SCHEDULE B –TRANSPORTATION

1. GENERAL:

1.1 Where Schedule A of this Bylaw or the Master Transportation Plan (MTP) requires the construction of transportation facilities, the Applicant shall construct such facilities consistent with the regulations, standards and specifications set out in this Schedule. All vertical and horizontal alignment elements for roads in the City shall be designed in accordance with the recommended practice as outlined in the "Geometric Design Guide for Canadian Roads", most recent edition, as published by the Transportation Association of Canada (TAC) or as stated elsewhere in this Bylaw.

1.2 All new transportation road allowances, works and upgrades within the City of Vernon are to suit the intended use; adhering to the intention and recommendations of the City's asset management plan by minimizing new infrastructure provided and maximizing the service life of those works through appropriate design and construction.

1.3 All new transportation allowances, works and upgrades within the City of Vernon are to be appropriate for the specific location (Development District) and adjacent land use as defined in the Official Community Plan (OCP) and the Zoning Bylaw. Rural standard roads (with no curb and gutter) are permitted for all existing rural standard roads in Development Districts 2 and 3 and new roads in Development District 3, except those in a Neighbourhood Centre. Improvements to provide dedicated on street parking on existing roads in Development Districts 1 and 2 is only required to provide additional on street parking to supplement existing on street parking or on bus routes Additional road dedication for existing roads in Development Districts 1 and 2 is only required where identified in the Zoning Bylaw~~,~~ ~~—~~Schedule B – Additional Setbacks, the MTP, or where necessary as a condition of development approval in which additional road works have been required, or as a current road Development Cost Charge project. General requirements for works to be provided within each Development District are defined in Table A.2 of Schedule A of this Bylaw.

1.4 Roads are required to convey major storm event overland flows to receiving waters. Road design must include verification of capacity to convey at least the 1 in 100 year flows for the relevant component of the catchment area, based on existing and proposed development of that area.

2. ROAD CLASSIFICATIONS:

2.1 Road classifications are defined in the Transportation Section of the OCP and the MTP. This includes, but is not limited to, the extension of existing roads. The road classification of all proposed new roads not identified in the OCP or in Neighbourhood Plans are to be established by the City Engineer prior to initiation of design of those works. Arterial roads are to provide safe and efficient transportation movement as their primary function. Collector roads are to provide access connectivity between Local roads and Arterial roads as their primary function, transportation movement as a secondary function, access to lands and on street parking as a tertiary function~~s~~. Local roads are to provide access to lands as their primary function and parking as a secondary function where onsite parking is limited.

3. DESIGN PARAMETERS:

3.1 Design Speed

Unless otherwise accepted, roadways shall be designed to the standards as specified in TAC "Geometric Design Guide for Canadian Roads". Roadway design is to discourage speeding and be specific to the following maximum identified road design speeds based on road classification, wherever possible.

- Arterial: 60 km/hr
- Collector: 50 km/hr
- Local: 30 km/hr

3.2 Vertical Alignment

3.2.1 All vertical alignment elements shall be designed in accordance with the "Geometric Design Guide for Canadian Roads" most recent edition as published TAC or as defined in this Bylaw.

3.2.2 The maximum longitudinal road grades are defined in the Table B-1~~,~~ ~~–~~of this Bylaw. Road grades 6% or greater shall be reduced at intersections by 1% to 2%. As a means of providing reduced grades at intersections the maximum road grade may be exceeded by up to 2%~~,~~ for a maximum distance of 30m, subject to acceptance by the City Engineer. No accesses are permitted where grades exceed those identified in Table B-1. 2%, for a maximum distance of 30m subject to acceptance by the City Engineer. No accesses are permitted where grades exceed those identified in Table B-1.

Table B-1 Highway Grades

Road Classification	**Maximum Grade**	
	Development Districts 1 & 2	**Development District 3**
Arterial	8%	12%
Collector	9%	12%
Local and Bare Land Strata	12%	*12%*
Cul-de-Sac (entry downhill)	8%	8%
Cul-de-Sac (entry uphill)	10%	10%
Cul-de-Sac (bulbs)	6%	6%
Lane	9%	12%
Walkway and Emergency Access Road	*15%*	*15%*

3.2.3 Minimum longitudinal road grades for all roads is 0.5%. The minimum longitudinal gradient around cul-de-sacs and curb returns shall be 0.80%. The City Engineer may accept reduced road grades if warranted in site specific situations where adequate cross slopes are present that address drainage concerns and do not result in ponding.

3.2.4 Vertical curves shall be provided at all grade changes greater than 1% for Arterial and Collector roads and 2% on all other roads.

3.2.5 Standards cross slopes on roads of all road classifications shall be 2% to 4%. Grades outside this range may be accepted by the City Engineer where necessary to address existing conditions and building elevations. In pre-existing situations and Development District 3, roads may be designed with cross slopes and one way cross falls provided drainage is addressed.

3.3 Horizontal Alignment

Centre Line Radii

3.3.1 All horizontal alignment elements shall be designed in accordance with the “Geometric Design Guide for Canadian Roads” most recent edition as published by TAC based on the road design speeds in 3.1 of this Bylaw, unless otherwise accepted by the City Engineer.

