

**Technical Circular T-01/07**

Date: February 14, 2007

Revised: December 18, 2007

Revised December 30, 2009

To: All HQ Directors: Operations, Planning and Major Projects  
All Regional Directors  
All District Managers Transportation  
All Project Managers  
All Regional Paving Managers  
All Regional Geotechnical Managers  
All Field Service Managers etc

**Re: Contract Preparation Guidelines for End Product Specifications Paving**

**SUBJECT:** Paving Contract Preparation Guidelines

**PURPOSE:** To assist in the preparation of paving contracts and to maintain consistency and uniformity on Ministry paving contracts. This in turn will assist Contractors in their tendering and performance of the work.

**BACKGROUND:** Previous Technical Circular T-04/01 (2001) set contract preparation guidelines and requirements for standardizing paving contracts for Hot in Place and Hot Mix Asphalt paving projects.

This Technical Circular T-01/07 (Feb 14, 2007) replaced T-04/01 (2001).

T circular T-01/07 (Revised December 18, 2007) is revised with T circular T-01/07 (Revised December 30, 2009)

**REQUIREMENTS:** In the preparation of all Ministry paving contracts, please use the attached "Contract Preparation Guidelines for EPS Paving."

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Attachment

# **CONTRACT PREPARATION GUIDELINES FOR END PRODUCT SPECIFICATION PAVING**

**for Regional and District Staff**

**SS 502: HOT MIX ASPHALT  
and  
SS 515: HOT IN-PLACE RECYCLING**



Prepared by Field Services

Revised by Geotechnical, Materials and Pavement Engineering

December 30, 2009

(Replaces - December 15, 2007)

# Contract Preparation Guidelines for EPS Paving

## SS 502 – Hot Mix Asphalt Paving and SS 515 – Hot In-Place Recycling Paving

### 1.0 Introduction

This document establishes thresholds for the application of End Product Specification bonus/penalty provisions for Hot Mix Asphalt Paving and Hot In-Place Recycling Paving.

Generally for contracts with total asphalt mix quantities (inclusive of level course, bottom and top lifts) of:

- < 5,000 t), no bonus/penalty provisions will apply other than in special circumstances; and
- $\geq$  5,000 t, all bonus/penalty provisions apply.

These thresholds have been mutually agreed between the Ministry and the BC Road Builders and Heavy Construction Association, Paving Sector representatives.

In special circumstances, senior Ministry managers identified herein may authorize exceptions to the above.

### 2.0 Background

End Product Specifications for Hot Mix Asphalt Paving are specifications that set out the final engineering characteristics of pavement on the road. The Ministry's objective is to enhance finished product paving quality through the provision of bonuses and by penalizing poor work. This is accomplished by paying the contractor a bid unit price for pavement but also and importantly providing the contractor a bonus for performing high quality work or assessing a penalty for low quality work. The contractor must still meet minimum quality standards to receive payment for the work but the specifications are intended to provide the contractor with incentives to strive and accomplish excellent quality.

End Product Specifications require that the contractor is responsible for the quality of the product on the road. To achieve this, the contractor is responsible for the material mix design, the materials selection, the quality control testing and all of the workmanship employed during paving. The Ministry is responsible for material quality assurance for acceptance and payment.

When using End Product Specifications, the Ministry reviews the product after paving by testing the materials placed on the road. This specification is different than method specifications, which the Ministry has used for many years. Method specifications emphasize the techniques or methods employed by the contractor rather than the quality of the product placed on the road. The contractor is no longer directed how to construct the pavement.

As stated above, the End Product Specifications provide bonuses for excellent quality work. If the product achieves an acceptable level of quality, the contractor will receive the bid unit price for paving. If a higher level of quality is produced, the contractor will receive the bid unit price plus a bonus or pay adjustment on top of the bid unit price for the material. The bonuses are designed to emphasize the most important pavement characteristics, which are the following:

- pavement density;
- smoothness;
- material gradation;
- asphalt content;

- segregation; and
- material application rate (pavement thickness).

