ALBERTA TRANSPORTATION GUIDELINES FOR THE ASSESSMENT, RATING AND PRIORIZATION OF PAVEMENTS FOR SEAL COAT

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TRANSPORTATION

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INTRODUCTION

The purpose of this document is to present relevant background information and to provide guidelines for using the seal coat rating system. This system is normally used to establish needs for chip seal coats on Primary Highways.

Alberta Transportation primarily uses seal coats to repair surface deficiencies, to protect the surface and prevent water ingression. Pavements that are good candidates for a seal coat exhibit surface characteristics that could to lead to ravelling, stripping, potholes and structural failures if left unprotected. Projects that are considered as high priority have pavement surfaces already showing signs of these problems occurring to some degree.

In order for Alberta Transportation to develop, an annual seal coat program within the framework of a limited budget, a system has been developed to establish priorities, objectively on a Regional and Province wide basis.

BACKGROUND

Seal coats have been applied to paved roadways in Alberta since 1941. Commencing in 1959, a planned seal coat program was developed each year as the final phase of pavement construction, and until the mid 1980's pavements were routinely seal coated within a few years of being paved. In the 1980's the Departments budgetary capacity for seal coat construction was approximately 1500 lane kilometres annually and since the early 1990's, this capacity has significantly reduced. No longer are funds available to seal coat all pavements and thus, it is very important to select only those that are in real need, to extend the life of the pavement.

Prior to the 1990's the preparation of the seal coat program consisted of assessing the needs and priorities based on structural adequacy of the pavement, surface condition, age of pavement and traffic volume. An expert within the Department was relied upon to use his best judgement to rank the various candidate projects for programming purposes.
A more scientific approach was developed in the early 1990's using a computerized Expert System known as SECOA (Seal Coat Adviser).

This system incorporated the Department expert's judgement as to which attributes of the pavement should be input as well as the relative importance of each with regard to rating and ranking projects, based on the need for seal coat. The weighting factors applied to each attribute were adjusted until there was close agreement between the system's priority list and the independently developed list of the Department expert. The SECOA system included 11 attributes which were judged for each candidate project. Two of the attributes were traffic volume and pavement age, the other 9 related to pavement condition. Site inspections were carried out to assess the various pavement condition attributes and severity levels for each and a rating form with all relevant information completed and submitted for processing. With all required information input, the Expert System calculated a total score for each candidate project which enabled a priority list to be prepared with the projects having the highest total score ranking highest on the priority list.

In 1995 the seal coat rating system was re-evaluated and several modifications and improvements were made.

CURRENT RATING SYSTEM

The latest system in place for rating potential seal coat projects is a relatively simple one, that does not require computer processing. It is based on the original SECOA system concept, incorporating the changes made in 1995. This new system involves the assessment of 7 attributes, 5 of which relate to pavement condition.

GUIDELINES FOR SEAL COAT RATING AND PRIORIZATION

Regional offices of Alberta Transportation and Utilities will provide a list of pavement projects to be considered as candidates for the seal coat program. Each of these projects are to be inspected, rated and evaluated to determine a total score and ranking on the priority list.

The following attachments are to be used:
1)   Explanatory Notes
2)   Rating Sheet (Sheet 'A')
3)   Weighting Factors (Table 1)
4)   Scoring Sheet (Sheet 'B')
Each project should be inspected objectively and critically, in accordance with the explanatory notes and the rating sheet form completed accordingly. The explanatory notes are intended to provide a basis upon which each attribute may be quantified in order to translate visual perceptions into objective numbers.

To assist the Rater in judging those attributes on the basis of a 0.1m² area of pavement, it may prove useful to utilize a cardboard cut-out or template of some sort with a 33 cm by 33 cm opening providing a one-tenth square metre area.

All judgements made should be representative of the proposed project as a whole, rather than of short sections of it.

Inspections and ratings should be carried out if possible during the months of July and August when daylight conditions are most favourable. Autumn inspections, when the sun is closer to the horizon, are more difficult to perform because of the shadows created which could give the rater a false impression about some of the attributes.

