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3.53 ASPHALT CONCRETE PAVEMENT - SUPERPAVE

3.53.1 GENERAL

3.53.1.1 **Description**

Asphalt Concrete Pavement (ACP) shall consist of crushed aggregates, or a combination of crushed aggregates and Reclaimed Asphalt Pavement (RAP), blend sand material as required and asphalt cement, combined in a hot mix plant, placed and compacted on a prepared surface in conformity to the lines, grades, dimensions and cross-sections as shown on the drawings or as directed by the Consultant.

This specification shall apply only to mixes specified to be designed using the Superpave mix design procedure and shall not be used for mixes designated according to AT&U's conventional mix type specifications.

3.53.1.2 **Definitions**

For purposes of this specification, the following definitions will apply:

3.53.1.2.1 Acceptance Limits

(i) Density and Actual Asphalt Content - Acceptance Limits for density and Actual Asphalt Content are the limiting values of the Lot Mean within which the Lot will be accepted at full, increased, or reduced payment for density, as shown in Table 3.53 A, or full or reduced payment for Actual Asphalt Content as shown in Table 3.53 B.

(ii) Smoothness - Acceptance Limit for smoothness is the limiting value of the Profile Index within which a Sublot will be accepted with or without penalty assessment as shown in Table 3.53 C.

3.53.1.2.2 Asphalt Content

(i) Design Asphalt Content - The Asphalt Content established by the approved mix design.

(ii) Approved Asphalt Content - The Design Asphalt Content or subsequent adjustments to it. Such adjustments must be approved in writing by the Consultant.

(iii) Actual Asphalt Content - The amount of asphalt binder in the mix as determined by ATT-12 or ATT-74, and includes an amount to correct for the asphalt binder lost due to absorption by the aggregate or aggregate loss.

This correction may be determined for each change in aggregate or asphalt binder.

3.53.1.2.3 End Product Specification (EPS)

A specification whereby the Department does not define the methods of construction. Under EPS, the Department will monitor the Contractor's control of the process that produces the items of construction and will accept or reject the end product according to a specified acceptance plan. The Contractor is entirely responsible for quality control. End product acceptance is the responsibility of the Department and includes a statistically oriented program of acceptance testing.

3.53.1.2.4 Job Mix Formula

The Job Mix Formula establishes the aggregate proportioning, target aggregate gradation and approved asphalt content to be used for production of asphalt mix and requires the approval of the Consultant on the basis of a mix design.

3.53.1.2.5 Lot

A Lot is a portion of the Work being considered for acceptance and is defined as the following:

(i) One day's plant production of more than 4 hours where approved changes to the following criteria have not occurred:
   a) Job Mix Formula
   b) Pavement Density Requirement
   c) Project

   A change in any one of the above may require a new Lot designation.

(ii) One day's plant production of less than 4 hours will be dealt with at the Consultant's option, as follows:

   a) The material will be added to the previous day's Lot if the criteria specified in (i) remains the same or,

   b) The material will be added to the next day's Lot with the same criteria specified in (i) or,

   c) If it is the last time the mix is produced with these criteria then the production will be designated as a Lot.

(iii) If the Consultant suspects a portion of a Lot is substandard, he may order extra testing to define the area and severity of the deficiency. A new Lot will be designated for this portion if this extra testing indicates the mix is subject to unit price adjustment or rejection.

3.53.1.2.6 Rejection Limit

(i) Density and Actual Asphalt Content - Rejection Limit for Density and Actual Asphalt Content is the limiting value of the Lot Mean beyond which a Lot is rejected and not paid for as shown in Tables 3.53 A, and 3.53 B.

(ii) Smoothness - Rejection Limit for smoothness is the limiting value of the Profile Index (PrI) beyond which a Sublot is rejected and not paid for as shown in Table 3.53 C.

3.53.1.2.7 Lot Mean and Range

The Lot Mean is the arithmetic mean of a set of 5 or more test results constituting the sample for the Lot. The Range represents the difference between the highest and lowest values within a set of test results.

3.53.1.2.8 Stratified Random Sample

A Stratified Random Sample is a set of test measurements taken one each from 5 or more separate (stratified) areas or segments within a Lot in an unbiased way.

3.53.1.2.9 Sublot

A Sublot is a portion of a Lot that is one paver width wide and 100 metres long on which the calculation for Smoothness and assessment of Workmanship and Obvious Defects are based.

3.53.1.2.10 Alberta Transportation Test Procedures

Test methods designated in these specifications as "ATT" or “TLT” refer to Alberta Transportation Tests.

3.53.1.2.11 Superpave Mix Design Procedure

Mix design procedure developed as a product of the Strategic Highway Research Program (SHRP) and described in the latest edition of the American Association of State Highway and Transportation Officials (AASHTO) Standard Practice for Superpave Volumetric Design for Hot Mix Asphalt (HMA), Designation PP28.

3.53.1.2.12 Managed Quality Assurance (MQA)

Within this specification, acceptance testing shall be applied using Managed Quality Assurance (MQA) practises. With MQA, certain quality control test results provided by the Contractor may be used in place of corresponding quality assurance test results, as a basis for acceptance and payment. The Lots for which quality control test results are used for acceptance and payment will be at the discretion of the Consultant.

3.53.1.2.13 QC Acceptance Lot

A Lot chosen by the Consultant in which acceptance testing for asphalt content and gradation is based upon the Contractor's quality control test results and for which no corresponding quality assurance test results are available. All other quality assurance testing as outlined in this specification will remain the responsibility of the Consultant.

Quality assurance test results, when available, shall replace any quality control test results used for material acceptance.

3.53.1.2.14 QA Acceptance Lot

A Lot in which all acceptance testing is conducted by the Consultant using quality assurance test procedures as outlined in these specifications. The number and selection of QA Acceptance Lots shall be determined as follows:

(i) First two Lots of production for each Mix Type used, and;
(ii) Minimumof one additional Lot per 60 000 tonnes, or portion thereof, of total ACP contract tender tonnage and;
(iii) One additional Lot of top lift production, for each Mix Type, if two or more lifts are specified and;
(iv) Any additional Lot(s) chosen by the Consultant.

3.53.2 MATERIALS

3.53.2.1 **Asphalt**

The Contractor shall supply asphalt material in accordance with Specification 5.7, Supply of Asphalt. The types and grades of asphalt shall be as specified in the Special Provisions.

For ACP mixtures containing RAP and specified to use penetration grade asphalts, the procedures outlined in TLT-300, Recycling of Asphalt Concrete Pavement, shall be used to determine the rheology of the RAP and the grade of virgin asphalt to be used. For ACP mixtures containing RAP and specified to use Performance Graded (PG) asphalts, the RAP rheology and the grade of virgin asphalt to be used shall be determined according to Appendix X1 of AASHTO MP2.

Rheological testing of the RAP is not required for mixtures using a maximum RAP to virgin aggregate ratio of 10/90.

3.53.2.2 **Aggregate**

The Contractor shall produce crushed aggregates in accordance with Specification 3.2, Aggregate Production and Stockpiling for the designation and class of material specified. The Contractor shall supply aggregate materials in accordance with Specification 5.2, Supply of Aggregate and haul materials in accordance with Specification 4.5, Hauling.

For Superpave designated aggregates, Table 3.2.3.1 Specifications for Aggregate shall be replaced with Table 3.53.2.2A Superpave Aggregate Gradation Specifications and Table 3.53.2.2B Boundaries of Superpave Aggregate Restricted Zone. Metric sieves in accordance with CGSB Spec. 8-GP-2M shall be used in place of the sieves specified in the AASHTO specifications.

Specifications for other aggregate properties are given in Table 3.53.2.2C, Superpave Aggregate Properties.

Table 3.53.2.2A Superpave Aggregate Gradation Specifications (% Passing)

Sieve Size (Fm)	Nominal Maximum Size (mm)		
	10.0	**12.5**	**20.0**
50 000	-	-	-
40 000	-	-	-
25 000	-	-	min. 100
20 000	-	min. 100	90 -100
12 500	min. 100	90 -100	max. 90
10 000	90 - 100	max. 90	-
5 000	max 90	-	-
2 500	32 - 67	28 - 58	23 - 49
1 250	-	-	-
630	-	-	-
315	-	-	-
80	2 - 10	2 - 10	2 - 8

Note: Boundary values for the Superpave Restricted Zone are listed in Table 3.53.2.2B Boundaries of Superpave Aggregate Restricted Zone. It is recommended that the design gradation does not pass through this restricted zone.

Table 3.53.2.2B Boundaries of Superpave Aggregate Restricted Zone

Sieve Size Within Restricted Zone (Fm)	Minimum and Maximum Boundaries of Sieve Size for Nominal Maximum Aggregate Size (Minimum/Maximum Percent Passing)		
	10.0 mm	**12.5 mm**	**20.0 mm**
5 000	-	-	-
2 500	47/47	39/39	35/35
1 250	32/38	26/32	22/28
630	24/28	19/23	17/21
315	19/19	16/16	14/14

Table 3.53.2.2C Superpave Aggregate Properties

Property and Test Method	Aggregate Angularity		Elongated Particles[c]	Clay Content	Detrimental Matter	Plasticity Index
	Coarse[a]	Fine[b]				
	ATT-50	TLT-125	ASTM D4791	AASHTO T 176	TLT 107	AASHTO T90
Traffic (ESALs million)					As listed for Designation 1 aggregates in Specification 3.2 Aggregate Production and Stockpiling	Non Plastic
<0.3	55/-	-	-	40		
0.3 to <3	75/-	45	10	40		
3 to < 10	85/80	45	10	45		
10 to < 30	95/90	45	10	45		
$30	100/100	45	10	50		

Note[a] "85/80" denotes that 85% of the coarse aggregate has one fractured face and 80% two fractured faces.
Note[b] Minimum % air voids in loosely compacted fine aggregate
Note[c] Maximum weight % of thin or elongated particles; ratio of 5:1
Note Disregard the mention of AASHTO values for coarse and fine aggregate angularity listed for pavement layers > 100 mm from pavement surface.

