

Supplementary Specifications

These Supplementary Specifications must be read in conjunction with the Master Municipal Specifications contained in the Master Municipal Construction Documents, Volume II, Platinum Edition 2009.

Reference No.

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- 32 91 21 Topsoil and Finish Grading

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| 1.0 GENERAL | .1 | <u>Section 01 53 01</u> addresses general requirements for temporary construction facilities not incorporated into the final or permanent work. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein. |
| | .2 | Comply with <u>General conditions Clause 4.4, Temporary Structures and Facilities</u> |
| 1.1 Section Includes | .1 | Dewatering. |
| | .2 | Sanitary facilities. |
| | .3 | Site Storage/Loading. |
| | .4 | Hoarding. |
| | .5 | Mobilization and Demobilization |
| 1.2 Installation and Removal | .1 | Provide temporary utilities and construction facilities in order to execute work expeditiously. |
| | .2 | Remove from site all such work after use. |
| 1.3 Dewatering | .1 | Provide temporary drainage and pumping facilities to keep excavations and site free from standing water. |
| 1.4 Sanitary Facilities | .1 | Provide sufficient sanitary facilities for workers in accordance with local health authorities. |
| 1.5 Site Storage / Loading | .1 | Confine work and operations of employees in accordance with Contract Documents. Do not unreasonably encumber premises with products. |
| | .2 | Do not load or permit to load any part of work with a weight or force that will endanger the work. |
| 1.6 Hoarding | .1 | Provide hoarding as shown on Contract Drawings protecting public and private property from injury or damage. Provide lockable gates within hoarding for access to site by workers and vehicles. |
| 1.7 Security | .1 | Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays. |
| 1.8 First Aid Facilities | .1 | Provide adequate first aid facilities in accordance with WorkSafe BC requirements. |
| 1.9 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. |
| | .2 | Payment for mobilization and demobilization shall include all the Contractor costs of mobilization at the beginning of the project and the cost of demobilization at the end of the project. |

1. Included in the mobilization are such items as bonding, insurance, permits, moving personnel, equipment and materials to the site, setting up temporary facilities and all preparation for performing the Work.
2. Included in demobilization are preparation and submission of record drawings, operation and maintenance manuals, removal of all personnel, equipment and materials and cleanup of the Site and the Work.
3. The lump sum price bid for this work shall be relative to the costs involved but shall not exceed ten percent of the Tender Price.
4. Payment shall be made as follows, as approved by the Contract Administrator:
 1. 60% of the lump sum bid will be included in the first progress payment certificate.
 2. 40% of the lump sum bid will be included in the final progress payment certificate.
5. The Contract Administrator may at their discretion authorize partial payment if mobilization or demobilization is not complete.

The cost of other items specified under General Requirements shall be considered incidental to the work and separate payment will not be made for any other items in the General Requirements unless specifically noted in the Schedule of Quantities and Prices.

1.10 Inspections and Testing

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

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION

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| 1.0 GENERAL | <p>.1 <u>Section 01 55 00</u> 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.</p> <p>.2 Comply with <u>General Conditions, Clause 4.4, Temporary Structures and Facilities.</u></p> <p>.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.</p> <p>.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.</p> <p>.5 Inform all owners or occupants of properties where access is affected in advance of proposed road and/or sidewalk closures.</p> |
| 1.1 <u>Section 01 55 00</u>
Includes | <p>.1 Temporary Access Roads</p> <p>.2 Temporary Parking Areas</p> <p>.3 Traffic Control</p> |
| 1.2 Temporary Access Roads | <p>.1 Provide and maintain temporary access roads at locations approved by the Contract Administrator.</p> |
| 1.3 Temporary Parking Areas | <p>.1 Parking will be permitted on site provided it does not disrupt the performance of the work.</p> |
| 1.4 Traffic Control | <p>.1 Parking will be permitted on site provided it does not disrupt the performance of the work.</p> <p>.2 Regulate traffic in general accordance with municipal requirements except where specified otherwise and in compliance with specific requirements stipulated herein.</p> <p>.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.</p> <p>.4 When working on travelled way:</p> <p style="padding-left: 40px;">.1 Place equipment in such position as to present a minimum of interference and hazard to the travelling public.</p> |