3.3.2 The minimum radius of a curb return at intersections shall be designed to accommodate anticipated vehicle traffic turning movements. Truck turning template design is to be provided to confirm design requirements for all non-passenger vehicle movements. The minimum acceptable curb return radii are:

- 7.5m for Local Roads greater than 7.5m in combined vehicle travel lane width;
- 9.0m for all Local Roads with a combined vehicle travel lane less than 7.5m; and
- 11m for Collector and Arterial Roads.

Double curb returns with coloured concrete aprons between are required at intersections where the difference between passenger and non-passenger vehicle radii exceeds 1m or where the visibility of pedestrians is impacted. This is required to provide better guidance to the general public while not limiting larger vehicle movements.

3.4 Intersections

3.4.1 Intersecting roads are to be designed as close as possible to right angles. The maximum variation permitted is 20 degrees.

3.4.2 The spacing between intersections is to be maximized where possible. A minimum distance of 60m is recommended.

3.4.3 Cross – slopes at intersections shall be designed in accordance with the "Geometric Design Guide for Canadian Roads" most recent edition as published by TAC unless otherwise accepted by the City Engineer.

3.4.4 Roundabouts shall be considered as the first option for intersection designs of Collector – Collector and Collector – Arterial roads. If an intersection other than a roundabout is recommended, documentation must be provided outlining the justification why a roundabout was not selected for the intersection. Roundabout design is to be consistent with the TAC Canadian Roundabout Design Guide. Traffic signals and roundabouts are to be designed by a qualified professional with sealed plans submitted for review and acceptance by the City Engineer.

3.5 Driveways & Access

3.5.1 Each lot created by development must have sufficient road frontage to accommodate construction of a driveway access to Bylaw standards. Access location must conform to that identified in the Zoning Bylaw for each type of land designation. New or modified accesses for development in Development Districts 1 and 2 must be located and designed to optimize safety and minimize the loss of on street parking.

3.5.2 Driveway grades in the boulevard area are to be between 1% and 8%. Access to strata developments, parking lots and multifamily development must be designed utilizing vertical curves where grade changes exceed 2% within the boulevard.

3.5.3 The maximum width of accesses, measured at the back of walk or back of curb where no sidewalk exists, or at edge of pavement for rural section roads, must be minimized. Maximum driveway width, between the edge of pavement and property line, is not to exceed 7.5m. For residential low density development where parking is permitted (on private property) within 6m of the curb or edge of pavement (for rural), the access width must not exceed 7m. Where onsite parking for residential development is greater than 6m from the property line, or onsite parking has an onsite maneuvering aisle, the access width must not exceed 6m.

3.5.4 Commercial and industrial accesses are to be designed based on vehicle turning template. The design must include verification of onsite maneuvering for loading. The design must be submitted to the City Engineer for acceptance. Where the proposed access width exceeds 9.0m additional works are required within the boulevard area to provide better guidance to the general public (refer to 3.3.2). New development with curb and gutters are to provide a letdown or drop curb only at the defined access location. The use of roll over curbing along more than the defined access for new development is not permitted.

3.5.5 At a minimum, there must be sufficient minimum stopping sight distance (MSSD) for a motorist on the road at an intersection with an access to perceive potential conflicts at the access, and to carry out the actions needed to negotiate the potential conflict safely. Verification of adequate sight distance is required for all new accesses or reuse of existing accesses to Collector or Arterial roads. The City Engineer may accept provision of a second access to low and medium density residential lots subject to demonstrated need or to address safety concerns. Acceptance is subject to reduction of the existing access width such that the combined access widths do not exceed 8m. Lane accesses are exempt from this, subject to those lane accesses conforming to requirements in 3.5.6. The City Engineer may accept provision of a second access to medium and high density residential, commercial and industrial lots based on accepted design of internal roads, onsite parking, loading and traffic circulation.

3.5.6 Driveway access spacing from intersections must be maximized. Where an intersection is signalized, accesses are to be located beyond the ultimate left-turn bay for all road classifications, where possible. Driveways within the left turn bay area are to be limited to right in and out. Distances are to be measured between the near gutter line(s) or edge of pavement where no gutter exists. Driveway access locations for commercial corner lots must be no closer than 15m from the intersection of the projected curb faces of that intersection. Driveways are to be designed to intersect the road at right angles within 6m of the curb, back of walk or pavement edge. This section of driveway must have a hardened surface (pavement or concrete). A variation of up to 20 degrees may be accepted subject to verification of adequate sight distances. Direct, individual parking stalls off a lane must have a depth of not less than 7.2m from the property line (off the lane).

3.5.7 Access to Arterial roads as the only, or a primary means of access or egress to development is subject to no other lower classification road access being available to that lot. Access to an Arterial road where Annual Average Daily Traffic (AADT) volumes exceed 5000 must be limited to right in and out movements only or provide a designated turn lane, where supported. Existing agricultural and low density residential lands applying for minor additions to existing buildings are exempted from providing these works.

3.5.8 Access to Collector roads as the only or primary means of access or egress for development is subject to no Local road or lane access being available to that lot. Access to a Collector roads where Annual Average Daily Traffic (AADT) volumes exceed 5000 must be limited to right in and out movements only, where no turn lane exists.

3.5.9 Access to rural roads where a drainage route exists, is subject to provision of ditching along the lot frontage and installation of a culvert at least 450mm in diameter across the driveway, extending a minimum of 1m beyond the toe of slope in each direction.

