STANDARD SPECIFICATIONS
FOR
HIGHWAY CONSTRUCTION

Prepared by
Alberta Transportation
Edmonton, Alberta

SUMMARY OF SPECIFICATIONS

SUMMARY OF SPECIFICATIONS

SPEC. NO.	DESCRIPTION
	Section 4 - Miscellaneous
4.1	Asphalt Curb, Medians, Traffic Islands and Flumes
4.2	Concrete Curbs, Gutters, Sidewalks, Medians and Traffic Islands
4.5	Hauling
	Section 5 - Materials
5.2	Supply of Aggregate
5.5	Supply of Portland Cement Concrete
5.7	Supply of Asphalt
5.11	Supply of Portland Cement
5.14	Supply of Fence Material
5.16	Supply of Reinforced Concrete Pipe and Related Junctions, Fittings and Materials
5.17	Supply of Polyvinyl Chloride Pipe
5.18	Supply of Permanent Highway Signs, Posts and Bases
5.20	Supply of Line Painting Materials
5.21	Supply of Livestock Guards
5.22	Supply and Install Smooth Wall Steel Pipes
5.23	Supply of Corrugated Metal Pipe and Pipe Arches
5.24	Supply of Polyethylene Pipe
5.25	Supply of W-Beam Guardrail and Posts
5.26	Supply Box Beam Guardrail and Posts
5.27	Supply of Cable Barrier and Metal Posts
5.28	Supply Flexible Guide Post Traffic Delineators
5.29	Supply of Reinforcement
5.30	Supply of Metal Bin Retaining Wall
	Section 7 - Signing and Pavement Markings
7.1	Temporary Construction Signing
7.2	Painted Roadway Lines
7.3	Painted Pavement Messages
7.7	Permanent Highway Signing

TABLE OF CONTENTS

GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

1.1 DEFINITIONS AND INTERPRETATION

All Department employee titles and descriptions are subject to change based on prescribed operational parameters. In these Specifications, unless the context requires a contrary meaning:

1.1.1 BIDDER

"Bidder" shall mean any individual, partnership, or corporation submitting a tender for the Work contemplated, acting directly or through a duly authorized representative.

1.1.2 BRIDGE CULVERTS

"Bridge Culverts" shall mean Corrugated Steel Pipe and Structural Plate Corrugated Steel Pipe with an equivalent diameter of 1500 mm or greater usually associated with road crossings of streams or other small watercourses.

1.1.3 BRIDGE STRUCTURES

"Bridge Structures" shall mean major bridge structures generally associated with bridging roadways, railways or large watercourses.

1.1.4 CONTRACT

"Contract" shall mean the written agreement covering the performance of the Work and the furnishing of labour, equipment and Material in the construction of the Work, and shall include without limiting the generality of the foregoing, the Tender, Contract form, Contract bonds, Plans, Specifications, special provisions, notices, supplemental specifications, specification amendments and all supplemental agreements required to complete the Work.

1.1.5 CONTRACTOR

"Contractor" shall mean the person agreeing to perform the Work set out in the Contract.

1.1.6 CONSTRUCTION COMPLETION

Construction Completion shall mean when all Work specified in the Contract (excluding Work required during the warranty period) has been completed by the Contractor in accordance with the Specifications and Plans and accepted by the Department.

1.1.7 CONSULTANT

“Consultant” shall mean the professional Engineer or Engineering consulting firm that has been retained by the Department to administer this Contract.

1.1.8 CONSULTANT'S REPRESENTATIVE

"Consultant's Representative" shall mean the person assigned by the Consultant to the Work, acting within the scope of the particular duties entrusted to him.

1.1.9 DEPARTMENT

"Department" shall mean Her Majesty the Queen in right of Alberta, as represented by Alberta Transportation and includes a person authorized by the Minister to perform, on his behalf, any of his functions under the Contract.