- .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 and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work which may require road user response.
 - .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.
 - .2 Clean, repair or replace to ensure clarity and reflectance.
 - .3 Removing or covering signs which do not apply to conditions existing from day to day.
- .10 Provide flag persons, trained and properly equipped for the following situations:
 - .1 Which 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 oncoming traffic would not otherwise have adequate warning.
- .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

END OF SECTION

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| 1.0 | GENERAL | <p>.1 <u>Section 01 57 01</u> 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.</p> <p>.2 Comply with <u>General Conditions, Clause 20.4, Environmental Laws.</u></p> |
| 1.1 | <u>Section 01 57 01 Includes</u> | <p>.1 Temporary Erosion and Sediment Control</p> <p>.2 Temporary Pest Control</p> <p>.3 Environmental Protection</p> <p>.4 Temporary Storm Water Pollution Control</p> |
| 1.2 | Temporary Erosion and Sediment Controls | <p>.1 Drainage</p> <p style="padding-left: 20px;">.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.</p> <p style="padding-left: 20px;">.2 Do not discharge water containing suspended materials into watercourses, sewer or drainage systems.</p> <p style="padding-left: 20px;">.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Federal, Provincial and Municipal requirements.</p> <p>.2 Work Adjacent to Watercourses</p> <p style="padding-left: 20px;">.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.</p> <p style="padding-left: 20px;">.2 Do not operate construction equipment in watercourses.</p> <p style="padding-left: 20px;">.3 Do not use watercourse beds for borrow material without approval from Federal, Provincial and Municipal authorities.</p> <p style="padding-left: 20px;">.4 Do not dump excavated fill, waste material or debris in or adjacent to watercourses.</p> <p style="padding-left: 20px;">.5 Design and construct temporary crossings to minimize erosion to watercourses.</p> <p style="padding-left: 20px;">.6 Do not skid logs or construction materials across watercourses.</p> <p style="padding-left: 20px;">.7 Avoid spawning beds when constructing temporary crossings of watercourses.</p> <p style="padding-left: 20px;">.8 Do not blast under water or within 100 m of spawning beds without approval from Federal, Provincial and Municipal authorities.</p> |

.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	500N
Mullen Burst	1900 kPa
Elongation at Break	25% Maximum
Opening	600 um 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/m2
Above values are "Minimum Average Roll Values"	

.4 Execution for Temporary Erosion and Sediment Controls:

.1 Silt Barrier Fence Placement:

- .1 Place silt 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 m² per 3m of fence.
 - .2 Do not use where site slope is steeper than 3:1, and water flow rates exceed 0.03 m²/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