3.53.2.3 **Interim Lane Markings**

The Contractor shall supply interim lane marking paint and glass beads. Paint shall be yellow 505-308 or white alkyd traffic paint conforming to the latest edition of Alberta Transportation TPC Specification for Traffic Paint.

The Contractor has the option of supplying Davidson Temporary Pavement Markers (or equivalent) or self-adhesive reflectorized pavement marking tape.

3.53.2.4 **Reclaimed Asphalt Pavement**

Unless specified otherwise, the Contractor may elect to use RAP in the ACP mixture to a maximum RAP to virgin aggregate ratio of 30/70. The handling, stockpiling, storage and hauling of all RAP shall be in accordance with Specification 3.16, Cold Milling Asphalt Pavement, and shall prevent the contamination and consolidation of the material.

3.53.3 ASPHALT MIX DESIGN AND JOB MIX FORMULA

3.53.3.1 **Responsibility for Mix Design**

Preparation and submission of asphalt mix designs for Consultant verification and approval are the responsibility of the Contractor. The Contractor shall use professional Engineering services and a qualified testing laboratory licensed to practice in the Province of Alberta, to assess the aggregate materials proposed for use and to carry out the design of the asphalt mixture. The design testing laboratory for Superpave mixes shall have obtained pre-qualification status from the Department in the category of Asphalt Concrete Mix Design - Superpave.

All costs incurred in mix design formulation are the responsibility of the Contractor. Shipping costs for samples sent to the Consultant for verification and approval are the responsibility of the Contractor.

3.53.3.2 **Requirements for Mix Design**

The asphalt mix design shall follow the AASHTO Designation PP28 Standard Practice for Superpave Volumetric Design for Hot Mix Asphalt (HMA) with design criteria changes as outlined in this section. The bulk specific gravity of the RAP aggregate shall be determined according to TLT-301. The mix design, at the Design Asphalt Content, shall meet the requirements in Tables 3.53.3.2.2A and B for the Superpave Mix Type specified in the Special Provisions and design requirements listed under section 3.53.3.2.3 Moisture Susceptibility Criteria.

3.53.3.2.1 Superpave Mix Type Designations

Superpave mix types shall be expressed as Traffic-S-Agg. where:

Traffic - Design Traffic loadings is expressed within one of the following ranges

"0.3" - for $< 0.3 \times 10^6$ ESALs
"3" - for $\geq$ 0.3 and $< 3.0 \times 10^6$ ESALs
"10" - for $\geq$ 3.0 and $< 10 \times 10^6$ ESALs
"30" - for $\geq$ 10 and $< 30 \times 10^6$ ESALs
"100" - for $> 30 \times 10^6$ ESALs

S - Value of “C” for coarse mixes or “F” for fine mixes to be chosen by the Contractor as follows:

C - If design aggregate gradation falls below the restricted zone,
F - If design aggregate gradation falls above or passes through the restricted zone.

Agg. - Expressed as 10, 12.5 or 20 based upon Nominal Maximum Aggregate Size as chosen by the Consultant.

Example A Superpave mix type 3-S-12.5 has a design traffic loading between 0.3 and 3×10^6 ESALs and is to use a 12.5 mm Nominal Maximum Size aggregate.

3.53.3.2.2 Superpave Design Criteria

Table 3.53.3.2.2A Superpave Volumetric Criteria

Traffic[1] (ESALs millions)	Required Density (% of Max. Specific Gravity)			Air Voids (%)	Voids Filled with Asphalt (%)
	$N_{initial}$	N_{design}	$N_{maximum}$		
<0.3	#91.5	= 96	< 98	4	70 - 80
0.3 to < 3	#90.5	= 96	< 98	4	65 - 78
3.0 to 10	< 89	= 96	< 98	4	65 - 75[2]
$10	< 89	= 96	< 98	4	65-75

Minimum Voids in Mineral Aggregate Criteria	
Nominal Aggregate Size (mm)	
10	15
12.5	14
20	13

(1) Design ESALs are the anticipated project traffic level expected on the design lane over a 20-year period. Regardless of the actual design life of the roadway, determine the design ESALs for 20 years and choose the appropriate N_{design} level.

(2) For 10 mm nominal maximum size mixtures, the specified VFA range shall be 73% to 76% for the design traffic levels $3 million ESALs.

Table 3.53.3.2.2B Superpave Dust Proportion Criteria

Fines/Asphalt Ratio	
All aggregate sizes and traffic levels "F" design aggregate gradations	0.6 to 1.2
All aggregate sizes and traffic levels "C" design aggregate gradations	0.7 to 1.5

Note: The Fines/Asphalt (F/A) ratio is defined as the ratio of the percent of aggregate passing the 80Fm sieve to the percent of effective asphalt content (by weight of dry aggregate).

The number of gyrations shall be selected according to the Design Traffic loadings listed in the Superpave mix type designation and compactive effort requirements listed in Table 3.53.3.2.2C, Superpave Design Gyratory Compactive Effort.

Table 3.53.3.2.2C Superpave Design Gyratory Compactive Effort

Design Traffic Loading (ESALs millions)	Number of Gyrations		
	$N_{initial}$	N_{design}	$N_{maximum}$
< 0.3	6	50	75
0.3 to <3	7	75	115
3 to < 30	8	100	160
$30	9	125	205

3.53.3.2.3 Moisture Susceptibility Criteria

The moisture susceptibility of the Superpave mix will be evaluated for acceptance according to AASHTO T 283, Resistance of Compacted Bituminous Mixture to Moisture Induced Damage. The minimum acceptance value shall be 80% on specimens not subjected to the optional freeze-thaw conditioning.

The following modifications to AASHTO T 283 shall apply:

(i) 150 mm diameter Gyratory compacted specimens shall be used.

(ii) The listed storage time of 72 to 96 hours at room temperature of the extruded samples shall be changed to a minimum of 24 hours.

(iii) A subset of three specimens shall be subjected to the optional freeze-thaw conditioning listed in T 283 and reported for information purposes only.

3.53.3.3 **Approval of Mix Design**

Mix designs shall be subject to the approval of the Consultant. The Contractor shall submit the mix design to the Consultant for verification and approval. The Contractor's submission shall include the following information:

(i) Aggregate source name(s) and location(s).

(ii) The gradation of each aggregate to be used in the mixture using the sieve sizes listed in Table 3.53.2.2A.

(iii) The percentage by mass of each aggregate to be used in the mixture.

(iv) The mix design gradation of the combined aggregate.

(v) Other characteristics of the combined aggregate specified in Table 3.53.2.2C. Superpave Aggregate Properties.

(vi) All Superpave Mix Design characteristics, including graphs used in arriving at the final mix design, the bulk specific gravity of the combined aggregates, graph of theoretical maximum specific gravities, the asphalt absorption of the combined aggregates and tensile strength ratio (both with and without freeze-thaw conditioning).

(vii) Identification of each asphalt supplier by name, location and types and grades of asphalt to be supplied.

(viii) For each asphalt supplied, asphalt specific gravity and recommended mixing and compaction temperatures for the preparation of design specimens.

(ix) Voids chart to include Air Voids, VMA and Voids Filled with Asphalt for various asphalt contents (0.1% increments) and bulk densities (increments of 5 kg/m^3).

(x) Mix design submissions using RAP shall include the RAP source name(s) and location(s), all RAP asphalt content and gradation test results, the bulk specific gravity of the RAP aggregate, the percentage by weight of RAP to be used in the mixture, and, when required, all RAP rheological test results, the design rheology and all blending information used.

The Consultant will require up to 5 working days from the time of receipt of the mix design to complete the design evaluation.

Where required by the Consultant for any change in the nature or sources of the aggregates or RAP, or where a new mix design is desired by the Contractor, the Contractor shall provide a separate and complete mix design. This new mix design shall be subject to the approval of the Consultant.

The Consultant may, at any time, require the Contractor to provide representative samples of each of the aggregate components and RAP for verification purposes. A sufficient quantity of each component shall be provided to result in a 100 kg sample of combined aggregate at design proportions. The Consultant will require up to 5 working days from the time of receipt of the sample to verify the mix design. The cost of such mix design verification will be borne by the Department.

Asphalt mix produced prior to the Contractor receiving the written approval of the mix design, will not be accepted.

The aggregate proportioning, target gradation and asphalt content for the approved mix design will then be the Design Mix Formula and will become the Job Mix Formula for the start in production of asphalt mix.

The Contractor is responsible for producing mixes which conform with the specifications.

3.53.3.4 **Variation from Approved Job Mix Formula**

Once the Job Mix Formula has been established and approved, no alteration will be permitted unless reviewed and approved by the Consultant.

The Lot Mean Gyratory Air Voids at N_{design}, as determined by the Consultant, shall not vary from the corresponding air voids in the approved mix design by more than 0.5%.

If the sum of any approved alterations to the Job Mix Formula are in excess of any one of the following limits away from the Design Mix Formula, a new mix design is required.

- ± 5% passing the 5 000 µm sieve.
- ± 1.0 % passing the 80 µm sieve.
- ± 0.3 % asphalt content.

All Job Mix formulas shall meet the aggregate gradation requirements of Table 3.53.2.2A (excluding the requirements of Table 3.53.2.2B) and the dust proportion criteria listed in Table 3.53.3.2.2B.

