grass in a vigorous growing condition, including, but not limited to, following:

.1 Mow at regular intervals as required, to maintain grass at maximum height of 60 mm. Do not cut more than 1/3 of blade at any one mowing. Neatly trim edges of seeded areas. Remove heavy clippings immediately after mowing and trimming.

.2 Water when required and with sufficient quantities to prevent grass and underlying soil from drying out.

.3 Roll when required to remove any minor depressions or irregularities.

.4 Undertake weed control when density of weeds reaches 10 broadleaf weeds or 50 annual weeds or weedy grasses per 40 m^2 and reduce density of weeds to zero.

.5 Immediately repair seeded areas that show deterioration or bare spots. Top-dress all areas showing shrinkage due to lack of watering and seed with seed mix that matches original seed mix.

.6 Protect all seeded areas with warning signs, temporary wire or twine fences, or other necessary means.

3.7 Conditions for Total Performance

.1 Contract Administrator will issue Certificate of Total Performance only when following conditions exist:

.1 Growing medium quality, fertility levels, depths and surface conditions are as specified in Contract Documents.

.2 Grasses are required varieties, free of varieties other than those specified.

.3 Grass areas are relatively free of weeds, containing no more than two broadleaf weeds or ten annual weeds or weedy grasses per m^2.

.4 Grass is sufficiently established that its roots are growing into underlying growing medium.

.5 Seeded areas have been mown at least twice, to a height of 38 mm, last mowing being within 48 h of inspection for acceptance.

.6 Grasses established in sufficient density that no surface soil visible when mown to height of 38 mm.

.7 Specified maintenance procedures have been carried out.

3.8 Guarantee / Maintenance

.1 Customary one year guarantee period for construction industry will apply as standard for landscape work. Contractor to guarantee all materials and workmanship for a period of one full year from date of Total Performance, unless specified otherwise in Contract Documents.

.2 Guarantee includes replacing all seeded areas determined by Contract Administrator to be dead or failing at end of guarantee period. Replacements to be made at next appropriate season, and conditions of guarantee will apply to all replacement seeding for one full growing season.

.3 Guarantee will not apply to seeded areas damaged after date of Total Performance by causes beyond Contractor's control, such as vandalism, "acts of God", "excessive wear and tear", or abuse. Contractor is responsible for work until Total Performance. After Total Performance, Owner is responsible for work and proper maintenance.

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END OF SECTION 32 92 20