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| 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 | <p>Section 31 05 17 includes specifications for aggregates and granular materials referred to in the following sections:</p> <table border="0" style="margin-left: 40px;"> <tr> <td>.1 Shrub and Tree Preservation</td> <td style="text-align: right;">Section 31 11 41</td> </tr> <tr> <td>.2 Excavating, Trenching and Backfilling</td> <td style="text-align: right;">Section 31 23 01</td> </tr> <tr> <td>.3 Roadway Excavation, Embankment and Backfilling</td> <td style="text-align: right;">Section 31 24 13</td> </tr> <tr> <td>.4 Granular Base</td> <td style="text-align: right;">Section 32 11 23</td> </tr> <tr> <td>.5 Granular Subbase</td> <td style="text-align: right;">Section 32 11 16.1</td> </tr> <tr> <td>.6 Unit Paving</td> <td style="text-align: right;">Section 32 14 01</td> </tr> <tr> <td>.7 Portland Cement Concrete Pavement</td> <td style="text-align: right;">Section 32 13 13</td> </tr> <tr> <td>.8 Waterworks</td> <td style="text-align: right;">Section 33 11 01</td> </tr> <tr> <td>.9 Storm Sewers</td> <td style="text-align: right;">Section 33 40 01</td> </tr> <tr> <td>.10 Pipe Culverts</td> <td style="text-align: right;">Section 33 42 13</td> </tr> </table> <p>.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:</p> <table border="0" style="margin-left: 40px;"> <tr> <td>.1 Controlled Density Fill</td> <td style="text-align: right;">Section 31 23 23</td> </tr> <tr> <td>.2 Hot-Mix Asphalt Concrete Paving</td> <td style="text-align: right;">Section 32 12 16</td> </tr> <tr> <td>.3 Pavement Crack Cleaning and Filling Prior to Overlay</td> <td style="text-align: right;">Section 32 01 17.7</td> </tr> <tr> <td>.4 Cast-in-Place Concrete</td> <td style="text-align: right;">Section 03 30 53</td> </tr> <tr> <td>.5 Topsoil and Finish Grading</td> <td style="text-align: right;">Section 32 91 21</td> </tr> <tr> <td>.6 Seeding</td> <td style="text-align: right;">Section 32 92 20</td> </tr> <tr> <td>.7 Hydraulic Seeding</td> <td style="text-align: right;">Section 32 92 19</td> </tr> <tr> <td>.8 Sodding</td> <td style="text-align: right;">Section 32 92 23</td> </tr> <tr> <td>.9 Planting of Trees, Shrubs and Ground Covers</td> <td style="text-align: right;">Section 32 93 01</td> </tr> </table> | .1 Shrub and Tree Preservation | Section 31 11 41 | .2 Excavating, Trenching and Backfilling | Section 31 23 01 | .3 Roadway Excavation, Embankment and Backfilling | 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 | .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 Shrub and Tree Preservation | Section 31 11 41 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| .2 Excavating, Trenching and Backfilling | Section 31 23 01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| .3 Roadway Excavation, Embankment and Backfilling | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| .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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| 1.3 Approvals | <ul style="list-style-type: none">.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 | <ul style="list-style-type: none">.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 | <ul style="list-style-type: none">.1 Refer to General Conditions, Clause 4.12, Inspections. |
| 2.0 PRODUCTS | |
| 2.1 Materials - General | <ul style="list-style-type: none">.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 coarse 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 1-11, 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 | <ul style="list-style-type: none">.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 | <ul style="list-style-type: none">.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	22	100
2.36	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:

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

		Percent Passing		
Sieve				
.....	Designation	Type1*	Type 2*	Type 3*
.....	50.0 mm	100	100	100 - 100
	38.0 mm	100	100	90 – 100
	25.0 mm	100	100	20 – 60
	19.0 mm	90 – 100		90 – 1000 – 15
	12.5 mm	65 – 85	70 – 100	
	9.5 mm	50 – 75		0 – 5
	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 approval

*Type 3: minimum 40% Porosity

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		100
75 mm		100
38 mm	60	100
25 mm		
19 mm	35	85
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
0.18 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	
25 mm		100
19 mm	80	100
9.5 mm	50	85
4.75 mm	35	70
2.36 mm	25	50
1.18 mm	15	35
0.300 mm	5	20
0.075 mm	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	
4.76 mm		100
0.42 mm	80	100
0.074 mm	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	
4.76 mm		100
0.42 mm	80	100
0.25 mm	50	100
0.15 mm	0	70
0.074 mm	0	20

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

Sieve Designation	Percent Passing	
150.0 mm		100
76.00 mm	85	100
4.76 mm	45	100
0.42 mm	25	100
0.074 mm	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

- | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|--|------------------|-----------------------|------------------|----|--------------|------------------|----|---------------------------------------|------------------|----|---|------------------|----|----------------------------|------------------|----|--|------------------|
| 1.0 GENERAL | <p>.1 Section 31 11 41 refers to those portions of the work that are unique to the preservation of existing shrubs and trees. This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.</p> <p>.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.</p> <p>.3 The International Society of Arboriculture publication, Guidelines for Establishing Values of Trees and other Products shall apply where plant material values are required to be established.</p> | | | | | | | | | | | | | | | | | | |
| 1.1 Related Work | <table border="0"> <tr> <td style="padding-right: 20px;">.1</td> <td>Clearing and Grubbing</td> <td style="text-align: right;">Section 31 11 01</td> </tr> <tr> <td>.2</td> <td>Site Grading</td> <td style="text-align: right;">Section 31 22 01</td> </tr> <tr> <td>.3</td> <td>Excavating, Trenching and Backfilling</td> <td style="text-align: right;">Section 31 23 01</td> </tr> <tr> <td>.4</td> <td>Roadway Excavation, Embankment and Compaction</td> <td style="text-align: right;">Section 31 24 13</td> </tr> <tr> <td>.5</td> <td>Topsoil and Finish Grading</td> <td style="text-align: right;">Section 32 91 21</td> </tr> <tr> <td>.6</td> <td>Planting Trees, Shrubs And Ground Covers</td> <td style="text-align: right;">Section 32 93 01</td> </tr> </table> | .1 | Clearing and Grubbing | Section 31 11 01 | .2 | Site Grading | Section 31 22 01 | .3 | Excavating, Trenching and Backfilling | Section 31 23 01 | .4 | Roadway Excavation, Embankment and Compaction | Section 31 24 13 | .5 | Topsoil and Finish Grading | Section 32 91 21 | .6 | Planting Trees, Shrubs And Ground Covers | Section 32 93 01 |
| .1 | Clearing and Grubbing | Section 31 11 01 | | | | | | | | | | | | | | | | | |
| .2 | Site Grading | Section 31 22 01 | | | | | | | | | | | | | | | | | |
| .3 | Excavating, Trenching and Backfilling | Section 31 23 01 | | | | | | | | | | | | | | | | | |
| .4 | Roadway Excavation, Embankment and Compaction | Section 31 24 13 | | | | | | | | | | | | | | | | | |
| .5 | Topsoil and Finish Grading | Section 32 91 21 | | | | | | | | | | | | | | | | | |
| .6 | Planting Trees, Shrubs And Ground Covers | Section 32 93 01 | | | | | | | | | | | | | | | | | |
| 1.2 References | <p>.1 British Columbia Landscape Standard</p> <p>.2 Canadian System of Soil Classification</p> <p>.3 International Society of Arboriculture. Guide for Establishing Values of Trees and Other Plants, 1983.</p> | | | | | | | | | | | | | | | | | | |
| 1.3 Measurement and Payment | <p>.1 Payment for all shrub and tree preservation and grade changes items includes all applicable work described in this Section and will cover area of shrubs or individual trees to be attended to as shown on Contract Drawings or as directed by Contract Administrator.</p> | | | | | | | | | | | | | | | | | | |
| 1.4 Inspection and Testing | <p>.1 Refer to General Conditions, Clause 4.12, Inspections.</p> | | | | | | | | | | | | | | | | | | |
| 2.0 PRODUCTS | | | | | | | | | | | | | | | | | | | |
| 2..1 Materials | <p>.1 Native material: to Section 31 05 17 - Aggregates and Granular Materials.</p> <p>.2 Pit run gravel: to Section 31 05 17 - Aggregates and Granular Materials.</p> <p>.3 Pit run sand: to Section 31 05 17 - Aggregates and Granular Materials.</p> | | | | | | | | | | | | | | | | | | |

- .4 Drain rock: to Section 31 05 17 - Aggregates and Granular Materials.
- .5 Imported Topsoil: to Section 32 91 21 – Topsoil and Finish Grading.
- .6 Drainpipe: 100 mm diameter corrugated plastic perforated tubing complete with snap couplings to CGSB 41-GP-31M or perforated PVC sewer pipe to CSA B182.1.
- .7 Asphalted felt: to CSA A123.
- .8 Fertilizer: complete commercial fertilizer (10-6-4 or approved type) with 50% of elements derived from organic sources.
- .9 Wound dressing: horticulturally accepted non-toxic, non-hardening emulsion.

3.0 EXECUTION

3.1 Existing Trees

- .1 Inspect with Contract Administrator and clearly identify on site all existing shrubs and trees shown on Contract Drawings or designated by Contract Administrator to be preserved. Establish barricades or suitable markings around such shrubs and trees.
- .2 Do not undertake construction procedures, stockpiling of materials or disposal adjacent to designated trees or areas to be preserved.
- .3 Do not undertake construction procedures which substantially alter natural drainage patterns. Provide interim drainage or irrigation as necessary to compensate for construction interference.
- .4 Where specified or shown on Contract Drawings apply fertilizer at rate of 50 g/mm of calliper to existing trees to be retained. Take calliper measurement 0.3 mm above grade. Apply once early in growing season unless specified otherwise.
- .5 Distribute fertilizer equally into holes drilled 200-250 mm deep, spaced 600-750 mm apart and located in circular pattern between $\frac{2}{3}$ and limit of each tree's branch spread. Water thoroughly after fertilizer applied.
- .6 Water retained trees 3 times during summer. Soak area immediately below tree crown sufficiently deep to reach feeder roots.