1.1.10 MATERIAL

"Material" shall mean all or any part of the commodities or other items used or expended in the prosecution of the Work and includes materials furnished by the Contractor or by the Department for use by the Contractor.

1.1.11 MINISTER

"Minister" shall mean the person holding the position of the Minister of Transportation for the Province of Alberta or his authorized representative.

1.1.12 PERSON

"person" shall include a corporation or a partnership and the heirs, executors, administrators or other legal representatives of a person.

1.1.13 PLANS

"Plans" shall include all drawings, or reproductions of drawings, provided by the Department and pertaining to the Work.

1.1.14 SPECIFICATIONS

"Specifications" shall include all specifications and the directions, schedules, special provisions and requirements contained herein, together with all written agreements made or to be made, pertaining to the method and manner of performing the Work, or to the quantities or quality of Material to be furnished under the Contract.

1.1.15 SURETY

"Surety" shall mean the person bound with the Contractor to provide security, respectively, for one or more of:

(i) the due performance of the Contract;

(ii) the payment in full for all items of labour and materials used or reasonably required for use in the performance of the Contract;

(iii) the repair of any damage to or failure in the Work to which the Contract relates and for which the Contractor is responsible under the Contract.

1.1.16 WORK

"Work" shall mean all or any part of the work to be performed under the Contract by the Contractor, whether complete or incomplete, as originally set forth or as revised by the Department, and any or all of the equipment, Material and labour supplied by or for the Contractor.

1.1.17 IMPLIED PROVISIONS

In the Contract:

(i) words importing male persons include female persons and corporations;

(ii) words in the singular include the plural and words in the plural include the singular;

(iii) the applicable law shall be the law of the Province of Alberta;

(iv) time shall be of the essence; and

(v) headings and subheadings are not substantive and are inserted for convenience of reference only.

1.1.18 UTILITY COMPANY

“Utility Company” shall mean an individual, partnership or corporation that carries on business in Alberta as a generator, distributor, producer or seller, to the public in Alberta or elsewhere, of electrical energy, natural gas, oil, steam, water, or telecommunications whose facilities may have impact on the Work.

1.2 GENERAL SPECIFICATIONS

1.2.1 TENDERS

All tenders must be submitted on the forms furnished by the Department. All blank spaces under the headings "Unit Price", "Estimated Quantity" where applicable, and "Total Bid" must be filled in. If the tender is submitted by an individual, his name and address must be given.

If the tender is made by a partnership or corporation, the name of the partnership or of the corporation must be given, and the address to which all notices or letters are to be mailed must be given in addition to the signature of one of the officers of the partnership or corporation.

Tenders shall bear the Bidder's signature and official seal, or the Bidder's signature shall be witnessed and the Affidavit of Execution completed.

All addenda issued during the tendering period must be acknowledged in the space provided on the tender forms.

Tenders may be rejected if they show any alteration of form, additions not called for, conditional or alternative bids, incomplete bids or irregularities of any kind. Tenders in which the prices are obviously unbalanced may be rejected.

1.2.2 QUANTITIES

1.2.2.1 **General**

The quantities given in the tender form are to be considered as approximate only, and are to be used in the comparison of tenders. Final payment to the Contractor will be made only for the actual quantities of Work performed or Material furnished in accordance with the Plans and Specifications as determined by measurements made by the Consultant. It is agreed that the quantities of Work to be done or Material to be furnished may be altered by the Consultant and such alterations shall not be considered as a waiver of any condition of the Contract, nor as invalidating any of the provisions thereof, nor shall any changes be made in the Contract unit prices on account of such alterations, but the same unit prices shall apply as if no alteration had been made.