3.6 Lanes

When corners or T-intersections are unavoidable, additional road dedication and construction at these corners is required based on tracking of the largest anticipated vehicle utilizing the lanes. Additional road dedication required is to be based on truck turning template design or historical evidence at the location where available. Where road dedication would create a non-conformity for an existing building a SROW may be used subject to a road reserve also being registered on the area.

3.7 Cul-de-Sacs

Cul-de-sac roads shall not exceed 200m in length and provide a turn around within 30m of the end. The City Engineer may accept cul-de-sacs up to 400m in length where an emergency access road is provided at the end of the cul-de-sac, subject to provision of a mid point bulb with a turning radius on no less than 11m. Cul-de-sac turnaround bulb design must conform to standard drawing in Schedule O of this Bylaw.

3.8 Emergency Access

Emergency access roads are required in Development District 3 for road extensions more than 300m in length. A gate or removable bollard with a lock is required at both ends of an emergency access to prohibit public vehicle use. Permanent emergency access roads are to be built to lane structure standards with a minimum width of 4m. Road grades are not to exceed 15%. Horizontal

and vertical design must meet or exceed TAC standards for tandem vehicles. Road extensions in excess of 300m that are to be extended further in future, are to provide temporary emergency access (where possible) in advance of the ultimate road network being completed.

Provision of temporary emergency access/egress through connection to existing onsite access roads is required where these structures are available. Temporary emergency access routes are not required to be paved but must provide an all-weather surface and competent road structure.

3.9 Active Transportation Corridor Facilities

Active transportation corridor facilities which promote efficient non-motorized movements of people are required as identified in the Transportation section of the OCP the MTP, and as necessary for new development to provide a connected system. These shall be provided in road ROWs or be protected by a SROW where outside of a road ROW.

Bicycle facilities should be designed as per the following (TAC~~)~~ design guidelines:

- British Columbia Active Transportation Design Guide, (MoTI)
- Bikeway Traffic Control Guidelines for Canada, (TAC)
- Traffic Signal Guidelines for Bicycles, (TAC)
- Geometric Design Guide for Canadian Roads, (TAC)

Bicycle facility design may also be supplemented with the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide and Urban Street Design Guide.

Pedestrian facilities should be designed as per TAC's Geometric Design Guide for Canadian Roads and Pedestrian Crossing Control Guide, the British Columbia Active Transportation Design Guide and supplemented with the NACTO Urban Street Design Guide. Accessibility for those with mobility impairments should be a prime consideration in the design of pedestrian facilities.

3.9.1 Sidewalks

3.9.1.1 Concrete sidewalks shall be provided in the boulevard area of urban section road ROWs as required in the OCP and the MTP for existing roads. Asphalt pedestrian facilities are permitted in Development District 3 as an alternative in low volume areas. Sidewalks shall extend across all accesses and lane intersections giving priority to pedestrians. Sidewalks shall cross fall towards the road at grades between 2% and 4%. Grades in excess of these are only permitted where design is limited by existing building elevations or lot grading and road grades or crossfall cannot changed to accommodate the noted sidewalk grades. Sidewalk

width where obstructions cannot be avoided must provide no less than 1.2m horizontal clear separation.

3.9.1.2 Sidewalks shall be separated as much as possible from the curb on all Arterial and Collector roads. Where Annual Average Daily Traffic (AADT) volumes exceed 5000 a buffer from vehicle traffic is required, where the road ROW width permits. The boulevard area between the back of curb and face of walk shall be a low maintenance finished surface (stamped concrete, asphalt or accepted alternative in urban areas and be consistent with other boulevard treatment in the area).

3.9.1.3 Sidewalk letdowns at accesses, wheelchair ramps and pedestrian crossings shall not exceed 6%. Where existing conditions in developed areas result in grades that would exceed 6% the resulting grades are to be minimized and provided to the City Engineer for review. Widening of sidewalks at letdowns may be required to attain required grades and ensure major storm event routing is contained within the road structure. The elevation requirements at letdowns on major event flow routes is to be confirmed by the project engineer.

3.9.2 Walkways

3.9.2.1 Paved walkways shall be provided in road ROWs as per the MTP and as required in new development to provide connectivity between sidewalk systems and other pedestrian facilities and destinations such as parks, schools or commercial nodes. For infill development, may be used as an alternative to road ROWs where road dedication is impractical or cannot be obtained.

3.9.2.2 Stairs may be utilized in walkways where grades in excess of 12% are unavoidable.

3.9.3 Trails (Class 2 to 4 Trails in the MTP)

Trails shall be provided primarily in road ROWs or SROWs as required in the Transportation section of the OCP and the MTP. For new development areas not defined in the OCP or Neighbourhood Plans the project engineer is required to contact the City Engineer to determine the location for trails.

3.9.4 Multi-use Paths (Class 1 Trails in the MTP)

Paved multi-use paths shall be provided in road ROWs as required in the Transportation section of the OCP and in the MTP.

3.10 Signage and Pavement Marking

3.10.1 Street names shall be assigned by the City of Vernon. Street name signs, traffic signs and pavement markings required as a result of constructing new roads shall be provided by the applicant. Traffic signs and pavement markings must be designed in accordance with the most recent edition of the 'Manual of Uniform Traffic Control Devices for as published by TAC. Where appropriate the British Columbia Manual of Standard Traffic Signs & Pavement Marking most recent edition as published by Ministry of Transportation and Infrastructure may also be used subject to acceptance of this alternate by the City Engineer.