3.2 Raising Grade Around

- .1 Apply fertilizer as specified in 3.1.4 and 3.1.5, of this Section, before revising grade.
- .2 Install drainpipe on existing grade consisting of 8 spokes radiating out from trunk to limit of branch spread. Slope slightly away from trunk and connect ends to form shape of wheel. Place uprights at both ends of each spoke to reach new grade level to provide aeration and means of watering.
- .3 Obtain Contract Administrator's approval before backfilling drainpipe.

- .4 Protect bark of buried portion of tree from abrasion by surrounding trunk with asphalted felt. Leave minimum 50 mm space between protective material and bark. Fill space with 9.5 mm drain rock.
 - .5 Use drain rock fill to cover 150 mm over and around each side of drainpipe. Use pit run sand fill for remainder of drainage course between radial spokes to minimum depth of 150 mm. Use approved native material or pit run gravel fill to raise grade to required level, making allowance for imported topsoil specified in Section 32 91 21 - Topsoil and Finish Grading. Fill vertical drains with 9.5 mm drain rock.
 - .6 Compact fill without disturbing or damaging buried drainpipe. Use frost-free materials over frost-free ground conditions. Compact fill to 80% Modified Proctor density in compliance with ASTM D1557.
- 3.3 Lowering Grade Around Existing Trees**
- .1 Cut specified slope from edge of branch spread to new grade level. Grade topsoil berm for each tree at periphery of branch spread to hold water where required.
 - .2 If excavation through roots is required, excavate by hand and cut roots with sharp axe, tree lopper or saw. Seal cut edges 10 mm in diameter and larger with wound dressing.
 - .3 Apply fertilizer after excavation backfilled and grading completed. Do not permit root system to dry out at any time.
- 3.4 Pruning**
- .1 Selectively remove 1/3 of tree branches to reduce transpiration and compensate for dieback of roots in fill conditions and damage to root system in cut conditions.
- 3.5 Clean Up**
- .1 After construction and prior to final inspection remove all fencing and flagging. Remove any dead branches or dying limbs on trees at the direction of the Contract Administrator
 - .2 Replace any trees the Contract Administrator assesses as irreparably damaged as determined by an Arborist and according to the requirements of the International Society of Arboriculture Guide for Establishing Value of Trees or Other Plants, 1983.

END SECTION

- | | | |
|------------------------------------|----|---|
| 1.0 GENERAL | .1 | Section 31 22 16 refers to those portions of the work that are unique to the requirements for scarifying and reshaping existing granular roadbeds, and where required, the supply and placement of additional 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 | 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 roadbed, driveway and shoulder includes all spreading and grading of materials and supply of added materials, adjustment of moisture content, compaction and disposal of excess material |
| | .2 | Where additional granular base material is approved for use by the Contract Administrator for reshaping as described above, measurement will be for actual quantity placed based on weigh tickets provided to Contract Administrator as loads are delivered. |
| | .3 | Payment for removal of unsuitable materials includes disposal off-site. Replacement of unsuitable material removed will be treated as new granular base under 1.4.2 of this Section. Measurement will be made by loose truck box volume of the suitable material brought to site and incorporated into work. |
| | .4 | Replacement of unsuitable material removed will be treated as new granular base under 1.4.2 of this Section. Measurement will be made by loose truck box volume of the suitable material brought to site and incorporated into work. |
| | .5 | Payment for removal of excess base gravels materials includes stockpiling as require and hauling to the site indicated on the Contract Drawings. Measurement will be made by loose truck box volume. |
| 1.5 Inspection and Testing | .1 | Refer to General Conditions, Clause 4.12, Inspections. |
| 2.0 PRODUCTS | | |
| 2.1 Materials | .1 | Additional granular base material to be in accordance with Section 32 11 |

23 – Granular Base and Section 31 05 17 – Aggregates and Granular Materials.

3.0 EXECUTION

3.1 Scarifying and Reshaping

- .1 Scarify roadbed in accordance with width and depth shown on Contract Drawings.
- .2 Pulverize and break down scarified material to 19 mm maximum particle size.
- .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 granular base material.
- .5 Dispose excess material off-site.