The inspection should involve a drive through, in both directions as well as walking a few short sections to view the paved surface close up to rate the individual attributes.

If possible two experienced individuals should rate projects particularly those that are likely to be in the higher priority category. The inspection could be done jointly or separately and where there is a difference agreement should be reached as to the most appropriate severity level rating.

The rating sheet, including project information and any relevant remarks should be completed, as shown on the attached example. Use one sheet for each project, describing it by the appropriate from and to limits, control section number and kilometres. As far as possible, individual paving jobs should be used as candidate project limits. Where combinations of adjacent paving jobs are being considered, each should be rated separately.

When the projects on the list have been inspected and rating sheets completed for each, weighting factors are to be determined for each attribute and a total score calculated. Using the weighting factors provided, the seal coat scoring sheet is to be filled out, as shown on the attached example. The total score, thus determined, is used to rank the projects on a priority basis. The higher the score, the greater need for seal coat.

The priority list, arranged in order of highest priority to lowest should be prepared, to assist in developing the seal coat program on a regional and provincial basis. The list should include the rank, project description, total score, lane kilometres, estimated cost and remarks.

The final submission should include a rating sheet and scoring sheet for each project as well as an overall priority list.

Highway Engineering, TSB
September, 2000

EXPLANATORY NOTES

ON THE

ASSESSMENT OF

PAVEMENT SURFACES

FOR

SEAL-COAT APPLICATION

1. SEGREGATED AREAS AND RAVELLING

SEGREGATED AREAS

Segregated areas are seen as changes in the consistency of pavement surface texture. Segregation occurs when the pavement is laid down, but need not become evident until much later. It often occurs at regular intervals along a pavement and in the same transverse position, corresponding to individual truckloads of mix, but it can also be seen as a narrow band continuously along a surface, often associated with the center of a paver mat or with the joint between two mats. Individual segregated areas are often typically about 0.5 by 1 m in size.

A) RAVELLING IN SEGREGATED AREAS

Asphalt matrix and fine aggregate was either not there in the first place or has disappeared. The aggregate particles are now being dislodged and are disappearing, along with the asphalt binder.

Measures of Ravelling in Segregated Areas:

> For the purposes of rating, consider the worst $0.1m^2$ (one square foot) are of ravelling within the segregation.

> **None:** There is <u>no evidence of ravelling</u> yet in such segregated areas as can be observed.

> **Slight:** It is evident that ravelling has begun but <u>less than 25%</u> of the aggregate and binder has been lost from the top surface of the pavement.

> **Moderate:** <u>25% to 50%</u> of the aggregate and binder has ravelled away from the top surface of the pavement.

> **Severe:** Over 50% of the aggregate and binder has disappeared from the top surface of the pavement.

Note: If the depth of the segregation is greater than 10 to 15 mm (a depth about equal to the aggregate top size), a patch may be required before a seal coat is applied.

B) FREQUENCY OF SEGREGATED AREAS

Counting the number of segregated areas per lane-kilometer of road provides a measure of the extent of the ravelling problem.

Measures of the average number of segregated areas per lane-kilometer:

Negligible: There are <u>less than 5</u> segregated areas per lane-km.

Few: There are <u>5 to 10</u> segregated areas per lane-km.

Many: There are <u>11 to 20</u> segregated areas per lane-km.

Very Many: There are <u>more than 20</u> segregated areas per lane-km, or the segregation is continuous as a narrow band.

2. <u>AGGREGATE LOSE EXCLUSIVE OF SEGREGATION</u>

The pavement surface is losing aggregate and wearing away more or less uniformly throughout its entirety, but particularly in the travel lanes. This aggregate loss may be in the form of general ravelling and/or coarse rock loss.

A) General Ravelling

The pavement surface is wearing away as a result of the dislodging of the aggregate particles and loss of asphalt binder.

Measures of General Ravelling:

Negligible: There is <u>little evidence of ravelling</u> outside areas of observed segregation.

Slight: Asphalt binder and fines matrix is beginning to disappear to a depth of <u>less than one-eighth of the aggregate top size</u>.