3.10.2 Thermoplastic pavement markings are required for stop bars, pedestrian crossings and any other non-linear markings for all new roads. Stop bars and pedestrian crossing pavement markings as a minimum, are to be provided for all new local roads in low density residential areas unless otherwise required by the City Engineer.

3.11 On Street Parking

On street parking is to be provided as part of road construction as defined in Schedule A of this Bylaw. Design for on street parallel parking is to be consistent with the dimensions for this in the Zoning Bylaw, with the exception of width, which is not to exceed 2.4m. Where an intersection is signalized, on street parking may be located beyond the ultimate left-turn bay. On street parking on Collector roads and Local roads adjacent to commercial or high density development requires provision of dedicated on -street parking lanes and is only permitted until such time as that space is required to add travel lanes. On street parking on existing roads without the provision of a dedicated parking lane is permitted in low and medium density residential areas provided the asphalt width is 7m or greater and where no bus route exists. On bus routes, parking on one side only, with a minimum asphalt width of 8.5m is permitted). In Development District 3 on street parking is not permitted in winter months and signage is required on all new roads identifying this restriction. The location of any proposed additional on street parking in Development District 3 must be accepted by the City Engineer. Where supported, additional on street parking clustered and based on area topography to minimize scarring of hillsides.

3.12 Curbing

Concrete curb and gutter is required for all roads in Development District 1 and Neighbourhood Centres in Development Districts 2 and 3. Asphalt curbing as an alternative to concrete curb and gutter, is permitted adjacent to low and medium density residential development in existing roads in Development Districts 2 and 3 only where existing asphalt curbing is predominate on the fronting road or where no curbs are present. In Development District 2 where blade-face sidewalks exist no additional curbing is required. Upright curbing is

required a minimum of 1.0 m horizontal from obstructions including but not limited to utility poles, vaults, hydrants, streetlights, kiosks, mail boxes, service boxes and tubs.

3.13 Mail Boxes

All mail box locations required by Canada Post must be shown on the engineering drawings. Mail box locations must be accessible for active transportation users. Street lighting must be provided at all mail box locations.

4. HIGHWAY DESIGN CRITERIA:

4.01 Pavement Structure

The pavement structure shall be designed in accordance with “Manual Series MS-1 of the Asphalt Institute” (current edition). The pavement structure shall be designed for a fifteen (15) year design life. Staged construction may be considered in the structural design by the City Engineer when a road is to be constructed and to be widened at a later date.

Roads shall be classified as follows for purposes of structural design of the total pavement structure; design traffic values and minimum depths of hot mix asphalt are defined as well.

TABLE B – 2

Road Classification	**Design Traffic(1) Equivalent Axle Loads (EAL's)**	**Min. Depth of Hot Mix Asphalt (mm)**
Arterial	> 2.8 X 10^5	See Note 2
Collector	2.8 X 10^5	100
Industrial	5.6 X 10^5	100
Residential	2.8 X 10^4	75
Lanes	Not applicable	50
Walkways	Not applicable	50

NOTES: (1) See Chapter IV of MS-1 of the Asphalt Institute.
(2) To be specifically designed, based on projected EAL's, in accordance with MS-1 of the Asphalt Institute.

Soils used to construct the roadway subgrade shall be evaluated in accordance with MS-1 (Chapter V) to determine the load bearing capacity of the subgrade. For this purpose, the California Bearing Ratio (CBR) test value shall be obtained using soil moulded to the minimum specified compaction level. The design CBR values shall be determined in the soaked condition in accordance with Internarial Association for Testing Materials, (ASTM) Des D1883. This value shall be used for structural design purposes. The minimum compacted depth of crushed granular base course, in the total pavement structure, shall be 50 mm.

If the soaked CBR value of the subgrade soil is less than 3, subgrade enhancement shall be provided to create a soaked CBR of 3, and the pavement structure shall be designed using a soaked CBR of 3. Subgrade enhancement shall be provided by placement of an initial layer of granular sub-base of a thickness which has been calculated to provide the necessary structural improvement to the subgrade.

A minimum pavement structure for roads shall be provided, notwithstanding the structural character of the subgrade. Minimum pavement structures are specified in Table B – 3~~5~~, and will be considered structurally adequate when the subgrade soil exhibits a minimum soaked CBR of 6:

TABLE B – 3
MINIMUM PAVEMENT STRUCTURES (FOR SUBGRADE CBR ≥ 6)

Road Construction	Sub-Base (Pit Run) mm	Crushed Granular Based Course(mm)	Hot Mix Asphalt (mm)	
			Surface Course	Lower Course
Arterial	Structural Design shall be project specific.			
Collector	200	50	50	50
Industrial	200	50	50	50
Residential	150	50	75	
Lanes	150	50	50	
Walkways	150	50	50	

5. STANDARD DRAWINGS:

The following City of Vernon Standard Drawings shall form part of this schedule:

Drawing No.	Drawing Description
100-1	Rural Road
100-2	Rural Roads with Barriers
100-3	Typical Lane, Emergency Access
100-4	Cul-de-Sac Bulb, Local Road
100-5	Expanded Corner, Local Road
100-6	Walkway, Stairs and Multi-use Path

SCHEDULE B1 – BYLAW NO. 3843

SUPPLEMENTAL ROAD CONSTRUCTION TO THE MASTER MUNICIPAL SPECIFICATIONS

This Schedule is supplemental to the Master Municipal Specifications, 2009 Platinum Edition Volume II, and is to be applied in conjunction with the Master Municipal Specifications, which otherwise apply to all road works and services constructed with in the City of Vernon.