3.2 Compaction

- .1 Compaction equipment to be capable of obtaining required densities in materials on project. Compact to density not less than 95% Modified Proctor density in compliance with ASTM D1557.
- .2 Shape and roll alternately to obtain smooth, even and uniformly compacted Base.
- .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 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 Maintenance

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

END SECTION

- 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
- .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 .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.
- .14 Payment for removal of unsuitable materials will be as over-excavation with offsite disposal and backfill with crushed granular base including finish grading, adjustment of moisture content and compaction as specified per the Unit Bid Item in the Schedule of Units and Prices for

over-excavation.

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 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

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|--|--------------------|--|--|--------------------------|--|------------------|--------------------------------------|------------------|-----------------|------------------|-----------------|--------------------|---------------------------|--------------------|
| 1.0 GENERAL | .1 | Section <u>32 11 16.1</u> 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 | <table border="0"> <tr> <td style="padding-left: 20px;">.1 Traffic Control, Vehicle Access and Parking</td> <td style="text-align: right;">Section 01 55 00</td> </tr> <tr> <td style="padding-left: 20px;">.2 Roadway Excavation, Embankment and Compaction</td> <td style="text-align: right;">Section 31 24 13</td> </tr> <tr> <td style="padding-left: 20px;">.3 Aggregates and Granular Materials</td> <td style="text-align: right;">Section 31 05 17</td> </tr> <tr> <td style="padding-left: 20px;">.4 Dust Control</td> <td style="text-align: right;">Section 31 15 60</td> </tr> <tr> <td style="padding-left: 20px;">.5 Cold Milling</td> <td style="text-align: right;">Section 32 01 16.7</td> </tr> <tr> <td style="padding-left: 20px;">.6 Full Depth Reclamation</td> <td style="text-align: right;">Section 32 01 16.8</td> </tr> </table> | .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 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 <u>Section 01 42 00</u> – 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 <u>Section 31 22 16.1</u> - Reshaping Existing Subgrade - 1.4.2. | | | | | | | | | | | | |
| 1.5 Inspection and Training | .1 | Refer to General Conditions, Clause 4.12, Inspections. | | | | | | | | | | | | |
| 2.0 PRODUCTS | | | | | | | | | | | | | | |
| 2.1 Specified Materials | .1 | Material for road subbase to be: <table border="0" style="margin-left: 20px;"> <tr> <td>.1 Select granular subbase.</td> </tr> <tr> <td>.2 75 mm pit run gravel.</td> </tr> <tr> <td>.3 75mm minus crushed gravel.</td> </tr> </table> | .1 Select granular subbase. | .2 75 mm pit run gravel. | .3 75mm minus crushed gravel. | | | | | | | | | |
| .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.

**3.4 Finished
Tolerances**

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

END OF SECTION

- | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------|---|--|------------------|--------------------------------------|------------------|---------------------|--------------------|-----------------|------------------|--|------------------|---|------------------|-----------------|--------------------|---------------------------|--------------------|--------------------------------------|------------------|---------------------------------|--------------------|
| 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 | <table border="0"> <tr> <td style="padding-left: 20px;">.1 Traffic Control, Vehicle Access and Parking</td> <td style="text-align: right;">Section 01 55 00</td> </tr> <tr> <td style="padding-left: 20px;">.2 Aggregates and Granular Materials</td> <td style="text-align: right;">Section 31 05 17</td> </tr> <tr> <td style="padding-left: 20px;">.3 Granular Subbase</td> <td style="text-align: right;">Section 32 11 16.1</td> </tr> <tr> <td style="padding-left: 20px;">.4 Dust Control</td> <td style="text-align: right;">Section 31 15 60</td> </tr> <tr> <td style="padding-left: 20px;">.5 Reference Specifications –
Site and Infrastructure</td> <td style="text-align: right;">Section 01 42 00</td> </tr> <tr> <td style="padding-left: 20px;">.6 Roadway Excavation, Embankment
and Compaction</td> <td style="text-align: right;">Section 31 24 13</td> </tr> <tr> <td style="padding-left: 20px;">.7 Cold Milling</td> <td style="text-align: right;">Section 32 01 16.7</td> </tr> <tr> <td style="padding-left: 20px;">.8 Full Depth Reclamation</td> <td style="text-align: right;">Section 32 01 16.8</td> </tr> <tr> <td style="padding-left: 20px;">.9 Concrete Walks, Curbs and Gutters</td> <td style="text-align: right;">Section 03 30 20</td> </tr> <tr> <td style="padding-left: 20px;">.10 Reshaping Existing Subgrade</td> <td style="text-align: right;">Section 31 22 16.1</td> </tr> </table> | .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 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.