3.53.4 SAMPLING AND TESTING

3.53.4.1 **General**

During the progress of the Work, tests will be carried out on materials and workmanship in order to ensure compliance with the requirements of the specifications.

Where it is required in these specifications that the Contractor submit samples of materials or mixtures to the Consultant for approval, these samples shall be submitted in sufficient time for proper testing.

The Consultant's approval of any materials or mixture shall in no way relieve the Contractor from his obligation to provide materials, mixtures and workmanship in accordance with the specifications.

Where specified, random sampling procedures shall be followed, and where no specific random sampling procedure is specified, the sampling procedure shall be as identified by the Consultant in the case of acceptance testing and by the Contractor in the case of quality control testing.

The Consultant shall have access to the work at all times for taking samples. The Contractor shall provide any assistance necessary for taking samples and shall reinstate pavement layers or other structures to the satisfaction of the Consultant at the positions where samples have been taken. Compensation for providing assistance with sampling and for reinstatement where samples are taken shall be included in the unit price bid for the various items of Work tested and no separate payment will be made.

The Contractor shall provide, at his own expense, sampling stands, sampling devices and other facilities which the Consultant may require to safely obtain representative samples of the item being produced.

When required, the Contractor shall provide and prepare, to the satisfaction of the Consultant, a suitable site for the parking of a mobile laboratory trailer. The Contractor shall provide power to the mobile laboratory trailer, at his own expense.

3.53.4.2 **Methods of Testing For Acceptance and Appeal Testing**

Unless otherwise specified, the latest edition of the following standard Alberta Transportation test methods (ATT) shown in Table 3.53.4.2 will be used to determine material characteristics.

TABLE 3.53.4.2
TEST METHODS ON MANAGED QA PROJECTS

	TEST DESCRIPTION	TEST METHOD
1.	Sampling Mixes	ATT-37
2.	Coring	ATT-5
3.	Extraction	ATT-12
4.	Correction Factor, Extracted Asphalt Content	ATT-12 Part III
5.	Percent Fracture	ATT-50
6.	Sieve Analysis, 20 000 Fm minus	ATT-26
7.	Density, Immersion Method, Waxed Asphalt Concrete Specimens	ATT-6
8.	Density, Immersion Method, Saturated Surface Dry Asphalt Concrete Specimens	ATT-7
9.	Voids Calculations, Asphalt Concrete Specimens	ATT-36
10.	Percent Compaction, Asphalt Concrete Pavement	ATT-67
11.	Forming Gyratory Specimens	AASHTO TP4
12.	Moisture Content, Oven Method Asphalt Concrete Mixes	ATT-15
13.	Smoothness of Pavements, Profilograph Method	ATT-59
14.	Stratified Random Test Sites for A.C.P. Projects	ATT-56
15.	Appeal Testing, Asphalt Content, Density and Gradation	ATT-68
16.	Asphalt Content, Ignition Method	ATT-74
17.	Correction Factor, Ignition Asphalt Content	ATT-74 Part II
18	Maximum Specific Gravity of Bituminous Mixes	ASTM D2041
	Additional Test Methods for QC Acceptance Lots Only	
19	Asphalt Content	AASHTO T164 , T287 or ATT-12 or ATT-74

NOTES:

(1) In all test methods used as reference in this specification, metric sieves as specified in Canadian General Standards Board Specification 8-GP-2M shall be substituted for any other specified wire cloth sieves in accordance with Specification 3.2, Aggregate Production and Stockpiling.

(2) In all cases the latest amendment or revision current at the closing date of the tender is implied when reference is made to one of the above standards in the specification.

3.53.4.3 **Quality Control Testing**

Quality control testing is the responsibility of the Contractor throughout every stage of the Work from the crushing and production of aggregates to the final accepted product. Tests performed by the Consultant will not be considered to be quality control tests. The Contractor shall provide and pay for equipment and qualified personnel to obtain all quality assurance core samples and perform all quality control testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the work, and the final product produced.

When the Contractor elects to use RAP, the asphalt content and gradation of the RAP shall be determined according to and at the frequencies specified in Specification 3.16. When required, the RAP rheology shall be determined at a minimum frequency of one per 5 000 t of RAP and a minimum of two samples shall be tested for each RAP source.

Test methods, sampling and minimum frequency of testing are described in Section 3.53.4.2, Methods of Testing For Acceptance and Appeal Testing and Table 3.53.4.3, Recommended Quality Control Testing - Superpave. The Consultant may require an increase in the frequency of any quality control test which has a specified minimum frequency. The Contractor shall arrange and pay for any additional tests required by the Consultant.

Results of all quality control tests shall be submitted to the Consultant as they become available. In addition, the quality control test results for mix asphalt content and aggregate gradation shall be provided to the Consultant no later than 12:00 noon of the day following placement.

The Contractor shall bear the cost of all consulting services retained by him.

The Contractor shall be totally responsible for production of aggregate and mixes that meet all the specified requirements.

Table 3.53.4.3
Quality Control Testing Requirements- Superpave, Managed QA Testing Projects

TEST	STANDARD	MINIMUM FREQUENCY
AGGREGATE PRODUCTION		See Specification 3.2
ASPHALT MIX PLANT		
1. Calibration	ATT-17	Once per project or as required
2. Inspection	ATT-16	(2)
SAMPLES		
1. Asphalt Cement	ATT-42	See Specification 5.7
2. Tack, Prime and Fog Materials	ATT-42	See Specification 5.7
3. Cold Feed Aggregate	ATT-38	(2)
4. Mix	ATT-37	(2)
5. QA Cores - Stratified Random Test Sites Chosen By The Engineer	ATT-56	
i) QA Cores for Pavement Density	ATT-5	One per segment for each Lot.
ii) QA Cores for Asphalt Content and Gradation	ATT-5	One per segment for selected Lots as directed by the Consultant.
TESTS WITH SPECIFIED MINIMUM FREQUENCIES		
1. Mix Asphalt Content	AASHTO T-164, T287 or ATT-12 or ATT-74	(2)
2. Correction Factors	ATT-12, Part III or ATT-74, Part II	As Required
3. Mix Moisture Content	ATT-15	(2)
4. Aggregate Sieve Analysis	ATT-26	(2)
TESTS WITH NO SPECIFIED MINIMUM FREQUENCIES		
1. Field Formed Gyratory Briquettes	AASHTO TP4	(1)
2. Maximum Specific Gravity of Bituminous Mixes (Gmm)	ASTM D2041	(1)
3. Density Immersion Method, Saturated Surface Dry	ATT-7	(1)

TEST	STANDARD	MINIMUM FREQUENCY
4. Void Calculations, Cores or Formed Specimens	ATT-36	(1 & 3)
5. Temperatures	ATT-30	(1)
6. Percent Compaction, Cores or Nuclear Density	ATT-67, ATT-5 or ATT-11	(1 & 3)
7. Random Test Site Locations	ATT-56	(1)
8. Correction Factors, Nuclear Moisture-Density Measurement	ATT-48	(1)

Notes: (1) Minimum Frequency not Specified.
(2) When a Lot has eight hours of plant production or more, a minimum of four plant checks plus four asphalt contents and four sieve analysis of the combined aggregate (any combination of cold feed, extraction or ignition) are required. When a Lot has less than eight hours of plant production, these tests shall be performed once for every two full hours of plant production.
(3) Percent compaction and core air voids based upon the Lot Mean Maximum Specific Gravity (Gmm). Air voids on Gyratory formed specimens based upon corresponding individual Maximum Specific Gravity (Gmm) test values.

3.53.4.4 **Acceptance Sampling and Testing**

3.53.4.4.1 General

Within this specification, certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship to be supplied. Compliance with these requirements where so specified, shall be determined by statistical testing as described in this section.

Acceptance testing is the responsibility of the Consultant except for Lots designated by the Consultant as QC Acceptance Lots in which case the Contractor's quality control test results for asphalt content and aggregate gradation only, may be used towards determining conditional material acceptance.

The Contractor shall provide to the Consultant all quality assurance density cores and any additional cores requested by the Consultant for quality assurance testing for asphalt content and gradation, within 24 hours of receiving the stratified random sample locations. Prior to the Contractor obtaining the cores, the Consultant may provide the Contractor with new or different random sample locations. The Consultant may have the Contractor obtain cores for quality assurance testing at any time throughout the project for any Lot. All cores provided to the Consultant shall be in their original condition. Core preparation or sawing shall be done by the Consultant.

All costs associated with pavement coring for quality control and quality assurance testing shall be the responsibility of the Contractor.

Initial acceptance testing will be performed free of cost to the Contractor. The Contractor shall be responsible for the cost of all Quality Assurance testing performed on material that is used to replace or overlay material that has been previously rejected.

The Contractor shall be responsible for the cost of all Quality Assurance retesting performed following attempts to improve smoothness or to remove bumps or dips.

After all quality control tests for the Lot are reported to the Consultant, the Consultant will provide the Contractor with a copy of the results of acceptance tests within one working day of their availability.

If the Consultant determines that certain test results are faulty due to testing equipment malfunction, improper testing procedures or calculations, he will replace the faulty tests with new tests.

If the testing equipment malfunction, improper testing procedures or calculations were on the part of the Consultant, the Contractor shall be reimbursed $50 per locations for obtaining cores.

3.53.4.4.2 Acceptance Sampling and Testing Procedures

3.53.4.4.2.1 Pavement Sampling for Density, Asphalt Content and Gradation

Pavement sampling will be done using stratified random sampling procedures. A minimum of 5 tests per Lot will be selected as follows:

(i) The Lot will be divided into 5 or more segments of approximately equal quantity.