The provisions of this Schedule B1, Supplement to the Master Municipal Specifications, supplement or supersede the provisions of the Master Municipal Specifications.

Where the provisions of Schedule B1 are in conflict with the Master Municipal

Specifications the provisions of Schedule B1 take precedence.

Section and article numbers in Schedule B1 coincide with those of the Master Municipal Specifications.

INDEX

SEC 31 05 17S AGGREGATES AND GRANULAR MATERIALS

2.1 Materials – General

Add: .3 The physical properties of the materials for granular sub-base and crushed granular base course shall meet the following specifications:

Physical Property	Test Designation	Granular Sub-base	Granular Base
$MgSO_4$ Loss % Course Ag (Max) Fine Ag (Max)	ASTM C88	 20 25	 20 25
Sand Equivalent % (Min)	ASTM D2419	25	35
Plasticity Index % (Max)	ASTM D4318	6.0	6.0
Crushed Particles (one face) % (Min)	MoT I-11 (A)		60
California Bearing Ratio (Soaked) % (Min)	ASTM D1883	20	80

2.7 Granular Pipe Bedding and Surround Material

Replace: .2 Pit run sand as specified in Section 31 05 17 (2.4) may also be used unless otherwise specified by the project engineer and accepted by the City Engineer.

Add: .3 Other permissible materials: Only where shown on design drawings and accepted by the City Engineer shall drain rock or approved native materials be used for bedding and pipe surround.

2.8 Select Granular Sub-base

Replace: .1 Select Granular Sub-base is not acceptable for sub-base gravels

2.10 Granular Base

Replace:.1 To be 25 mm crushed gravel conforming to the following gradations:

Sieve Designation	Percent Passing
25 mm	100
19 mm	80 - 100
9.5 mm	50 - 85
4.75mm	35 - 70
2.36 mm	25 - 50
1.18 mm	15 - 35
0.300 mm	5 - 20
0.075 mm	3 - 8

2.11 Recycled Aggregate Material

Replace: .1 Aggregates containing recycled material may be utilized in sub-base and trench fill if approved by the City Engineer. 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 and asphalt pavement. Other construction and demolition materials such as bricks, plaster, etc. are not acceptable.

Add: .2 Material retained on the 4.75 mm sieve to be not more than 20% recycled material. Minimum size of processed recycled material is to be retained on the 4.75 mm sieve.

Add: . 3 Recycled material and granular sub-base material is to be mechanically blended to produce a homogeneous mixture prior to delivery to site for use in sub-base. Blending on site will only be permitted for use in trench fill.

SEC 31 23 01S EXCAVATING, TRENCHING AND BACKFILLING

3.6 Surface Restoration

.7 Permanent pavement restoration:

Replace: .5 Restore pavement as detailed on MMCD drawing G5. Pavement trench restoration and width of restoration to be as follows:

Add: .1 All asphalt shall be saw cut 500 mm wider and longer than the surface dimensions of the actual trench excavation. This saw cut must extend cleanly through the existing asphalt to the base material prior to asphalt removal.

Add: .2 If the thickness of the existing asphalt is greater than 75 mm, grind it to a depth of 40 mm and a width of 200 mm along the saw cut edge. This can be done just prior to the final asphalt restoration.

Add: .3 Where the edge of the saw cut or milled asphalt, whichever is wider, extends into the travel lane, it should be extended to the mid point of that lane. Where the edge extends past the mid point of the travel lane, it should be extended to the far edge of that travel lane.

Add: .4 Where the edge of the saw cut or milled asphalt, whichever is wider, is less than 1.5 m from the lip of gutter or edge of paved shoulder, it should be extended to the lip of gutter or edge of paved shoulder.

Add: .5 When an area of existing asphalt between two transverse trenches is less than one third (1/3) of the total area of the proposed paving of the two trenches plus the area between them (based on the shortest trench), the existing asphalt shall be removed and the area paved in conjunction with the paving of the two trenches.

Add: .6 Regardless of 7.5.5, if the longitudinal distance between two trenches is less than three (3) meters it shall be removed and the area paved in conjunction with the paving of the two trenches.

Add: .7 Longitudinal trenches must be paved with a paving machine.

Add: .8 Hot-mix paving shall meet the thickness of the existing pavement or that shown on the design drawings, whichever is greater. If the thickness of the hot-mix paving is 75 mm or less, it shall be placed in one lift. If the thickness of the hot-mix paving is greater than 75 mm it shall be placed in two lifts as shown on Drawing SS-G5.

Add: .9 Vertical faces and the surface of the bottom lift of asphalt must be painted with bituminous material prior to hot mix paving.

SEC 31 24 13S ROADWAY EXCAVATION, EMBANKMENT AND COMPACTION

3.3 Inspection of Native Surface

Add .2 Top 150 mm of Native Surface to be scarified, moisture conditioned to optimum moisture content and compacted to a minimum of 95% of Modified Proctor density in compliance with ASTM D1557, before placing of embankment or sub-base material

SEC 32 11 16.1S GRANULAR SUB-BASE

2.0 Products

Replace 2.1.1 Material for Road sub-base to be 75mm minus crushed gravel

SEC 32 11 23S GRANULAR BASE

2.0 Products

Replace 2.1.1 Material for Road base to be 25mm minus crushed gravel as per supplementary specification 31 05 17S

SEC 32 12 16S HOT MIX ASPHALT CONCRETE PAVING

2.0 PRODUCTS
2.1 Materials

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

Replace: .3.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117.