It has been established that a pavement will last longer if dense and smooth; made and laid with good materials, consistent aggregate gradation, sufficient asphalt contents and product thickness.

The bonuses paid to the contractor will provide the incentive to achieve this high quality, long lasting pavement and the Ministry will benefit by not having to rehabilitate these pavements as often.

In many instances, and particularly on small contracts, the costs associated with tracking compliance with an EPS characteristic are higher than the benefits achievable or the likelihood of being able to excel is very limited. In such cases it is recommended that the bonus/penalty payments (but not the rejection limits) for select EPS characteristics be waived, which will result in more reasonable Unit Prices for the Work.

Note: Even though SS 508 Graded Aggregate Seal Coat is an end product specification, there is no bonus/penalty structure for seal coating.

### 3.0 Guidelines for Ministry Regional and District Staff involved with the Preparation of Paving Contracts.

#### 3.1 General

For each of the specific cases discussed in this document, Special Provisions must be drafted to invoke or waive the various bonus/penalty provisions for each EPS characteristic.

***In virtually all cases, the rejection limits for any EPS characteristic shall continue to apply. The guidelines in this document relate to waiving only the bonus/penalty payments for select aspects of EPS paving.***

A Special Provision addressing the issue follows:

*“Notwithstanding any other provision of the Contract, including full or partial waivers of EPS payments adjustments for any or all of the six rated characteristics (density, smoothness, AC content, gradation, application rate, and segregation), the rejection limits for each and every characteristic will apply to the Work.”*

#### 3.2 Superpave

Due to the high costs of aggregate production and testing of Superpave mixes, they are not normally used on small projects.

However, where local asphalt plants have an established record of producing quality Superpave mixes, they can be beneficially used in paving intersections and approaches.

Where Superpave is specified, the payment adjustments guidelines are the same as for conventional Marshall mixes.

#### 3.3 Crushing

Crushing and paving should be one contract, since the contractor is responsible for all aspects of paving construction including the materials selection and job mix design.

Existing Ministry stockpiles should not be used as that will potential transfer a significant portion of the liability for the characteristics of the mix back to the Ministry.

Where Ministry stockpiles are used, all QC data from production should be made available to bidders as a “Contract Specific Reference Document”.

Special Provisions should indicate that anyone who samples the stockpiles are to report any out-of-specification findings to the Ministry Contact or Ministry Representative immediately.

### **3.4 Contract Advice and Contract Document Preparation Assistance**

It is recommended that Regional or District staff involved with the preparation of a paving contract contact Field Services paving personnel.

The Field Services Paving Managers can review the site, project scope, project constructability and the applicability of specific End Product Specification clauses, and provide advice as to how the End Product Specifications should be applied to the specific project site conditions.

The Field Services Paving Manager can also offer assistance with special provision writing, and preparation or review of the contract documents and may direct the Project Manager to other Ministry staff such as Paving Project Supervisors or Regional Paving Managers for additional advice and support.

The Sample Special Provisions (found at the link below) contain a number of standard clauses that can assist users in drafting contracts, but should not be considered a full substitute for consulting with a Field Services Manager.

[http://www.th.gov.bc.ca/publications/const\\_maint/contract\\_serv/contract\\_services.htm](http://www.th.gov.bc.ca/publications/const_maint/contract_serv/contract_services.htm)

## **4.0 Guidelines for Small Projects (Less than 5,000 tonnes)**

Generally, for projects under 5,000 tonnes, there will be no bonus or penalty payments adjustments provided in the contract.

The Contractor must meet or exceed the minimum quality requirements as stated in SS 502, however the bonus/penalty payment adjustments will not apply.

The Contractor shall be responsible to provide a complete mix design for each asphalt mix specified but, for pits which have a history of successful use in asphalt pavements, the Contractor may use a previously proven mix design appropriate to the gradation of the asphalt mix aggregate currently produced.