1.2.2.2 **Quantity Variations**

1.2.2.2.1 Conditions for Unit Price Adjustment

Notwithstanding Section 1.2.2.1, and except for items of Work, if any, for which the applicability of this Section 1.2.2.2 has been specifically excluded elsewhere in the Contract, the Minister and the Contractor may agree to adjust a rate or price contained in the Contract:

(i) if the actual quantity of work executed under the item exceeds or falls short of the estimated quantity specified in the Unit Price Schedule by more than 15%; and

(ii) if there is no off-setting adjustment with respect to the quantity of any other item of work; and

(iii) if, based on the actual quantity of work executed and the rate or price contained in the Unit Price Schedule, the extended amount of the item exceeds 15% of the original Contract Price; and

(iv) if the Contractor believes that he has incurred significant additional expense as a result thereof or the Minister believes that the quantity variation entitles the Minister to an adjustment in the rate or price.

1.2.2.2.2 Quantity Over-Runs

An adjusted rate or price made pursuant to Sub-section 1.2.2.2.1, where the actual quantity of work executed under the item exceeds the estimated quantity specified in the Unit Price Schedule by more than 15%, shall apply only to the quantity that is in excess of 115% of the estimated quantity specified in the Unit Price Schedule.

1.2.2.2.3 Quantity Under-Runs

An adjusted rate or price made pursuant to Sub-section 1.2.2.2.1, where the actual quantity of work executed under the item falls short of the quantity specified in the Unit Price Schedule by more than 15%, shall not exceed the rate or price that would cause the total amount paid for the bid item to exceed the product of the original rate or price contained in the Unit Price Schedule multiplied by 85% of the estimated quantity specified in the Unit Price Schedule.

1.2.3 EXAMINATION OF WORK

1.2.3.1 **Bidder's Investigation**

The Bidder shall examine the Plans, Specifications and Contract forms and carefully investigate and satisfy himself of every condition affecting the Work including the site conditions, and the labour and Material to be provided. It is agreed that submission of a tender shall be conclusive evidence that the Bidder has made such investigation and that, whether or not he has so investigated, he is willing to assume and does assume all risk regarding conditions affecting the Work.

Any information pertaining to subsurface soil, rock and groundwater conditions on the borehole/testpit logs shown on the drawings has been obtained for design purposes and is valid only at the specific locations of the boreholes/testpits and on the date that the subsurface investigations took place. Bidders may wish to supplement this information, for their purposes, by performing additional investigations.

1.2.3.2 **Hierarchy Of Documents**

In the event of discrepancies, the hierarchy of documents shall be as follows, in descending order:

- special provisions
- applicable appendices contained in the document entitled Dispute Resolution Process for Government of Alberta Construction Contracts, Edition 1, 1997
- project specific construction plans
- standard construction plans
- specification amendments
- supplemental specifications
- general specifications
- construction specifications

In the event of a difference between scaled dimensions on Plans and the figures written thereon, the figures shall govern. In the event that two or more plans show conflicting information, the information on the most recently dated plan shall govern.

Any technical and manufacturer's standards referred to in the Contract documents shall be the version current at the time the Contract is awarded.

1.2.3.3 **Plans**

When the Contract has full sized plans or drawings rolled separately, the drawing package will be available for purchase by bidders as required.

For Bridge Structure construction contracts, the Contractor will be provided with four sets of full sized drawings and one set of reduced drawings, as well as four full sized sets of any subsequent revised drawings.

Drawings for Bridge Structures issued during tendering which are marked with "Preliminary Only - Do Not Use for Construction" shall not be used as construction drawings.

1.2.3.4 **Deviations From Plans**

No deviation from the Plans or the approved working drawings will be permitted without the written order of the Consultant.

1.2.3.5 **Omissions**

In the event of an omission of any detail from the Specifications or Plans, only the best general practice is to prevail and only Material and workmanship of the highest quality are to be used.

1.2.3.6 **Interpretation and Modification of Tender Documents**

The Contractor shall submit questions about the meaning and intent of the Tender Documents directly to the Engineering Consultant at the office identified in the Special Provisions. Interpretations and modifications considered necessary by the Consultant in response to such questions will be issued by the Department in writing in the form of an Addendum.

Addenda may also be issued by the Department to modify the Tender Documents as deemed necessary.