Table 2.1.3.2
Hot Mix Asphalt Aggregate Gradation Specification

Sieve Designation	Percent Passing	
	Lower Course	Surface Course
25 mm	100	-
19 mm	80-100	100
12.5 mm	-	84-95
9.5 mm	50-84	73-90
4.75 mm	25-55	50-75
2.36 mm	20-45	35-57
1.18 mm	15-35	25-45
0.600 mm	-	18-34
0.300 mm	5-20	10-26
0.150 mm	-	6-17
0.075 mm	3-7	3-7

Replace: .3.6 Sand Equivalent: to ASTM D2419. Min: 50 (New Arterial), Min: 40 (All other street classifications).

Replace: .3.10 Lightweight particles: to ASTM C123. Maximum % by mass less than 1.95 relative density:

.1 Surface course: 1.0
.2 Lower course: 1.5

Replace: .3.11 Flat and elongated particles: (with length to thickness ratio greater that 5): Maximum % by mass:

.1 Coarse aggregate, surface course: 10
.2 Coarse aggregate, lower course: 10

Replace: .3.12 Crushed Particles (fraction retained on 4.75 mm sieve), 2 faces, % minimum:

.1 New arterial streets: 85
.2 All other street classifications: 70

2.2 Mix Design

Replace: .1 The Contractor, at their cost, must retain an independent testing consultant to perform trial mix designs and to submit the job mix formula. The trial mix design must be performed in accordance with ASTM D1559 (75 blows per face) and must include five (5) separate trial values of asphalt content. Contractor must pay for trial mix designs and submissions.

Replace: .2 Mixes for construction of asphalt lower course may contain up to 20% of RAP, provided that the properties of RAP material are considered in the trail mix design. Submissions for RAP mixes must contain all data relevant to RAP utilized in the mix design.

Replace: .3 Design of Mix: Include the following data with the trial mix design submission:

.1 Aggregate bulk specific gravity and water absorption.
.2 Sand equivalent values.
.3 Asphalt cement properties including mixing and compaction temperatures, based on temperature viscosity properties of asphalt cement.
.4 Aggregate gradations and blending proportions.
.5 Maximum theoretical density of trial mixes.
.6 Asphalt absorption values.
.7 Mix physical requirements to meet Table 2.2.3 below.
.8 Do not change job-mix without prior acceptance from City Engineer. Should change in material source be proposed, new job-mix formula to be submitted to the City Engineer for review.

Table 2.2.3
Specified Physical Requirements of Hot Mix Asphalt

Property	Mix Type	
	Lower Course (1)	Surface Course
Stability @ 60°C, kN (min)	8.0	9.0
Flow Index, 0.25 mm units	8-14	8-14
Voids in Mineral Aggregate % (min)	12.0	14.0
Air Voids, % (2)	3-6	3-5
Index of Retained Stability after Immersion in Water for 24 hrs @ 60°C, % (min)	75	85

Notes: (1) If lower course mix is used in staged construction, i.e. exposed for at least one winter, specified properties for surface course mix must apply.
(2) Percent air voids in compacted trial mixes must be determined in accordance with ASTM D3203, with asphalt cement absorbed into the aggregate compensated for in the calculation.

3.0 EXECUTION

3.1 Plant and Mixing Requirements

.1 Batch and continuous mixing plants:

Replace: .3 Before mixing, dry aggregates to a moisture content not greater than 1% by mass or to a lesser moisture content if required to meet mix design requirements.

.9 Where RAP is to be incorporated into the mix:

Replace: .3 RAP must not be fed through the aggregate dryer system.

.11 Mixing time:

Add: .3 Mixing period and temperature to produce a uniform mixture in which particulates are thoroughly coated, and moisture content of material as it leaves mixer to be less than 0.2%.

.4 Mixing Tolerances:

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

.1	4.75 mm and larger	+ 4.5
.2	2.36 and 1.18 mm	+ 4.0
.3	0.600 mm	+ 3.5
.4	0.300 mm	+ 2.5
.5	0.150 mm	+ 1.5
.6	0.075 mm	+ 1.0”

3.2 Equipment

Add to .1: Pavers must be capable of placing a standard mat width not less than 3 m and must be capable of paving wider widths in 150 mm and 300 mm increments by means of equipment supplied by the manufacturer of the equipment. The screed must include a tamping bar or strike-off device.

.2 Control of the screed must be by automatic sensing devices. Longitudinal control must be by a sensor that follows a string-line, ski or other reference. The grade sensor must be movable and mounts provided so that grade control can be established on either side of the paver. A slope control sensor must be provided to maintain the proper transverse slope of the screed.

3.6 Compaction

.2 General:

Replace: .1 Provide sufficient compaction equipment to ensure that the compaction rate meets or exceeds the placement rate and to ensure that specified density is achieved before the temperature of the mat falls below 100C.

3.7 Joints

.1 General:

Add: .4 When placing final pavement layer against concrete curbing, compacted pavement must meet the gutter at the same elevation or a maximum of 10 mm above and along the entire lip of the gutter unless reverse grade gutter is specified.