The Contractor shall also be responsible to take samples in accordance with contract quality management provisions and to provide those samples to the Ministry Representative. Samples will not normally be tested, but if, in the opinion of the Ministry Representative, there is any doubt that the mix meets contract specifications, the samples will be tested and the results used to determine whether the mix is to be accepted or rejected.

Special circumstances are to be discussed with a Field Services Paving Manager, Regional Paving Manager, or the Chief Geotechnical, Material & Pavement Engineer who may authorize application of the bonus/penalty structure on small projects.

## **5.0 Guidelines for Large Projects (Over 5,000 t)**

Large projects are generally considered to be continuous highway paving and usually all aspects of End Product Specifications apply (except that, per the Standard Specifications, Smoothness and Segregation bonus/penalty provisions apply to top lift only).

Where the character of the project or portion thereof is substantially the same as one of the elements identified as follows:

### **5.1 Mill and Fill without an Overlay**

- Application Rate may not be applicable as existing rutting or project design may not lend itself to paving at a consistent thickness.

- For Smoothness, use Table 502-J-2, as only a single lift of pavement is being laid.

## 5.2 Curb and Gutter

Paving adjacent to C&G is difficult as you must match the gutter elevations and handwork is extensive

- Apply Density, Aggregate Gradation and Asphalt Content.
- Smoothness (Table 502-J) may be optional. Use Smoothness if paving is consistent with long runs with few utility covers. Generally Smoothness is measured only for pavement runs over 1 km in length.
- Do not apply Application Rate.
- Only use Segregation in areas away from intersections.

## 5.3 Intersections, Tapers, Acceleration and Deceleration Lanes

- Application Rate would not be applicable to most of these areas of paving contained within a large project, since it is difficult to obtain a consistent thickness and smoothness in intersections due to the typically poor initial smoothness and initial inconsistent thickness. On large continuous paving contracts, the main highway driving lanes through most intersections would still have all EPS applied.
- Apply payment adjustments for Density, Aggregate Gradation, and Asphalt Content.
- Do not apply payment adjustments for Application Rate, Segregation, or Smoothness.

## 5.4 Discontinuous Paving, (i.e. for several areas of paving or several side roads, and for areas less than 1 kilometre)

Short sections make it very difficult to establish consistent paving practices, making the workmanship characteristics difficult to achieve.

- Apply Density, Aggregate Gradation, and Asphalt Content
- For Smoothness, apply Table 502-J or provide project-specific criteria.
- Do not apply Application Rate or Segregation.

## 5.5 Additional Lanes (Such as Passing Lanes)

Similar to Curb &Gutter, paving an additional lane may be difficult as you must match the existing lane edge profile.

- Apply Density, Asphalt Content, Aggregate Gradation, and Segregation.
- For Smoothness, apply Table 502-J or provide project-specific criteria. If the existing road is rough or undulating, Smoothness may be waived.
- Do not apply Application Rate.

## 5.6 Other Considerations in Exceptional Circumstances:

### 5.6.1 Safety Projects such as Shoulder Widening and Guardrail Placement

These are projects of very limited scope, where there are no traffic loading normally anticipated, no opportunity to develop consistent paving practices, and the potential for a significant amount of handwork.

- Apply Aggregate Gradation and Asphalt Content. Only a review of the Quality Control data supplied by the contractor may be required.
- Do not apply Application Rate, Density, Smoothness, or Segregation.
- In only this specific project application, the reject limits may also be waived.

### 5.6.2 Bridge Approaches

Paving distances are typically very short, preventing consistent workmanship practices.

For short approaches <100 m:

- Apply Density, Aggregate Gradation, Segregation and Asphalt Content.
- Do not apply Smoothness or Application rate.

Project Managers and contract authors should ensure adequate level course (project specific) and contract quantities are included, consistent with the estimating practices identified in Section 9.00 following, to ensure sufficient mix is available to achieve smoothness and an acceptable minimum thickness while meeting the overall application rate.