The Contractor shall submit questions as early as possible during the tendering period. The Consultant may not respond to questions received too close to the bid closing time to permit issuance of an Addendum.

Replies to questions, interpretations and modifications made in a manner other than by written Addendum shall not be binding.

1.2.4 DISQUALIFICATION OF BIDDERS

The right to reject any or all tenders is reserved by the Minister, and the lowest or any tender will not necessarily be accepted.

Only one tender from an individual, firm, partnership or corporation will be considered. Reasonable grounds for believing that any Bidder is interested in more than one tender for the Work, in the capacity of the Contractor, may cause the rejection of all tenders in which such Bidder is interested.

Any or all tenders will be rejected if there is reason for believing that collusion exists among the Bidders, and none of the participants in such collusion will be considered in future proposals.

Failure to satisfactorily complete previous contracts, avoidable delays in completing such contracts, or a lack of experience or capital will be considered sufficient cause for rejecting any tender.

1.2.5 COMPETENCY

1.2.5.1 **General**

Contracts will not be awarded to any government agency including but not limited to the government of Canada, the government of a province or territory of Canada, any agency thereof, or any municipality or other unit of local government within any province or territory of Canada.

"Government Agency" means a branch, unit, subsidiary or other form of entity, owned or controlled by a government agency and includes any subsidiaries or entities owned or controlled by that agency.

Contracts will only be awarded to Bidders registered with Alberta Government Services, Corporate Registry.

The low bidder may be required to supply evidence of experience, equipment, ability and financial capability before the Contract is executed.

At the time of Contract execution, the successful bidder shall submit on forms supplied by the Department a detailed schedule delineating commencement and completion dates for each phase of the Work, planned fleet numbers, production rates and working hours.

1.2.5.2 **Safety Prequalification**

Contracts will only be awarded to Bidders who, prior to the time fixed for receiving tenders, possess a Certificate of Recognition (COR) which is relevant to their industry and which is recognized by Alberta Human Resources and Employment, Workplace Health and Safety.

Bidders are advised that a small employers certificate of recognition (for employers with less than ten employees) is not considered acceptable.

For Bidders who have not obtained a Certificate of Recognition, a valid Temporary Letter of Certification (TLC) issued by the Alberta Construction Safety Association (ACSA) will be considered acceptable.

The Department will confirm that the Bidder possesses a COR or a valid TLC through the Alberta Construction Safety Association.

It is the Bidder's responsibility to ensure his registration in the program is properly documented with the Alberta Construction Safety Association and the Department will assume no liability for errors or omissions by the Alberta Construction Safety Association in this regard.

During the progress of the Work, the Contractor shall complete Monthly Health and Safety Summary Reports and submit these reports to the Consultant’s Representative at the end of each month.

When the Contract has been completed, the Contractor and Consultant’s Representative shall jointly complete the Project Completion Health and Safety Report.

The Department will provide copies of these forms to the Contractor.

1.2.5.3 **Conflicts of Interest**

As required by the Conflicts of Interest Act (Alberta) no member of the legislative assembly or person directly associated with a member, as defined in the Act, shall submit a bid for this Contract.

1.2.6 DELIVERY OF TENDERS

All tenders must be submitted in sealed envelopes addressed as show in the Instructions to Bidders and marked "Tender for Construction" or "Tender for Bridge Construction" with the highway or bridge file number clearly marked thereon. All tenders must be received at the proper location and by the time and date set for the receipt of such tenders as shown in the instructions to bidders.

1.2.7 BID DEPOSIT

1.2.7.1 **Requirements**

Each tender must be accompanied by a Bid Bond, Certified Cheque, Money Order or a Bank Draft equal to 10 % of the tender amount.