3.5 Proof Rolling

- .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.
- .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.

END OF SECTION

- 1.0 GENERAL** 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
- .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 1,500m² 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 a 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 BGSB-13.3-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.
- .3

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: ASTM D2419 Min: 40
- .7 Magnesium Sulphate soundness: 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 1-11, Fracture Count for Coarse Aggregate, Method "B", which determines fractured faces by mass.

Passing 25mm 12.5mm	to to	Retained On 12.5mm 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 course 1	% min. 13 lower
	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 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.

3.5 Placing

- .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.
- .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
 - .5 Straight edges and correct irregularities.
 - .6 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 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 cannot 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 A 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.

3.12 Clean-Up

- .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.
- .1 Remove lids or covers from all castings and clean any prime, tack coat or hotmix asphaltic concrete from frames, lids and covers of all castings.

END OF SECTION

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|--|--|-----------------|------------------|------------|------------------|----------------------|------------------|------------|------------------|--|------------------|
| 1.0 GENERAL | <p>.1 <u>Section 32 91 21</u> 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.</p> <p>.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.</p> | | | | | | | | | | |
| 1.1 Related Work | <table border="0"> <tr> <td style="padding-right: 20px;">.1 Site Grading</td> <td>Section 31 22 01</td> </tr> <tr> <td>.2 Seeding</td> <td>Section 32 92 20</td> </tr> <tr> <td>.3 Hydraulic Seeding</td> <td>Section 32 92 19</td> </tr> <tr> <td>.4 Sodding</td> <td>Section 32 92 23</td> </tr> <tr> <td>.5 Planting of trees, Shrubs and Ground Covers</td> <td>Section 32 93 01</td> </tr> </table> | .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 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 | <p>.1 British Columbia Landscape Standard</p> <p>.2 Canadian System of Soil Classification</p> | | | | | | | | | | |
| 1.3 Source Quality Control | <p>.1 Advise Contract Administrator of sources of growing medium to be utilized 7 days in advance of starting work.</p> <p>.2 Contractor is responsible for soil analysis and requirements for amendments to supply growing medium as specified.</p> | | | | | | | | | | |
| 1.4 Measurement and Payment | <p>.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.</p> <p>.2 Payment for placement and spreading of native topsoil previously stockpiled on site will be made under <u>Section 31 22 01</u> – Site Grading – 1.4.6.</p> <p>.3 Payment for excavation of native topsoil and re-use on site will be made under <u>Section 31 22 01</u> – Site Grading – 1.4.2.</p> | | | | | | | | | | |
| 1.5 Inspection and Testing | <p>.1 Refer to General Conditions, Clause 4.12, Inspections.</p> | | | | | | | | | | |

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 ₂ O ₅)
Superphosphate (0-45-0)	19.5%	P (45% P ₂ O ₅)
Potassium Sulfate	41.5%	K (50% K ₂ O)
Potassium Chloride (muriate)	50.0%	K (60% K ₂ O)
Potassium Nitrate	13.0%	N
	36.5%	K (44% K ₂ O)
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/m² 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 of 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 $\pm 20\%$, except for salinity, which is to be less than stated limit.

TABLE 2: Properties of Growing Mediums for Different Applications

Properties	Low Traffic Lawn Areas, Trees and Large Shrubs	High Traffic Lawn Areas	Planting Areas, Planters, Shrub and Groundcover Areas
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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			
Minimum Depths			
		Over Prepared Subsoil	Over Structures
Application		Where subsoil has medium (loamy) texture	Where subsoil has coarse (sandy) texture
Low traffic lawn areas:			
1. irrigated		100 mm	150 mm
2. not irrigated		100 mm	150 mm
High traffic lawn areas:		100 mm	150 mm
Planting medium:			
i. ground cover areas		150 mm	300 mm
		300 mm	450 mm
ii. shrub areas –			
small shrubs		450 mm	600 mm
mm			
iii. shrub areas –		225 mm on sides	300 mm on sides
		See Section	
large shrubs		and bottom of	and bottom of
iv. tree pits		rootball	rootball
			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 foot printing 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