Moderate: Aggregate particles and asphalt binder has worn away to a depth of <u>an eighth to a quarter of the aggregate top size</u>. The surface texture is becoming rough and pitted.

Severe: Aggregate particles and asphalt binder has worn away to a depth of more than a quarter of the aggregate top size. The surface texture is very rough and pitted.

B) COARSE ROCK LOSS

The pavement surface is losing coarse rock in the form of popouts, leaving voids conforming to the shape of the coarse rock particles that have disappeared. These voids have dimensions approximating the aggregate topsize (10mm or more in diameter).

Measures of Coarse Rock Loss:

Counts should be taken to estimate the average number of voids in a $0.1m^2$ (one square foot) are of pavement surface.

Negligible: There is less than 1 void per $0.1m^2$.

Slight: 1 to 4 voids per $0.1m^2$.

Moderate: 5 to 8 voids per $0.1m^2$.

Severe: More than 8 voids per $0.1m^2$.

3. <u>HAIR-LINE CRACKING</u>

Hair-line cracks are often seen as a network of fine cracks distributed over many small discrete areas of pavement, throughout the roadway length. For the purposes of rating this cracking, only the travel lanes should be considered.

A) SEVERITY OF HAIR-LINE CRACKING

Measures of the severity of Hair-Line Cracking:

An imaginary line, one meter in length, drawn across the area of cracking in any direction, will cross hair-line cracks as follows:

None: No hairline cracks are visible.

Slight: Less than 5 cracks.

Moderate: 5 to 10 cracks.

Severe: More than 10 cracks.

B) EXTENT OF HAIR-LINE CRACKING

Estimating the length of roadway affected by hairline cracking per lane-kilometer of road provides a measure of the extent of hairline cracking.

Measures of the extent of Hair-Line Cracking:

Negligible: There are less than 10m of hair-line cracking per lane-km.

Slight: There are 10 to 25m of hair-line cracking per lane-km.

Moderate: There are 26 to 50m of hair-line cracking per lane-km.

Severe: There are more than 50m of hair-line cracking per lane-km.

4. <u>PRESENCE OF FOREIGN MATERIAL</u>

Foreign material may be ironstone or other soft rock that is disintegrating, clay balls, coal or other deleterious material.

Measures of the Presence of Foreign Material:

Counts should be taken to estimate the average number of pieces of foreign material in a $0.1m^2$ (one square foot) area of pavement surface.

Negligible: There may be evidence of foreign material, but there is less than 1 piece per $0.1m^{2.}$

Slight: 1 to 3 pieces per $0.1m^{2.}$

Moderate: 4 to 6 pieces per $0.1m^{2.}$

Severe: More than 6 pieces per $0.1m^{2.}$

5. <u>PAVEMENT SURFACE TEXTURE</u>

This describes the smoothness of the surface, primarily in the wheel-paths, throughout the length of the road.

Measures of the Pavement Surface Texture:

High: The surface is <u>roughly textured</u>. Much rock is evident, but little asphalt matrix appears to be holding it together. This surface would have <u>high skid resistance</u> properties.

Normal: The surface has <u>some texture</u>. The rock that is evident is well bound within the asphalt matrix.

Low: The surface is <u>very "tight" and finely textured</u>. The rock and matrix of asphalt and sand appears to be highly polished. This is a <u>slick surface</u> that often looks shiny and has a mirror-like appearance in certain light conditions.

Very Low: The surface is <u>non-textured</u>. Few rocks are evident and there is a definite film of free asphalt on top. This is a bleeding pavement with <u>very low skid resistance</u>.

6. <u>TRAFFIC VOLUME</u>

This is simply the Average Annual Daily Traffic (AADT). Remember that it is measured as he total for both directions.

Measures of Traffic Volume:

Low: AADT $\leq$ 1000.

Moderate: 1 000 < AADT < 5 000.

High: 5 000 < AADT < 10 000.

Very High: AADT $\geq$ 10 000.

7. <u>AGE OF THE PAVEMENT SURFACE</u>

This is simply the age of the latest pavement surface.