1.2.7.2 **Forfeiture**

If, within 21 days after the Contract is presented to him for signature, hand delivered or sent by registered mail or courier addressed to him at the address stated in his tender, the Bidder refuses or fails:

(i) to sign and return to the Department the Contract for the performance of the Work and the supplying of Material covered by his tender; or

(ii) to provide the security for the performance of the Contract and for labour and material payment as required by Section 1.2.9; or

(iii) to provide the insurance required by Section 1.2.10;

the bid bond or deposit shall be subject to forfeiture to the Department, and if a Contract for that Work and Material is then entered into with some other person for a greater amount, the Bidder is liable to the Department in the amount equal to the difference between the amount of his tender and the amount of the Contract actually entered into; the maximum not exceeding the amount of the security required under this Section.

1.2.8 ACCEPTANCE OR WITHDRAWAL OF TENDER

A Bidder may withdraw his tender when he submits a request in writing signed by the Bidder, or his agent in fact, if the request is received in the office set out in Section 1.2.6 at any time up to the time fixed for receiving tenders.

No Bidder may withdraw a tender at or after the time fixed for receiving tenders until:

(i) some other person has entered into a contract with the Minister for the performance of the Work and the supplying of the Material specified in the notice inviting tenders, or

(ii) 35 days after the time fixed for receiving tenders,

whichever occurs first.

1.2.8.1 **Tender Changes**

A Bidder wishing to change his Tender, may withdraw the Tender in accordance with Section 1.2.8, modify and resubmit it in accordance with Section 1.2.6, Delivery of Tenders.

Alternatively, if this change is to the unit price schedule only, the Bidder may send a facsimile (FAX) message on a copy of the "TENDER AMENDMENT FORM" included in the Tender Document, to the number and to the attention of the Director, Tender Administration, as shown in the Instructions to Bidders. To be acceptable, the form must be received by the time and date set for the receipt of the tender in accordance with Section 1.2.6, Delivery of Tenders and the Instructions to Bidders. The time of the submission will be considered the receipted time as shown on the Department's FAX machine.

1.2.9 SECURITY

The successful Bidder shall furnish security in a form satisfactory to the Department, in the amount of:

(i) 50% of the Contract tender price for the due performance of the Contract;

(ii) 50% of the Contract tender price for the payment in full of all claims for labour and for Material used or reasonably required for use in the performance of the Contract; and

(iii) the total interim payment for crushing and stockpiling when required.

1.2.9.1 **Bonds**

A Performance Bond and a Labour and Material Payment Bond will be the type of security required.

The Department will provide the successful Bidder with standard forms of these bonds for completion.

1.2.9.2 **Alternative Forms of Security**

When specified in the special provisions, an Irrevocable Letter of Credit, Certified Cheque, Bank Draft or Money Order may be used as security in lieu of Performance Bonds and Labour and Materials Payment Bonds.

When Irrevocable Letters of Credit are used in lieu of bonds or as security for interim payment for crushing, they shall comply with the following:

(i) The Irrevocable Letter of Credit shall be provided by a Domestic Chartered Bank as listed in the Bank Act, "Schedule A, Domestic Chartered Banks", "Schedule B, Foreign Chartered Banks", or the Alberta Treasury Branch.

(ii) Unless otherwise approved by the Department, the Irrevocable Letter of Credit shall be worded the same as the sample in the Contract.

(iii) The Irrevocable Letter of Credit shall initially be dated to expire a minimum of five months after the specified Contract completion date except for irrevocable letters of credit used as security for interim payment for crushing and stockpiling aggregates which shall be dated to expire on the specified Contract completion date.

(iv) Should the time to complete the Contract extend beyond the specified Contract completion date, the Contractor may be required to provide the Department with an Irrevocable Letter of Credit with a revised expiry date. Where the Contractor is required to provide for this extension in time, the Contractor shall, within 14 days of being notified of the requirement, provide to the Department the Irrevocable Letter of Credit with the revised expiry date. Should the Contractor fail to provide this revised Irrevocable Letter of Credit, the Department will without further notice draw funds on the original Irrevocable Letter of Credit.