(ii) In each segment a test site will be located by using random numbers to determine the longitudinal distance from the end of the segment and the lateral distance from the edge of the segment. In no case will a lateral distance be less than 0.5 m from the shoulder or 0.3 m from any other edge of a mat except when matching mats, in which case the test site may be within 0.3 m of the joint.

For lifts of 20 mm or less, samples for asphalt content and gradation may be obtained by the Consultant using the Sampling Mix Behind Paver method described in ATT-37. If sufficient numbers of mix samples cannot be obtained in this manner, stratified random core samples shall be taken by the Contractor as determined by the Consultant in order to perform the minimum five tests per Lot.

On Lots designated by the Consultant as QC Acceptance Lots, material sampling for quality control testing of asphalt content and gradation may consist of cold feed aggregate or loose mix or core samples as outlined in ATT-37, ATT-38 or ATT-56.

3.53.4.4.2.2 Pavement Sampling for Smoothness

The surface of the Sublots in the final lift of asphalt concrete pavement will be profiled by the Consultant in accordance with ATT-59 using a California Cox Model Profilograph. Other makes of Profilograph machines may be used if they have been individually approved by the Department. Profiles will be made approximately at the traffic wheel paths.

3.53.4.4.2.3 Asphalt Mix Sampling

Sampling of the asphalt mixture for Gyratory compaction comparison will be done by the Consultant using the procedures identified in ATT-37.

3.53.4.4.2.4 Exclusions to Random Sampling

Random sampling methods will not be applied when the Consultant samples mix behind the paver on lifts of 20 mm or less; nor to small areas such as tapers, approaches, areas of handwork, gores; nor for asphalt mix used for isolated levelling and repair of failed areas; nor for aggregate or asphalt mix chosen for QC Acceptance Lot testing.

3.53.4.5 **Retesting Following Attempts to Improve Smoothness**

When the test results on a Sublot of ACP indicate a penalty or rejection because of smoothness, the Contractor, at his option, may make one attempt to improve the smoothness on the Sublot by additional work in which case

the following shall apply:

(i) the Contractor shall notify the Consultant in writing that he will make one attempt to improve smoothness.

(ii) additional work on a Sublot to improve smoothness shall be completed within 10 calendar days from the time the Contractor receives written notification from the Consultant indicating the smoothness test results for that Sublot.

(iii) additional work to improve smoothness will not be allowed on Sublots with:
a PrI of 10 or less for multilift applications,
a PrI of 15 or less for single lift applications and
a PrI of 22 or less for applications through areas of curb and gutter,
except for removal of bumps and dips over 8 mm.

The Contractor shall not undertake any method of repair that is detrimental to the quality of the pavement. Any method of heating that has a detrimental effect on the pavement in the opinion of the Consultant, will not be allowed.

3.53.4.6 **Aggregate Gradation Requirements**

The following requirements apply to asphalt concrete pavement material in all lifts except preliminary levelling and those Lots designated as QC Acceptance Lots.

Price adjustments for aggregate gradation variation will be based on the variation of the Lot Mean Gradation from the Job Mix Formula tolerance, for each size, as shown in Table 3.53 D and the corresponding adjustment points as shown in Table 3.53 E.

For lifts greater than 20 mm in thickness, the Lot Mean Gradation will be determined using the sieve analysis of core samples. For lifts 20 mm or less, the Lot Mean Gradation will be determined using the sieve analysis of mix and/or core samples.

When the Lot Mean Gradation is outside the Job Mix Formula tolerance, the penalty assessment will be $0.02 per tonne for each Mean Adjustment Point within the limits shown in Table 3.53.2.2A (excluding the requirements of Table 3.53.2.2B). When the Lot Mean Gradation is outside the limits of Table 3.53.2.2A (excluding the requirements of Table 3.53.2.2B) the penalty assessment will be $0.20 per tonne for each Mean Adjustment Point outside those limits, regardless of the Job Mix Formula tolerance.

When the Lot Mean Gradation for all sieve sizes is within the Job Mix Formula tolerance and within the limits of Table 3.53.2.2A (excluding the requirements of Table 3.53.2.2B) and individual test results for each sieve size are within the allowable range shown in Table 3.53 D, a bonus of $0.10 per tonne will be applied.

3.53.4.7 **Pavement Segregation Requirements**

3.53.4.7.1 General

The finished surface of the top lift of ACP shall have a uniform texture and be free of segregated areas.

3.53.4.7.2 Classifying Pavement Segregation

A segregated area is defined as an area of the pavement where the texture differs visually from the texture of the

surrounding pavement. For the purposes of classifying pavement segregation, only segregated areas greater than $0.1m^2$ and centre-of-paver streaks greater than 1 metre in length will be considered. Moderate or severe segregated areas which do not meet these size parameters will be considered obvious defects. Pavement segregation will be classified as follows:

Slight - The matrix, asphalt cement and fine aggregate is in place between the coarse aggregate. However, there is more stone in comparison to the surrounding acceptable mix.

Moderate - Significantly more stone than the surrounding mix; moderately segregated areas usually exhibit a lack of surrounding matrix.

Severe - Appears as an area of very stony mix, stone against stone, with very little or no matrix.

Centre-of-Paver Streak - Appears as a continuous or semi-continuous longitudinal "streak" typically located in the middle of the paver "mat".

3.53.4.7.3 Inspections for Pavement Segregation

3.53.4.7.3.1 Inspections by the Contractor

The Contractor shall perform a daily inspection of the paving operations on all lifts of pavement to identify any instances of pavement segregation. If segregation is evident, the Contractor shall take immediate corrective action to his operations to prevent any further occurrence of segregation.

3.53.4.7.3.2 Inspections by the Consultant

(i) Inspections During Construction

The Consultant shall inspect the lower lifts of pavement to identify any instances of pavement segregation. If segregation is evident, the Consultant shall immediately notify the Contractor so that corrective action can be taken to prevent further occurrence of segregation.

The Consultant shall also inspect the top lift of pavement. Typically, each pavement Lot would be inspected, as soon as possible after the Lot is placed. During the inspection(s) of the top lift, the Consultant will identify and record any areas of moderate and severe segregation and any areas of center-of-paver streak. Areas requiring repair in accordance with Section 3.53.4.7.4 shall be marked. The Consultant will provide the Contractor with a written assessment (location and severity) of the segregated areas as soon as possible following each inspection.

(ii) Inspection Following Construction

The Consultant shall conduct a second inspection of the top lift, normally 2 weeks after the completion of paving work. During this inspection, the Consultant will identify and record any areas of slight, moderate and severe segregation and any areas of centre-of-paver streak which were not identified in the inspections during construction. The Consultant will provide the Contractor with a written assessment (location and severity) of the segregated areas as soon as possible following this inspection.

3.53.4.7.4 Repairing Pavement Segregation

Pavement segregation identified during the inspection performed 2 weeks after the completion of paving operations will not require repair. However, this shall not relieve the Contractor from his responsibility to repair any obvious defects, deteriorated repairs or failures which become evident within the warranty period.

Pavement segregation identified in the inspections performed during construction shall be repaired by the Contractor at his expense and in accordance with the following:

Moderate and severe segregation in the top lift of pavement and on entrances and intersections shall require repair.

For entrances and the portion of intersections outside the through travel lanes and shoulders, areas of moderate and severe segregation shall be repaired in accordance with the methods of repair listed for moderate segregation. Intersections and entrances shall also be neatly shaped, smooth and free of surface defects and depressions.

Slight segregation on any lift of pavement will not require repair.

Moderate segregation on lower lifts will not require repair.

Severe segregation on lower lifts will only require repair in instances where, in the opinion of the Consultant, the segregated area will affect the long term structural integrity of the pavement structure. Such repair will not be required in instances where the Consultant determines that the paver screed is "dragging" due to distortion of the existing surface.

Only moderate and severely segregated centre-of-paver streak on the top lift of pavement will require repair.

The following methods of repair are pre-approved:

Moderate Segregation - The Contractor has the option of using a slurry patch or a hot mix patch.

Severe Segregation - The Contractor has the option of removal and replacement or overlay.

Any other methods of repair proposed by the Contractor will be subject to the approval of the Consultant with the exception that the application of asphalt (by distributor, hand spraying, squeegeeing, etc.) shall not be permitted as a method of repair under any circumstances.

Repairs for segregation using an overlay shall be for the entire pavement width. Repairs for segregation using removal and replacement shall be for the full lane width, full lane width and shoulder or the shoulder only as applicable, depending on the extent of the segregated area. The full depth of the asphalt lift shall be removed and replaced with new ACP using an appropriate paver and cold milling equipment. All ACP material used for overlay and removal and replacement repairs shall have a tack coat applied prior to placement and will be subject to the requirements of Section 3.53.6.3, End Product Rejection.

The Consultant will mark out the area of repair. The "marked area" shall extend a minimum of 0.5 metres beyond the segregated area. For centre-of-paver streak, the "marked area" shall extend a minimum of 100 mm laterally and 0.5 metres longitudinally beyond the streak.

All repairs shall be regular in shape and finished using good workmanship practises to provide an appearance suitable to the Consultant. Traffic shall be kept off all repairs for a sufficient period of time to ensure that tracking does not occur.

All hot mix and other repairs for which compaction is normally required shall be properly compacted.

In the event repairs cover existing roadway lines or markings, the Contractor shall reinstate the lines and markings at his expense and to the satisfaction of the Consultant.

Repairing pavement segregation will not affect the assessment of segregation payment adjustments.