## 6.0 Guidelines for Hot In Place Recycling Contract Specifications

Hot In-Place Recycling projects only attract bonus/penalty payments for Density and Smoothness. These projects typically involve paving of large sections on mainline highways and as such all aspects of SS 515 would apply.

Exception can be made for narrow or curvilinear roads where Smoothness may not apply. The Regional Paving Manager or Field Services Paving Manager can offer advice and contract document preparation.

## 7.0 Use of RAP (Recycled Asphalt Pavement) in Asphalt Mixes

RAP has a residual value requiring analysis before employing into a virgin mix design.

The properties and amount of the RAP needs to be examined prior to its use in a HMA design.

Research shows that properties of the asphalt binder can be significantly affected when RAP content exceeds 20%.

In those mix designs (RAP>20%), a softer PG Binder is suggested to offset the RAP's aged binder. Percentage of RAP based on Ministry and other jurisdictions results and performance of RAP mix design results.

(see "NCHRP Report 452 Recommended Use of Reclaimed Asphalt Pavement in the Superpave Mix Design Method: Technician's Manual" TRB 2001; "Determination of Usable Residual Asphalt Binder in RAP" Illinois Center for Transportation 2009; and "2008 Ontario Survey Results" Ministry Transportation Ontario 2008 for more information)

Regional Paving Managers have the final determination for the % amount of RAP allowed in an asphalt mix design up to the maximum specified limits noted below through the Special Provisions of the Contract.

Some examples of identified routes as follows:

### 1. Freeways, Primary Highways, and High Volume Secondary Highways:

i.e. Hwy. #1, #5, some sections of #7, #17, #97, #99

Top Lift	-	0%
Bottom Lift	-	30%

## 2. Lower Volume Secondary Highways:

i.e. Lower Volume #3A, #3B, #4, #5A #19, #28,- some sections of Hwy. #3, #16, #97,

Top Lift	-	10%
Bottom Lift	-	30%

## 3. Low Volume Roads:

i.e. Secondary, Hwy. #8, #14, #23, #37

Top Lift	-	30%
Bottom Lift	-	100%

## 4. Secondary Roads

100% on side roads when cold millings are placed

Contractor's development and processing of RAP into an end paving product must ultimately meet SS 502 EPS for Highway Construction. A Contractor should be employing methods that fractionalizes the RAP into aggregate gradients that can be added to the asphalt mixing plant to meet the required specifications.

## 8.0 Consistency in Paving Contracts

### 8.1 Technical Circular T-04/01

Tech Circular T-04/01 was issued in 2001 to provide consistent estimating and payment practices in Paving contracts, based upon an agreement made with the BC Road Builders Paving sector. Tech Circular T-04/01 is now obsolete, with provisions updated and incorporated into this revision and subsequent revisions.

### 8.2 Order of Items

Mobilization will normally be the first item on the Schedule of Approximate Quantities and Unit prices.

Paving Items to follow in sequential order of logical construction and application for the work.

### 8.3 Milling

Milling will be paid for by Unit Price for each m<sup>2</sup> with the depth specified in Special Provisions (typically 50 mm per pass) as follows:

- Placement of cold Pavement Millings will be incidental and specified as either surfacing on side roads, or cold in a stockpile;
- When Recycled Asphalt Product (RAP) is incorporated into the asphalt mix, the mix will be paid for as asphalt mix with RAP by the tonne. Ministry will determine the percentage of RAP to be added to the virgin asphalt mix; and
- Full 100% RAP at low temperature from a plant will be paid for as a separate unit item by the tonne.

### 8.4 Prime Coat and Tack Coat

Prime and tack coat will be paid for as follows:

- Supply for each will be a separate unit item by the litre prior to dilution; and
- Spray for each will be a separate unit item by the litre of material actually sprayed through the distributor with dilution rates provided by the Ministry;

Additional requirements are:

- limiting distance for application ahead of the paver will be project specific; and
- supply and placement of blinding sand and inversion of the prime will be specified in the Special Provisions. These are paid for as a Unit Price Item or by Provisional Sum.