It is determined as the difference between the year paving work was completed (not necessarily Contract Year) and the year of rating.

Highway Engineering, TSB
September, 2000

SEAL COAT RATING SHEET "A"

(Judgement of the Attributes of Pavements as Candidates for Seal Coat Application)

PROJECT NUMBER _____   PAVING CONTRACT NUMBER: _____

PROJECT DESCRIPTION

From: _____
To: _____
Control Section: _____ From Km. _____ To Km. _____
Control Section: _____ From Km. _____ To Km. _____
Control Section: _____ From Km. _____ To Km. _____

RATING CATEGORY   N.B.: Circle the appropriate "Rating" for each attribute observed.

1. Segregated Areas	a) Ravelling	None	Slight	Moderate	Severe
	b) Frequency	Negligible	Few	Many	Very Many
2. Aggregate Loss (Exclusive of Segregation)	a) General Ravelling	Negligible	Slight	Moderate	Severe
	b) Coarse Roak Loss	Negligible	Slight	Moderate	Severe
3. Hairline Cracking	a) Severity	None	Slight	Moderate	Severe
	b) Extent	Negligible	Slight	Moderate	Severe
4. Presence of Foreign Material		Negligible	Slight	Moderate	Severe
5. Pavement Surface Texture		High	Normal	Low	Very Low
6. Traffic Volume (AADT = _____)		Low	Moderate	High	Very High
7. Age of Pavement Surface (_____ Years)		1 to 3	4 to 6	7 to 9	>9

N.B.: Pavements with excessive bleeding, rutting or longitudinal / alligator cracking should not be considered as candidates for Seal Coat application.

Remarks: _____
_____
_____

Inspected By: _____ Consultant: _____ 8   Date: _____ Region: _____

SEAL COAT RATING – SHEET "B"

PROJECT NUMBER: _____   **PAVING CONTRACT NUMBER:** _____

<u>**PROJECT DESCRIPTION**</u>

From: _____

To: _____

Control Section: _____   **To Km:** _____   **To Km:** _____

Control Section: _____   **To Km:** _____   **To Km:** _____

Control Section: _____   **To Km:** _____   **To Km:** _____

RATING CATEGORY		Rating (Sheet A)	Weigthing Factor (Table 1)	Score	
1. Segreated Areas Segreated Areas	A) Ravelling			A x B	
	B) Frequency				
2. Aggregate Loss (Exclusive of Segregation)	A) General Ravelling			A + B	
	B) Coarse Rock Loss				
3. Hairline Cracking Hairline Cracking	A) Severity			A x B	
	B) Extent				
4. Presence of Foreign Material	A) Severity				
5. Pavement Surface Texture					
6. Traffic Volume	AADT =				
7. Age of Pavement Surface	Years				
				Total Score	

Inspected By: _____ **Consultant:** _____   **Date:** _____   **Region:** _____

SEAL COAT WEIGHTING FACTORS

Table 1

RATING CATEGORY				WEIGHTING FACTORS					
1. Segregated Areas	A) Ravelling	None	2.0	Slight	5.0	Moderate	13.0	Severe	18.0
	B) Frequency	Negligible	0.0	Few	1.0	Many	2.0	Very Many	3.0
2. Aggregate Loss (Exclusive of Segregation)	A) General Ravelling	Negligible	0.0	Slight	5.0	Moderate	17.0	Severe	40.0
	B) Coarse Rock Loss	Negligible	0.0	Slight	1.0	Moderate	5.0	Severe	12.0
3. Hairline Cracking	A) Severity	None	0.0	Slight	2.0	Moderate	5.0	Severe	7.0
	B) Extent	Negligible	0.0	Slight	1.0	Moderate	2.0	Severe	3.0
4. Presence of Foreign Material		Negligible	0.0	Slight	1.0	Moderate	2.0	Severe	5.0
5. Pavement Surface Texture		High	0.0	Normal	0.0	Low	6.0	Very Low	10.0
6. Traffic Volume (AADT=_____)				AADT/1000 (Maximum 15)					
7. Age of Pavement Surface (_____years)				Age-3 (Maximum 7)					