Repairs shall be completed during construction or shortly after construction, except when prevented by inclement weather or seasonal shutdown. In these cases, the Contractor shall complete the repairs prior to June 15 of the following year.

3.53.4.8 **Appeal of Acceptance Test Results and Appeal Testing**

3.53.4.8.1 Density, Asphalt Content and Gradation

Appeal testing will be done using ATT-68. The Contractor may appeal the results of acceptance testing of Density, Asphalt Content or Gradation for any rejected or penalized Lot only once. Appeals will only be considered if cause can be shown. Quality Control test results for density which are provided to the Consultant subsequent to the Contractor's receipt of the quality assurance test results for that Lot will not be considered when evaluating cause for an appeal. The appeal shall be for all tests within the Lot, and there will be no appeal allowed for single tests within a Lot.

Any attempt to improve density on the appealed Lot after the Consultant has tested the Lot for acceptance shall void the appeal and the original test results will apply.

The following procedures will apply for an appeal:

(i) For Gradation and Asphalt Content appeals, the Contractor shall serve notice of appeal to the Consultant, in writing, within 48 hours of receipt of the test results.

For all other appeals notice shall be served to the Consultant, in writing, within 24 hours of receipt of the test results.

(ii) The Consultant will arrange and pay for an independent testing laboratory certified to operate in the Province of Alberta, to perform the appeal testing. The personnel employed or testing laboratory retained by the Contractor for quality control testing on the project will not be used for appeal testing.

(iii) The Consultant will determine the number and location of the new tests for each segment in accordance with Section 3.53.4.4.2. The Contractor shall sample the pavement at such locations and provide the samples to the Consultant.

(iv) For appeals other than gradation appeals, the single high and single low test results from the old Lot will be rejected and the remaining test results will be added to the results of the new tests. A new Lot Mean for the test results will be determined and used for acceptance and unit price adjustment.

For gradation appeals, all tests from the old Lot will be retained and averaged with the new appeal tests. A new Lot Mean and Range for all tests will be determined and used for acceptance and unit price adjustment.

The new values, thus determined, in all cases, will be binding on the Contractor and the Department.

3.53.4.8.2 Smoothness

The Contractor may appeal acceptance test results of smoothness of any rejected or penalized Sublot once. The appeal shall be in writing and submitted within 24 hours of receipt of the test results.

Any attempt to improve smoothness on the appealed Sublot after the Consultant has tested the Lot for acceptance shall void the appeal and the original test results will apply.

The appeal testing will be performed by the Consultant and the new results will be binding on the Contractor and the Department.

3.53.4.8.3 Segregation Rating

The Contractor may appeal the rating of segregated areas classified as moderate or severe in any portion of the Work or the entire project.

The following procedures will apply for an appeal:

(i) The Contractor must serve written notice of the appeal to the Consultant within 7 days of receipt of the final segregation assessment. The written notice shall detail the location(s) and nature of the appeal.

(ii) The Consultant will determine a representative sample of the portion of the Work appealed, and will reassess this area. Generally, this reassessment will be completed within 2 weeks of the Consultant's receipt of the written notice of appeal.

Based on the reassessment of the representative sample, the Consultant will determine whether or not a reassessment of the entire appealed work is necessary.

3.53.4.8.4 Payment of Appeal Testing Costs for Asphalt Content, Smoothness or Gradation

If the new results show that a penalty no longer applies, then sampling and testing costs for the appeal procedures for that Lot will be the responsibility of the Department. Furthermore, in such cases the Contractor shall be reimbursed sampling costs at the rate of $50 per location.

If the new results verify that any unit price reduction or rejection remains valid for that Lot, then the Contractor will be invoiced by the Department for the testing costs for the appeal procedures at the following rates:

Asphalt Content: $ 1,750.00 for the first appeal Lot
$ 750.00 for subsequent Lots if an asphalt correction factor is not required.

Gradation: $ 750.00 per appeal

Profilograph: $ 100.00 per hour (travel time, testing time and standby time)

3.53.4.8.5 Payment of Appeal Testing Costs for Density

If the new results indicate that the new Lot Mean for Density is no longer in a penalty situation and that the Lot Mean has increased by more than 0.8%, then the costs of sampling and testing for the appeal procedures shall be the responsibility of the Department. Furthermore, in such cases the Contractor shall be reimbursed sampling costs at the rate of $50 per location.

If the new results indicate that the Lot Mean for Density is either in a penalty situation or has not increased by more than 0.8%, then the Contractor shall be invoiced by the Department for the sampling and testing costs for the appeal procedures at a rate of $250.00 per Lot appealed.

3.53.4.8.6 Payment of Appeal Testing Costs for Segregation Rating

If a reassessment of the appealed Work results in a change in the original rating, the revised rating will apply.

If the overall payment adjustment for segregation is reduced as a result of an appeal, the cost of the reassessment will be borne by the Department.

If there is no change to the overall payment adjustment for segregation or if the overall payment adjustment is increased, the Contractor will be charged an amount of $3,500.00.

3.53.5 CONSTRUCTION

3.53.5.1 **Equipment**

3.53.5.1.1 General

Equipment shall be designed and operated to produce an end product complying with the requirements of this specification.

3.53.5.1.2 Mixing Plant

Mixing plants shall be operated in accordance with the manufacturer's recommendations and shall be calibrated prior to commencing production of the specified mix. The Contractor shall provide the Consultant with a certificate of calibration which certifies that the plant has been calibrated to produce a uniform mixture in accordance with the Job Mix Formula.

When asphalt concrete pavement contains Reclaimed Asphalt Pavement, the mixing plant shall be capable of thoroughly separating and heating the RAP particles and blending the RAP with virgin aggregate and any required asphalt cement, to create a homogeneous mix at the plant discharge. The plant shall also contain specialized mixing equipment that will prevent the RAP from coming into direct contact with the flame, thus minimizing "blue smoke" and oxidation of the asphalt in the RAP.

3.53.5.1.3 Mix Production

Aggregate and asphalt shall be combined to produce a uniform mixture of specified gradation at an asphalt content in accordance with the approved Job Mix Formula and in which all particles of aggregate are uniformly coated.

Unless otherwise specified, the maximum mixing temperature for all grades of asphalt shall be 155E C , or for Performance Grade specified asphalt, as recommended in writing by the asphalt supplier.

Plant emissions shall not exceed the limits set by Alberta Environment.

3.53.5.2 **Preparation of Existing Surface**

3.53.5.2.1 General

Failed areas in existing surfaces shall be repaired in accordance with Specification 3.1 Subgrade Preparation, or as

directed by the Consultant. Areas requiring repair will be identified by the Consultant in consultation with the Contractor.

Before the asphalt mix is placed, dirt and other objectionable material shall be removed from the surface to be paved, by brooming or other methods and a tack coat or prime coat shall be applied in accordance with Specification 3.19, Prime, Tack and Fog Coats.

Existing fillets and ramps at approaches to railway crossings and bridge structures, or adjacent to paved surfaces or other structures, shall be removed to the depths shown on the plans or as directed by the Consultant. The removed material shall be disposed of and the exposed surfaces shall be prepared as directed by the Consultant.

Contact edges of existing mats and contact faces of curbs, gutters, manholes, sidewalks and bridge structures shall be coated with a thin film of liquid asphalt material before placing the asphalt mix.

3.53.5.2.2 Preliminary Levelling

Areas that require preliminary levelling will be identified by the Consultant. Generally, areas that show depressions, rutting or other deformations to a depth of 15 mm or greater will be designated by the Consultant for preliminary levelling and all the following shall apply for acceptance:

(i) material for preliminary levelling shall be the same designation and class as specified for the subsequent lift of asphalt concrete pavement;

(ii) asphalt mix for preliminary levelling shall be spread by means of a motor grader or other methods approved by the Consultant;

(iii) only pneumatic tired rollers will be allowed for compaction, and a minimum density of 87.0% of the Maximum Specific Gravity, as determined by the Consultant, is required;

(iv) preliminary levelling is intended to be a separate operation and shall not be done as part of the construction of the subsequent lift of asphalt concrete pavement.

3.53.5.2.3 Transverse Pavement Joints

Transverse joints between existing pavement and ACP placed under this Contract shall be of a vertical butt type, well bonded, sealed and finished to provide a continuous, smooth profile across the joint. This shall include tie-ins to all paved road allowances and approaches to bridges and railway crossings. Tie-ins to streets, parking lots and other urban approaches shall be as specified in the special provisions. To accomplish this, the existing pavement shall be cold-milled to expose a vertical surface, of a depth equal to the thickness of the final lift, against which new ACP may be placed. In longitudinal section the minimum slope of the milled area shall be 200 horizontal to 1 vertical, all in general conformance with drawing CB6-3.50M16. In plan, the Contractor shall have the option of cutting the joint in any of the three ways following:

(i) The joint shall be cut at 45E to the centreline of the roadway across the full width of each mat; or

(ii) The joint shall be cut at 45E to the roadway centreline across the travel lanes and contiguously at 90E to the roadway centreline elsewhere; or

(iii) For bridges and railway crossings the joint shall be cut parallel to the crossing.

When the existing pavement has been removed in advance of paving the joint area, the Contractor shall construct

a smooth taper at the joint area to a slope of at least 50 horizontal to 1 vertical. The taper may be placed on tar paper and shall be removed when paving is resumed as directed by the Consultant. The transverse joint shall be straight and have a vertical face when the taper is removed.

3.53.5.3 **Transporting the Asphalt Mix**

The mix shall be transported in accordance with Specification 4.5, Hauling. Trucks used for transportation of the mix shall be compatible with the size and capacity of the spreading equipment.