### **8.5 Mix Quantities**

- For routine Paving Rehabilitation Projects use length x width x depth and add 10%;
- For grading and routine Mill and Fill Projects use length x width x depth and add 5%;
- Use tonnes for estimated Asphalt Mix Quantities on the Schedule of Approximate Quantities and Unit Prices;
- Use 60 kg per square meter per 25 mm of thickness to obtain quantities;
- Use the same asphalt quantity for the crushed paving aggregate; and
- Paving Aggregate payment to be prorated as material produced up to the calculation as set out in the Standard Specifications for Highway Construction.

### **8.6 Additives**

When specified, additives such as cyclogen and magnesium chloride (MgCl) will be paid for by Unit Prices and by the litre for liquids. Application rates to be determined by Ministry.

Anti-strip additives are covered by a “Sample Special Provision” and will be incorporated in an upcoming refresh of SS 502.

### **8.7 Shouldering**

Shouldering (supply, haul, and place) will be a Unit Price Item for the supply and placement of the Shouldering Aggregate, paid inclusive of watering:

- by the tonne for paving projects; or
- by neat line m<sup>3</sup> for grading projects (where the Contractor is also responsible for constructing the base below the shouldering to specified tolerances).

This is a combination of the old “Shouldering Aggregate” and “Shouldering Work” items.

### **8.8 Estimating the Provision Sum for EPS Payment Adjustments**

EPS paving contracts have bonus/penalty adjustments, based on the quality of the Contractors’ work, which are paid under a Provisional Sum Item “Allowance for Payment Adjustments, SS 5xx”. Adjustments vary between SS 502 and SS 515.

The amount of money to set aside depends on the likelihood of successfully producing a quality product, and is usually between 80 - 90% of the maximum achievable. The local Field Services Manager can help determine what value is appropriate for a project.

**Example:** 10.0 km of two-lane road with a single 50 mm, 8.0 m wide overlay, 9,600 t.

<b>Element</b>	<b>Quantity</b>	<b>Max. Bonus (per SS 502)</b>	<b>100%</b>
AC content	9,600 t	\$0.50/t	\$4,800
Application rate	9,600 t	\$0.50/t	\$4,800
Density	9,600 t	\$1.00/t	\$9,600
Gradation	9,600 t	\$0.75/t	\$7,200
Segregation	20.0 lane-km	\$1,000 per lane-km	\$20,000
Smoothness	20.0 lane-km	\$2,000 per lane-km	\$40,000
<b>P.S. Value</b>			<b>\$86,400 At 90% \$77,800</b>

**8.9 Saw Cutting Thickness**

Estimate the linear length (m) at an average cutting depth to meet the saw cutting requirements.

**8.10 Pavement Removal Thickness**

Estimated quantity based on overall area and estimated depth. Actual quantity as agreed upon.

**8.11 Paving Quantities for Neat Line Items**

Add 5% for quantity estimate for neat line items.

**8.12 Variations**

Variations to the above may be necessary for project specifics and deviations should be highlighted in Special Provisions. Consult with a Manager, Field Services or Regional Paving Manager beforehand.

**9.0 Contacts**

A complete list of Field Services contacts, including Managers and Project Supervisors can be found on the Ministry of Transportation Intranet only (sorry, not available on the Internet) at:

<http://gww.th.gov.bc.ca/gwwr2/Content/Field%20Services/Contacts/fscrows.xls>

For external users, you can browse the BC Government on-line directory.

<http://www.dir.gov.bc.ca/>

Or click the following link to display the list for Field Services management.

<http://www.dir.gov.bc.ca/gtds.cgi?show=Branch&organizationCode=TRAN&organizationalUnitCode=FIELDSE>

These ***Contract Preparation Guidelines for EPS Paving Projects*** are available on-line at:

<http://www.th.gov.bc.ca/publications/Circulars/lister.asp?set=Current&circ=T&year=2007>