Irrevocable Letters of Credit, Certified Cheques, Bank Drafts or Money Orders used in lieu of Labour and Materials Payment Bonds, will be released 120 days after the date of Construction Completion providing there are no outstanding claims filed with the Department against the Contractor.

Irrevocable Letters of Credit, Certified Cheques, Bank Drafts or Money Orders used in lieu of Performance Bonds will be released:

(i) After the Department's acceptance of the Work as detailed in Section 1.2.53, Construction Completion and Acceptance; or

(ii) In cases where Section 1.2.54, Contractor's Warranty and Final Acceptance applies, after the expiration of the warranty period provided any repairs are completed to the satisfaction of the Department.

Irrevocable Letters of Credit used as security for interim payment for crushing and stockpiling aggregate will be returned to the Contractor upon acceptance of the Work.

1.2.10 INSURANCE

The Contractor shall, without limiting his obligations or liabilities herein and at his own expense, provide and maintain the following insurances in compliance with the Alberta Insurance Act, and in forms and amounts acceptable to the Department:

(i) General Liability Insurance in an amount not less than five million dollars ($5,000,000) inclusive per occurrence, insuring against bodily injury, personal injury and property damage including loss of use thereof. The Minister is to be added as an additional insured under this policy for any and all claims arising out of the Contractor's operations. The policy shall be endorsed to state it is primary and will not require the pro rata sharing of any loss by any insurer of the Minister. Such insurance shall include but not be limited to:

- Products and Completed Operations Liability;
- Owner's and Contractor's Protective Liability;
- Blanket Written Contractual Liability;
- Contingent Employer's Liability;
- Personal Injury Liability;
- Non-Owned Automobile Liability;
- Cross Liability with respect to additional insureds;
- Employees as additional insureds;
- Broad Form Property Damage Endorsement;
- Operation of Attached Machinery;
- Sudden and accidental pollution,

and where such further risk exists:

- Blasting, Demolition, Pile Driving, Caisson Work or Tunneling, as applicable;
- Elevator and Hoist Liability.
- Towing/On Hook Coverage.

(ii) Automobile Liability on all vehicles owned, operated or licensed in the name of the Contractor in an amount not less than $5 million.

(iii) Aircraft and/or Watercraft Liability for all craft owned, operated or licensed in the name of the Contractor and for all non-owned craft used in the operations of the Contractor, in an amount not less than $5 million per occurrence and including passenger hazard liability where applicable.

(iv) For bridge structures, bridge culverts and building structures, Course of Construction insurance in the form of an "all risks" builder's risk policy. Such policy shall insure the Work to a minimum of the full value of the bridge or building component of the Contract price and the full value of any bridge or building Material that is provided by the Department for incorporation into the Work and shall include coverage for the risk of flood where such peril exists. Such insurance shall be in the joint names of the Contractor, the Minister, the subcontractors, and all others having an insurable interest in the Work, and shall continue until the date of Construction Completion.

All the foregoing insurance shall be primary and not require the pro rata sharing of any loss by any insurer of the Minister.

The Contractor shall provide the Department with a certified true copy of each policy prior to execution of the Contract.

The Contractor shall ensure that Products and Completed Operations coverage, as applicable, shall be in force for the duration of the warranty period.

All required insurance shall be endorsed to provide the Department with 30 days advance written notice of material change or cancellation.

The Contractor shall require and ensure that each subcontractor provides evidence of comparable insurance to that set forth in clauses (i) through (iv) of this section.

The Contractor is responsible for insuring his equipment against "all risks" of accidental loss or damage. The Contractor shall waive his right of recourse against the Minister with regard to any loss or damage to the equipment and shall make his insurer aware of this waiver.

1.2.11 CONTRACT DESIGN CHANGE PROPOSALS

1.2.11.1 **General**

After the tender is awarded, the Contractor has the option of submitting a Contract Design Change Proposal for an alternate design or change to the Department's design or any component thereof provided cost savings can be achieved without compromising the integrity and quality of the project. These proposals will be accepted or rejected by the Department at its sole discretion. Proposals shall be submitted through the Department's Regional office.