Truck boxes shall be clean, free from accumulations of asphalt mix and foreign material. Excess truck box lubricants such as light oil, detergent or lime solutions shall not be allowed to contaminate the mix, and shall be disposed of in an environmentally acceptable manner.

During transport, the mix shall be completely covered to protect it from precipitation and excessive heat loss by securely fastened waterproofed tarpaulins, unless otherwise approved by the Consultant.

3.53.5.4 **Placing the Mix**

Asphalt mix shall be placed only on dry surfaces.

Unless otherwise shown on the plans, the asphalt mix shall be placed in the following lift thicknesses:

(i) in a single lift when the design compacted total thickness is 70 mm or less.

(ii) in two or more lifts when the design compacted total thickness is greater than 70 mm. The lift thickness selection shall be determined by the Contractor except that:

a) the maximum thickness of any lift shall be 100 mm.

b) the minimum thickness of a top lift shall be 50 mm.

c) When a total ACP thickness of 80 mm is specified, the thickness of the first lift shall be 30 mm and the final lift shall be 50 mm.

d) When a total ACP thickness of 90 mm or more is specified, the minimum thickness of all lifts except the top lift shall be 40 mm or greater.

Lift thickness will normally be designed and expressed in increments of 10 mm.

Longitudinal joints will not be permitted between the edges of driving lanes in the final lift of ACP. Longitudinal joints shall be offset a minimum of 150 mm from one lift to the next.

Longitudinal and transverse joints shall be vertical butt type, well bonded and sealed, and finished to provide a continuous, smooth profile across the joints. Surplus material at longitudinal joints shall be disposed of in a manner acceptable to the Consultant. Broadcasting surplus material across the mat will not be permitted.

If required by the Consultant the contact edge of any mat placed by the Contractor shall be coated with a thin film of liquid asphalt before placing the adjacent mat.

When paving is discontinued in any lane, the mat shall be tapered to a slope of 10 horizontal to 1 vertical. The taper may be placed on tar paper and shall be removed when paving is resumed. The transverse joint shall be

straight and have a vertical face when the taper is removed.

Transverse construction joints from one lift to the next shall be separated by at least 2 metres.

Where the construction of a top lift of pavement next to a concrete curb section or curb and gutter section will be delayed, the Contractor shall construct a temporary asphalt concrete fillet next to the concrete section in accordance with the plans or as directed by the Consultant. These fillets shall be removed when paving is resumed.

Placement of ACP adjacent to guardrail shall conform with Dwg. No. TEB 3.56.

3.53.5.5 **Road Intersections and Entrances**

Road intersections and entrances shall be paved in accordance with the plans or as herein described in these specifications.

On all road intersections, median cross overs and residential farm entrances, the asphalt mix shall be spread by means of a paver. No grader laying will be permitted except for bottom lift or preliminary levelling.

On all other entrances, the asphalt mix shall be spread by means determined by the Contractor and in a manner acceptable to the Consultant.

3.53.5.6 **Compacting the Mix**

All asphalt mix, including those areas of the mat which are excluded from testing as noted in Section 3.53.4.4.2.1 , shall be thoroughly compacted, and after final rolling the finished surface of the mat shall be free from segregation, waves, hairline cracks, and other obvious defects.

After final rolling is complete, the Contractor shall ensure that the finished mat has cooled for a minimum period of 2 hours before opening the section to traffic.

3.53.5.7 **Asphalt Mix For Others**

The Contractor shall make available, on request, additional asphalt mix for the use of the Department. The estimated quantity of additional mix is shown in the unit price schedule as "Asphalt Mix For Others." This additional mix will be picked up at the mixing plant by other forces at times that are mutually agreeable to the Contractor and the Consultant.

3.53.5.8 **Interim Lane Markings**

The Contractor shall provide interim lane markings on all newly constructed ACP surfaces, or on tacked surfaces that are to be exposed to traffic overnight.

When paint is used, the paint shall be the same colour as the permanent markings designed for the Work.

All paint spots shall be 100 mm wide and 300 mm long, shall be applied lengthwise to the road surface, shall be spaced 15 m apart on centre in tangent sections and 7.5 m apart on curves and shall be completely covered with glass beads at the time of painting.

When self-adhesive, reflectorized pavement marking tape is used, the spacing shall be the same as is used for paint spots. Tape on lower lifts does not need to be removed prior to placement of the next lift of pavement. If tape is

used on the upper lift, it shall be removed immediately prior to painting the permanent lane markings.

When Davidson Temporary Pavement markers are used, they shall be placed at 25 m intervals on tangent sections and at 15 m intervals on curves. Markers used on the upper lift must remain in place until the permanent markings are applied. Markers used on lower lifts, shall be removed immediately prior to placement of the next lift of pavement.

3.53.5.9 **Grooved Rumble Strips**

When specified in the Special Provisions, the Contractor shall construct grooved rumble strips as shown on drawing CB6-3.50M15.

No grooving will be done across intersections or accesses nor at any other locations specified by the Consultant.

The grooving shall be applied only to the top lift of the pavement and may be formed by any means which the Contractor may propose and which are acceptable to the Consultant. The Contractor shall remove and repair any grooving placed beyond the limits outlined, at his own expense.

3.53.6 END PRODUCT ACCEPTANCE OR REJECTION

3.53.6.1 **General**

The Contractor shall provide an end product conforming in quality and accuracy of detail to the dimensional and tolerance requirements of the specifications and drawings. Where no tolerances are specified, the standard of workmanship shall be in accordance with normally accepted good practice.

3.53.6.2 **End Product Acceptance**

3.53.6.2.1 Acceptance at Full or Increased Payment

Acceptance of any Lot at full or increased payment will occur if it contains no obvious defects and if:

(i) for lifts 35 mm or greater, the Lot Mean for density of the compacted mix in the Lot meets or exceeds 93.0% of the Lot Mean Maximum Specific Gravity as established from samples of the mix being produced.

(ii) for lifts less than 35 mm and greater than 20 mm, full payment will occur if the Lot Mean for density of the compacted mix in the Lot meets or exceeds 90.0% and increased payment will occur if the Lot Mean for density in the Lot exceeds 93.0%.

(iii) for 20 mm lifts, full payment will occur if the if the Lot Mean for density of the compacted mix in the Lot meets or exceeds 89.0 % and increased payment will occur if the Lot Mean for density in the Lot exceeds 93.0%.

(iv) the Lot Mean for Actual Asphalt Content of the mix, is within 0.3 of the Approved Asphalt Content. On QC Acceptance Lots, where quality assurance test results for asphalt content are not available, the Contractor's quality control test results shall be used. Quality assurance test results when available shall replace any corresponding quality control test results.

(v) for smoothness, full payment will occur if the Profile Index of all Sublots in the Lot in the top lift of pavement:

(a) does not exceed 10 mm for multilift applications,

(b) does not exceed 15 mm for single lift applications and

(c) does not exceed 22 mm for applications through areas of curb and gutter,

over 0.1 km for any 0.1 km section.

Increased payment will occur for any of the above lift applications if the Profile Index of all Sublots in the Lot in the top lift of pavement is 0.

(vi) individual bumps and dips in the top lift of pavement do not exceed 8 mm.

(vii) For gradation in QA Acceptance Lots only, full payment will occur if there are no Lot Mean Adjustments for gradation and increased payment will occur if there are no Lot Mean Adjustments and the Maximum Range as shown in Table 3.53 D is not exceeded for any sieve size in the Lot.

For gradation in QC Acceptance Lots, consideration is only given to acceptance at full payment. No increased payment will be applied using quality control test results.

3.53.6.2.2 Acceptance at Reduced or Adjusted Payment

Acceptance of any Lot at reduced payment will occur if it contains no obvious defects and if;

(i) the quality assurance test results are such that the Lot or Sublot meets with requirements for acceptance at a reduced payment. For asphalt content and aggregate gradation no decreased payment will be applied using quality control test results.

(ii) the Lot or Sublot is approved in respect of all other requirements.

(iii) the Contractor has not notified the Consultant in writing that he will exercise his option to repair or remove and replace the Work at his own cost with work meeting the requirements for acceptance at full or increased payment.

(iv) individual bumps and dips measuring 12 mm or greater have been repaired.

(v) individual bumps and dips exceeding 8 mm and less than 12 mm which have been designated by the Consultant as unacceptable, have been repaired.

Both bonus and penalty adjustments may be made for any Lot in accordance with Section 3.53.7, Measurement and Payment.

3.53.6.3 **End Product Rejection**

If the Lot Mean for Density or Actual Asphalt Content are outside the applicable acceptance limits, then the Lot is rejected automatically, regardless of the values of the other control characteristics.

If the smoothness of the top lift of any Sublot is outside the acceptance limit, then the Sublot is rejected automatically, regardless of the values of the other control characteristics.

The finished surface of any lift shall have a uniform close texture and be free of visible signs of poor workmanship.

Any obvious defects as determined by the Consultant such as, but not limited to the following, will be cause for automatic rejection of asphalt concrete pavement regardless of the values of any other control characteristic.

(i) individual bumps and dips 12 mm or greater. The Consultant may reject asphalt concrete pavement with individual bumps and dips exceeding 8 mm and less than 12 mm.

(ii) segregated areas not already covered in Section 3.53.4.7, Pavement Segregation Requirements.

(iii) areas of excess or insufficient asphalt.

(iv) improper matching of longitudinal and transverse joints.

(v) roller marks.

(vi) tire marks.

(vii) cracking or tearing.

(viii) sampling locations not properly reinstated.

(ix) improperly constructed patches.

When ACP is rejected by reason of obvious defects, the minimum area of rejection will be Sublot size as defined in Section 3.53.1.2 of this specification.