Add the following Sub-Sections:

4.0 COMPLIANCE WITH SPECIFICATIONS AND PAYMENT ADJUSTMENT FOR NON-COMPLIANCE

4.1 Hot Mix Asphalt Concrete

.1 A Marshall analysis will be performed from a sample obtained at the paving site on a frequency of one analysis per day, with at least one analysis required per project or 700 tonnes of asphalt.

.2 When analysis identifies non-conformance with specified properties, the Contractor must immediately initiate remedial measures, and submit, at its expense, evidence that compliance exists with the approved mix design. Failure to do so will result in suspension of plant mixing operations.

.3 In no case will a pavement structure be acceptable if the service life of the pavement structure is less than 15 years as confirmed and certified by the project geotechnical engineer. Failure to meet a service life of less than 15 years will require replacement of the asphalt surfaces.

4. Non-conformance to asphalt specifications are subject to penalties, as further outlined. Penalties as calculated are payable to the City of Vernon as a condition of acceptance of the project. Such acceptance does not relieve the contractor of maintenance responsibilities through the 1 year maintenance period

4.2 Aggregate Gradation

.1 When the aggregate fails to comply with tolerances set forth in Section 3.1.4.1 of this specification, the project engineer will initiate the following action:

.1 When two (2) consecutive gradation analyses identify non-compliance with the specified tolerances, the contractor must be served notice and a third test will be initiated.

.2 If continued non-compliance is indicated from the third test, the Contractor must suspend production. It must not commence construction again until it has demonstrated that corrective action has been taken and that the aggregate gradation is within the specified tolerance limits.

4.3 Asphalt Cement

.1 Payment adjustment for non-compliance with the tolerance specified:

Asphalt Content Deviation from Design %	Payment Adjustment Factor
0.30 OR LESS	0.00
0.31 TO 0.40	0.20
0.41 TO 0.50	0.75
0.50 OR GREATER	Remove and replace

.2 Adjustment for asphalt cement content non-compliance to the amount payable for Hot Mix Asphalt Paving equals the unit bid price times the payment adjustment factor times the quantity to which the factor is to be applied, i.e.:

$$A_c = P\,(F_c)\,(Q_n)$$

where:

A_c = Adjustment for asphalt cement content non-compliance
P = Unit bid price
Fc = Payment Adjustment Factor for Asphalt Cement Content non-compliance
Qn = Asphalt measured for payment which was produced during the production period to which a test applies

4.4 Pavement Thickness

.1 Pavement of any type found to be deficient in thickness by more than 10 mm must be removed and replaced by pavement, of specified thickness, at the contractor's expense.

.2 Pavement of any type found to be deficient by less than 10 percent of its specified compacted thickness will not be subject to payment adjustment for thickness noncompliance.

.3 Pavement of any type found to be deficient in thickness by more than 10 percent of its specified thickness but not more than 10 mm shall give rise to an adjustment in the amount to be paid to the Contractor. The adjustment shall be subtracted from the amount otherwise payable to the Contractor, and the amount of the adjustment will be paid to the City. The adjustment shall be calculated as follows:

$$A_t = \frac{T_d \times P \times Q_t}{T_s}$$

where:

A_t = Adjustment for thickness deficiency
T_d =Deficiency in thickness measured in mm and being greater than 10% of specified thickness but not greater than 10 mm.
T_s = Specified thickness in mm.
Q_t =Asphalt measured for payment lying within a unit of work area defined in 5.2.2, where the thickness deficiency has been identified.
P = Unit Bid Price.
NOTE:No allowance will be made for the tolerance provided for in Section 4.4.2.

.4 The adjusted price will be applied to all asphalt measured for payment which lies within a unit of work area defined in 5.2.2 where the thickness deficiency had been identified, or to such lesser area as may be defined in accordance with the provisions of 5.2.2.

4.5 Density

.1 The minimum specified density for acceptance, without payment adjustment, must be 97% of the 75 blow Marshall density as most recently determined by the appointed testing agency.

.2 Payment adjustment for density non-compliance will be as follows:

DENSITY (% OF 75 BLOW MARSHALL)	PAYMENT ADJUSTMENT FACTOR
97 and greater	0.0
95.0 to 96.9	As per Density Payment Adjustment Factor Chart (see Standard Drawing SS-R24)
Less than 95.0	No Payment (subject to removal and replacement after review by the Engineer)

Adjustment for density specification non-compliance shall be determined as follows:

$A_D = P (F_D) (Q_{nD})$

where:

A_D = Adjustment for density non-compliance
P = Unit Bid Price for Hot Mix Asphalt Cement paving
F_D = Payment Adjustment Factor for density non-compliance
Q_{nD} = Asphalt measured for payment within a unit of test area as defined in 5.3.

4.6 Adjusted Payments

.1 The total adjustment arising from pavement deficiencies identified in the foregoing shall be determined as follows:

$$A_r = A_c + A_t + A_D$$

where:

A_r = Total Adjustment
A_c = Adjustment for asphalt cement content non-compliance
A_t = Adjustment for thickness deficiency
A_D = Adjustment for density non-compliance

The total adjustment (A_r) shall be paid to the City.

5.0 TESTING FREQUENCY AND PROCEDURES

5.1 Aggregate Gradation and Asphalt Cement Content

.1 One test per production period as defined in Section 4.1.1. Asphalt content shall be determined in accordance with ASTM D2172 or D6307. Gradation analysis of extracted aggregate shall be performed in accordance with ASTM C136 and C117.

5.2 Thickness

.1 The actual pavement thickness, for each unit of work area, will be determined on the basis of the average thickness of three (3) cores. The cores shall be spaced at intervals of 150m of paved lane width or less. If the deficiency of any individual core exceeds 10mm, three (3) additional cores may be extracted in proximity to the location of the core of excessive deficiency, to identify the extremities of the pavement area to be removed and replaced. The contractor will initiate and pay for such additional coring.

.2 A unit of work area is defined as1,500 m^2 or fraction thereof, representing pavement placed in an individual placement day.

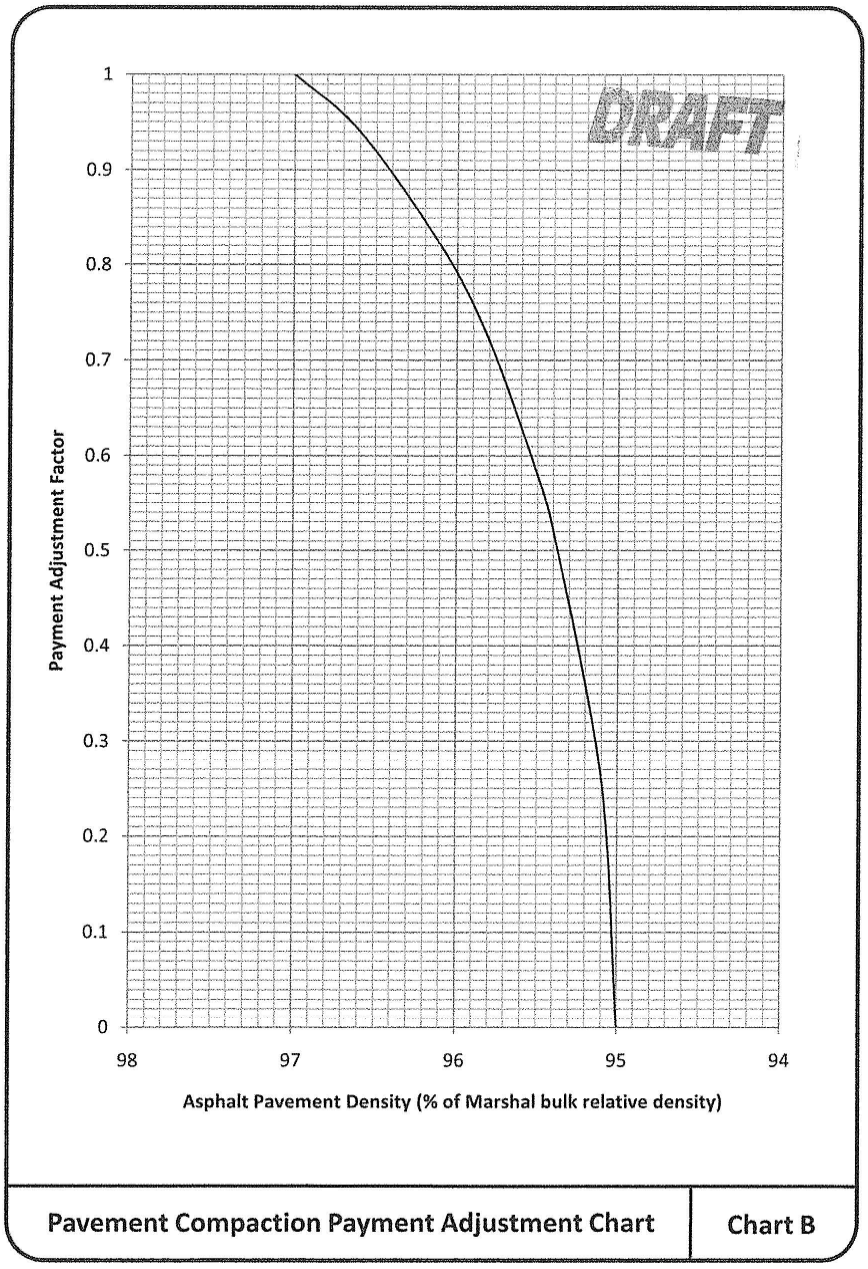
.3 Sampling and testing for thickness determination shall be in accordance with ASTM D3549.

5.3 Density

.1 Density of compacted pavement shall be determined on the basis of tests of core samples taken at a maximum interval of 150 m of paved lane width. A test area shall be that area lying between longitudinal joints and between transverse lines located midway between test cores or between such transverse lines and the beginning or end of placement.

.2 With prior approval of the City Engineer, the in situ density of a compacted layer of pavement may also be determined by nuclear methods in accordance with ASTM D 2950. Spacing of tests shall be as stated above, and tests shall be taken in the vicinity of the core samples extracted for testing of the thickness of the pavement layer. In a situation where the in situ density of the lift does not meet

specification, according to D 2950, then the density of the extracted cores shall be determined and will take precedent over the in situ density. Where the specified compaction has not been met, as confirmed by the direct measurement of the core, then an additional three cores shall be taken in the immediate area and the average of the three cores shall be used.



Pavement Compaction Payment Adjustment Chart | **Chart B**