Rejected work shall be promptly repaired, remedied, overlayed, or removed and replaced all in a manner acceptable to the Consultant. The Contractor shall be responsible for all costs including materials.

No payment will be made for work in any Lot or Sublot which has been rejected, until the defects have been remedied.

If an overlay is used as a corrective measure on a defective Lot or Sublot, the overlay thickness will be subject to the approval of the Consultant. Where an overlay is used as a corrective measure in any lane, adjacent lanes shall also be overlayed to the same thickness and length, regardless of whether the adjacent lanes were acceptable or not. The overlay will be subject to the same specifications as the original pavement, except that the minimum thickness of an overlay shall be 40 mm.

3.53.7 MEASUREMENT AND PAYMENT

The unit prices for the following items of work shall be full compensation for all labour, material, tools, equipment and incidentals necessary to complete the work in accordance with these specifications.

3.53.7.1 **Asphalt Concrete Pavement - Superpave**

Accepted asphalt concrete pavement will be measured in tonnes and will be paid for at the unit price bid per tonne for "Asphalt Concrete Pavement - Superpave" subject to the unit price adjustments and assessments hereinafter specified. This payment will be full compensation for supplying, applying and maintaining tack coat; supplying the asphalt binder; processing, hauling and placing the mix; interim lane marking and quality control.

3.53.7.1.1 Pay For Acceptable Work

The following end product properties of "Asphalt Concrete Pavement - Superpave" will be measured for acceptance in accordance with Section 3.53.4.4, Acceptance Sampling and Testing.

(i) Density
(ii) Actual Asphalt Content
(iii) Smoothness
(iv) Aggregate Gradation

For the Density, Actual Asphalt Content of a Lot to be acceptable, the Lot Means must be within the acceptance limits shown in Tables 3.53 A and 3.53 B respectively.

For each Lot, the unit price adjustments for Density and Actual Asphalt Content will be the amounts shown in Tables 3.53 A and 3.53 B for the Sample Mean of the test results for that Lot.

For each Lot, the unit price adjustment for Gradation will be as defined in Section 3.53.4.6, Aggregate Gradation Requirements.

The Unit Price applicable to each Lot quantity of "Asphalt Concrete Pavement - Superpave" will be calculated as follows:

Lot Unit Price Per Tonne	=	Contract Unit Price Bid Per Tonne	+	the sum of the unit price adjustment for PAd and PAa and PAg

where:

PAd = Unit Price Adjustment for Density (bonus or penalty)
PAa = Unit Price Adjustment for Asphalt Content (penalty only; QA Acceptance Lots only)
PAg = Unit Price Adjustment for Gradation (bonus or penalty; QA Acceptance Lots only)

If the Lot Mean for Density, Actual Asphalt Content or Gradation for any Lot is outside the acceptance limit, the Lot is rejected, and no payment will be made for the quantity of asphalt concrete pavement in that Lot, until the defect has been remedied.

For the Smoothness of any Sublot in the top lift of ACP to be acceptable, the PrI must be within the limits shown in Table 3.53 C. For each Sublot in the top lift of ACP, the penalty assessment for Smoothness will be the amounts shown in Table 3.53 C for the PrI of that Sublot. All of these penalty assessments so determined will be deducted from the payment made for Asphalt Concrete Pavement-Superpave.

Every Sublot in the top lift of ACP that is outside the acceptance limit for smoothness will be rejected and payment will not be made for the quantity of asphalt concrete pavement in these Sublots until they have been made acceptable. Payment for the remainder of the Lot will be made in accordance with the above formula using PAd, PAa and PAg as determined for the Lot from which will be subtracted any penalty assessment for smoothness.

No payment will be made for any material, equipment or manpower used to improve acceptable work that is or was subject to unit price adjustment or penalty assessment.

3.53.7.1.2 Segregation Payment Adjustments

Payment adjustments for pavement segregation shall apply to the top lift of ACP only and in accordance with the following:

Segregated areas, centre-of-paver streak and any repaired segregated areas identified by the Consultant either during construction or during the inspection conducted 2 weeks after the completion of paving work, will be used to determine payment adjustments. Payment adjustments will not apply to segregated areas 0.1 m^2 or less or on centre-of-paver streaks 1 metre or less in length.

Segregated areas (excluding centre-of-paver streaks) separated by less than 3 metres shall be considered a single area for the determination of payment adjustments. For centre-of-paver streaks, each area will be measured separately for payment adjustments.

Payment adjustments for segregation will not apply to entrances or the portion of an intersection outside the through travel lanes and shoulders.

If a segregated area is identified by the Contractor and repaired prior to inspection by the Consultant it will be classified as "moderate" for the purpose of determining payment adjustments.

The total payment adjustment for segregation is determined as follows:

Each lane.km of the completed pavement is inspected separately by the Consultant. A "lane" includes the adjoining shoulder. Measurement of lane.kms will be made in 1 kilometre (or partial kilometre) long segments, 1 lane wide as shown on the contract plan. Acceleration and deceleration lanes and interchange ramps are considered separate lanes.

For each lane.km, the Consultant will determine the following:

(i) the total number of slight segregated areas and
(ii) the total number of moderate and severe segregated areas and
(iii) the total length of centre-of-paver streak (determined by adding each instance of streak that is in excess of 1 metre in length)

These values will be used for the “segregation frequencies” and "length of centre-of-paver streak" in Tables A, B & C as applicable, with the exception that for partial lane·kms, the segregation frequency for slight segregation will be calculated by dividing the actual number of slight segregated areas by length of the segment assessed (expressed in kilometres) and rounding to the nearest whole number.

Table A Payment Adjustment for Slight Segregation

Segregation Frequency of Slight Areas (per lane·km)	Payment Adjustment $ per lane·km
0	Note 3
1 or 2	Note 4
Greater than 2	- (number of areas - 2) x $100

Table B Payment Adjustment for Moderate and Severe Segregation

Segregation Frequency of Moderate and Severe Areas (per lane·km)	Payment Adjustment $ per lane·km
0	Note 3
Greater than 0	- (number of areas) x $500

Table C Payment Adjustment for Centre-of-Paver Streak

Length of Centre-of-Paver Streak (per lane·km)	Payment Adjustment $ per lane·km
1 metre or less	Note 3
Greater than 1 metre	- $1.50 per linear metre

Notes:

1. Total payment adjustment per lane·km for segregation will be the sum of Tables A, B and C.

2. For partial lane kilometres, the payment adjustments for Table A will be prorated based upon the actual length of segment assessed.

3. Lane kilometres with no areas of segregation of any type or severity, or any centre-of-paver streaks will be assigned a bonus payment of $1000 per lane.km.

   (For partial lane.kms the bonus will be prorated based upon the actual length of the segment assessed.)

4. Lane kilometres with 1 or 2 areas of slight segregation, no moderate or severely segregated areas and no centre-of-paver streak will be assigned a bonus payment of $500 per lane.km.

   (For partial lane.kms the bonus will be prorated based upon the actual length of the segment assessed.)

5. The maximum penalty adjustment for segregation shall be limited to $2,000 per lane·km. For partial lane·kms, this adjustment will be prorated based upon the actual length of segment assessed.

3.53.7.1.3 Payment For Work That Had Been Rejected, But Was Made Acceptable

When defects have been remedied in Lots or Sublots which had been rejected, payment for the original quantity of material in those Lots or Sublots will be made subject to unit price adjustments and penalty assessments determined as follows:

(i) Penalty or bonus assessments will be made for smoothness as follows:

Penalty or bonus assessments for PrI will be the amounts shown in the applicable section of Table 3.53 C and will be based on Profilograph tests following the Contractor's corrective efforts for any bumps and dips.

Penalty assessments for bumps and dips will be $300.00 for each individual bump or dip over 8 mm and will be based on initial Profilograph testing conducted by the Consultant. Repairs carried out by the Contractor will not affect the penalty assessment for bumps and dips.

(ii) The unit price adjustment for Asphalt Content, Density and Gradation will be based on testing of the replacement or overlay material where applicable. Where replacement or overlay material does not cover the entire Lot or Sublot, prior tests on the uncovered area will be averaged with new tests on the corrective work.

The unit price adjustment determined through retesting of the corrective work will be applied to that quantity of material in the Lot or Sublot which was originally rejected, to determine payment.

No payment will be made for any material used to replace, repair or overlay rejected work and all corrective work shall be performed entirely at the Contractor's expense.

3.53.7.2 **Repair of Failed Areas in Existing Surfaces**

Repair of failed areas in existing surfaces as identified under Section 3.53.5.2 will be paid for at the Contract unit prices bid for the work. Unit price adjustment will not apply to material used to repair failed areas in existing surfaces.

3.53.7.3 **Removal and Disposal of Fillet and Ramp Material**

The removal and disposal of fillet and/or ramp material will be considered incidental to the Work and will not be paid for separately.

3.53.7.4 **Transverse Pavement Joints**

Constructing transverse pavement joints including any required cold-milling will be considered incidental to the Work and will not be paid for separately.

3.53.7.5 **Preliminary Levelling**

Accepted material used for preliminary levelling will be measured and paid for at the unit price bid for Asphalt Concrete Pavement - Superpave where applicable. Unit Price Adjustments will not apply to material used for levelling. No payment will be made for unacceptable material.

3.53.7.6 **Asphalt Mix For Others**

Accepted additional asphalt concrete mixture will be measured in tonnes and paid for at the unit price bid for "Asphalt Mix For Others".

Unit price adjustment will not apply to additional asphalt concrete received at the plant by other forces.

3.53.7.7 **Grooved Rumble Strips**

Measurement of shoulder grooving will be made parallel to the road centreline, to the nearest 0.001 km of through highway chainage for each side of the road where accepted grooving is performed.

Payment for shoulder grooving will be made at the unit price bid per kilometre for "Grooved Rumble Strips". This payment will be full compensation for all labour, equipment, tools, materials and incidentals necessary to complete the Work.

Table 3.53 A
UNIT PRICE ADJUSTMENT FOR DENSITY

% of Maximum Specific Gravity	UNIT PRICE ADJUSTMENT - DOLLARS PER TONNE		
	DESIGN LIFT THICKNESS		
Lot Mean	**35 MM OR GREATER**	**LESS THAN 35 MM AND GREATER THAN 20 MM**	**20 MM**
$ 94.0	+ 0.50	+ 0.50	+ 0.50
93.9	+ 0.45	+ 0.45	+ 0.45
93.8	+ 0.40	+ 0.40	+ 0.40
93.7	+ 0.35	+ 0.35	+ 0.35
93.6	+ 0.30	+ 0.30	+ 0.30
93.5	+ 0.25	+ 0.25	+ 0.25
93.4	+ 0.20	+ 0.20	+ 0.20
93.3	+ 0.15	+ 0.15	+ 0.15
93.2	+ 0.10	+ 0.10	+ 0.10
93.1	+ 0.05	+ 0.05	+ 0.05
93.0	0.00	0.00	0.00
92.9	- 0.10	0.00	0.00
92.8	- 0.20	0.00	0.00
92.7	- 0.30	0.00	0.00
92.6	- 0.40	0.00	0.00
92.5	- 0.50	0.00	0.00
92.4	- 0.60	0.00	0.00
92.3	- 0.70	0.00	0.00
92.2	- 0.80	0.00	0.00
92.1	- 0.90	0.00	0.00
92.0	- 1.00	0.00	0.00
91.9	- 1.10	0.00	0.00
91.8	- 1.20	0.00	0.00
91.7	- 1.30	0.00	0.00
91.6	- 1.40	0.00	0.00
91.5	- 1.50	0.00	0.00
91.4	- 1.60	0.00	0.00
91.3	- 1.70	0.00	0.00
91.2	- 1.80	0.00	0.00
91.1	- 1.90	0.00	0.00
91.0	- 2.00	0.00	0.00
90.9	- 2.20	0.00	0.00
90.8	- 2.40	0.00	0.00
90.7	- 2.60	0.00	0.00
90.6	- 2.80	0.00	0.00
90.5	- 3.00	0.00	0.00
90.4	- 3.20	0.00	0.00
90.3	- 3.40	0.00	0.00
90.2	- 3.60	0.00	0.00
90.1	- 3.80	0.00	0.00
90.0	- 4.00	0.00	0.00
89.9		- 0.10	0.00
89.8		- 0.20	0.00
89.7		- 0.30	0.00
89.6		- 0.40	0.00
89.5		- 0.50	0.00
89.4		- 0.60	0.00
89.3		- 0.70	0.00
89.2		- 0.80	0.00
89.1		- 0.90	0.00
89.0		- 1.00	0.00
88.9		- 1.10	-0.10

Table 3.53 A
UNIT PRICE ADJUSTMENT FOR DENSITY

% of Maximum Specific Gravity	UNIT PRICE ADJUSTMENT - DOLLARS PER TONNE		
	DESIGN LIFT THICKNESS		
Lot Mean	**35 MM OR GREATER**	**LESS THAN 35 MM AND GREATER THAN 20 MM**	**20 MM**
88.8		- 1.20	-0.20
88.7		- 1.30	-0.30
88.6		- 1.40	-0.40
88.5		- 1.50	-0.50
88.4		- 1.60	-0.60
88.3		- 1.70	-0.70
88.2		- 1.80	-0.80
88.1		- 1.90	-0.90
88.0		- 2.00	-1.00
87.9		- 2.20	-1.10
87.8		- 2.40	-1.20
87.7		- 2.60	-1.30
87.6		- 2.80	-1.40
87.5		- 3.00	-1.50
87.4		- 3.20	-1.60
87.3		- 3.40	-1.70
87.2		- 3.60	-1.80
87.1		- 3.80	-1.90
87.0		- 4.00	-2.00
86.9			-2.20
86.8			-2.40
86.7			-2.60
86.6			-2.80
86.5			-3.00
86.4			-3.20
86.3			-3.40
86.2			-3.60
86.1			-3.80
86.0			-4.00

For lower lifts greater than 35 mm design lift thickness, when the Lot Mean for Density is less than 90.0% and greater than 87.0%, payment will be at 50% of the unit bid price.

For 20 mm designated lifts, when the Lot Mean for Density is less than 86.0% and greater than 84.0%, payment will be at 50% of the unit bid price. 20 mm designated lifts below 84% average density shall be removed and replaced.

For top lifts where the Lot Mean for Density is from 89.9% to 88.0%, the Contractor shall either overlay or remove and replace the previously placed mix.

Except for 20 mm lifts, the Contractor shall remove and replace the mix when the Lot Mean for Density is less than 88.0% for top lifts and when the Lot Mean for Density is less than 87.0% on lower lifts.

Table 3.53 B
UNIT PRICE ADJUSTMENT FOR ASPHALT CONTENT

Deviation of the Actual Asphalt Content from the Approved Asphalt Content	**Unit Price Adjustment for Asphalt Content PAa $ per tonne**			
	Top Lift		**Lower Lift**	
	Below	Above	Below	Above
From 0 to 0.30	0.00	0.00	0.00	0.00
From 0.31 to 0.35	-1.10	-0.90	-1.10	-0.90
From 0.36 to 0.40	-2.20	-1.80	-2.20	-1.80
From 0.41 to 0.45	-3.30	-2.70	-3.30	-2.70
From 0.46 to 0.50	-4.40	-3.60	-4.40	-3.60
From 0.51 to 0.55			-5.50	-4.50
From 0.56 to 0.60			-6.60	-5.40
From 0.61 to 0.65			-7.70	-6.30

For top lift deviations of more than 0.50% the Contractor shall either overlay or remove and replace the previously placed mix.

For lower lift deviations of more than 0.65%, the Department will determine whether removal and replacement is necessary. For material that is allowed to stay in place, payment will be at 50% of the unit price bid.

Table 3.53 C
LUMP SUM SUBLOT ASSESSMENT FOR SMOOTHNESS

PrI for Tangents and Curves	Assessment for Smoothness of Top Lift $ per Sublot Lump Sum		
	Multilift	Single Lift	Curb and Gutter
0	25.00	25.00	25.00
>0 and 10 or less	0.00	0.00	0.00
11	-40.00	0.00	0.00
12	-65.00	0.00	0.00
13	-90.00	0.00	0.00
14	-115.00	0.00	0.00
15	-140.00	0.00	0.00
16	-165.00	-40.00	0.00
17	-190.00	-80.00	0.00
18	-215.00	-120.00	0.00
19	-240.00	-160.00	0.00
20	-265.00	-200.00	0.00
21	-290.00	-240.00	0.00
22	-315.00	-280.00	0.00
23	-340.00	-320.00	-40.00
24	REJECT	REJECT	-80.00
25	"	"	-120.00
26	"	"	-160.00
27	"	"	-200.00
28	"	"	-240.00
29	"	"	-280.00
30	"	"	-320.00
Greater than 30	"	"	REJECT

PrI assessment for smoothness will not be applied to interchange ramps with radii of less than 190 metres. Penalty assessments for bumps and dips will be applied to all top lifts of pavements.

Single lift criteria shall also apply to cold mill and inlay.

TABLE 3.53 D TOLERANCES FOR THE LOT MEAN FROM THE JOB MIX FORMULA AND MAXIMUM RANGE BETWEEN INDIVIDUAL TEST RESULTS IN A LOT

CHARACTERISTICS	SIEVE SIZE Fm				
	(1)	1250	630	315	80
Tolerances for the Lot Mean from the Job Mix Formula	+/-5	+/-3	+/-2	+/-2	+/-1.5
Maximum Range Between Individual Test Results in a Lot	10	6	5	4	3

(1) Note: Include all sieves; 2 500, 5 000, 10 000, 12 500, 20 000, 25 000 up to nominal maximum size.

TABLE 3.53 E ADJUSTMENT POINTS FOR DEVIATIONS BEYOND THE REQUIREMENTS IN TABLE 3.53 D

SIEVE SIZE Fm	MEAN
(1)	5 for each 1% Deviation
2 500, 1250	1 for each 1% Deviation
630	2 for each 1% Deviation
315	2 for each 1% Deviation
80 Deviation ˜ 1.0% 80 Deviation ™ 1.0%	1.0 for each 0.1% Deviation 2.0 for each additional 0.1% Deviation

(1) Note: Include all sieve sizes; 5 000, 10 000, 12 500, 20 000, 25 000 up to nominal maximum size.

Lot Mean Adjustment points will be calculated for each Lot. A Lot Gradation Price Adjustment per tonne will be applied based upon on the following formula.

PAg = (A× -$0.02) + (B × -$0.20) + Bonus

Where:

PAg = Unit Price Adjustment for Gradation (bonus or penalty; QA Acceptance Lots only)

A = Mean Adjustment Points assessed within the gradation limits specified in Table 3.53.2.2A (excluding the requirements of Table 3.53.2.2B).

B = Mean Adjustment Points assessed outside the gradation limits specified in Table 3.53.2.2A (excluding the requirements of Table 3.53.2.2B).

Bonus = +$0.10 when there are no Mean Adjustment Points and the maximum range as shown in Table 3.53 D, is not exceeded for any sieve size in the Lot.