Project Net Cost Savings will be shared on a 65% / 35% basis between the Contractor and the Department. These net savings shall be identified, itemized, confirmed and fixed prior to the Department giving approval to proceed with the proposed changes.

When a Contract Design Change Proposal is submitted, a preliminary technical review will be conducted by the Department to ensure it meets the Department's requirements. A one week period will be required for this review after which the proposal will be accepted or rejected. If the proposal is accepted, the Contractor shall complete a detailed design as required.

When submitting a Design Change Proposal, the Contractor shall also provide non-refundable certified cheques in accordance with the following:

(i) Preliminary Technical Review - At the time the proposal is submitted, the Contractor shall provide a non-refundable certified cheque in the amount of $1,000.

(ii) Final Design Review - If the Project Net Cost Savings (PNCS) is more than $10,000.00, the Contractor shall provide an additional non-refundable certified cheque in the amount of $ 3,000.00 at the final design review stage. If the PNCS is less than or equal to $ 10,000.00, the contractor will not be required to provide the $ 3,000.00.

Contract Design Change Proposals shall be sufficiently complete at the preliminary technical review stage so that the Department can fully assess alternates for equivalencies, and compliance to standards and practices, including functionality, serviceability, durability, maintainability and overall cost effectiveness. The Department may recommend or request adjustments or alterations to the proposal to make it acceptable.

Acceptance or rejection of the proposal at any time during the initial review process will not be considered a basis for claim or relieve the Contractor of any obligations of the Contract.

Once both parties have agreed to the terms and conditions of the proposal, the Contract will be modified through a supplementary agreement (Contract Change) to incorporate the changes agreed upon, all other Contract conditions will remain in effect.

1.2.11.2 **Payment**

Project Net Cost Savings (PNCS) shall be taken as the cost difference between the Department's tendered design and the Contractor’s proposed design, net any additional costs or savings incurred by the Department. The Contractor’s Cost for Contract Changes (CCCC) shall include but are not limited to, any required design work, the preparation of the proposal submission, the involvement of the Contractor's engineer if necessary and all costs associated with construction and profit. The Department’s costs and/or savings (DC) shall include those which are project related but outside the terms of the Contract, such as, but are not limited to, consultant costs for participating in the review of the Contractor’s proposal, project testing, measurement, inspection, including any specialized inspection required by the Department, and management;

$$PNCS = DTDC - CCCC \pm DC$$

PNCS - Project Net Cost Savings
DTDC - Department's Tender Design Cost
CCCC - Contractor's Cost for Contract Changes
DC - Department Costs (Savings(+), Additional Costs (-))

Payment to the Contractor to complete the work identified in the proposal will be made through progress payments in accordance with the terms and conditions agreed to for the proposal. This payment shall not exceed the Contractor's estimate for the work as identified in the proposal.

Payment of the Contractor's 65% share of the Project Net Cost Savings will be made as a lump sum payment to the Contractor once the project is ready for the Construction Completion Inspection.

1.2.11.3 **Engineering Standards and Guidelines for Contract Design Change Proposals**

1.2.11.3.1 General Requirements

Proposals will be evaluated for compliance with Alberta Transportation Standards and Guidelines for Highway and Bridge Structures. If a proposed alternate does not meet or exceed the Department's standards, guidelines, practices or specifications, it is the responsibility of the Contractor to undertake the level of engineering necessary to justify the deviation. Details of the justification with supporting documentation must be provided to the Department with the submission.

For environmental and other approval requirements, the Contractor shall note that conditions on any existing permits and approvals are only applicable for the existing Contract. When required the Contractor must resubmit the plans and drawings for review and obtain new or revised permits and approvals.

1.2.11.3.2 For Bridge Structures and Bridge Culverts

Alberta Transportation reference documents:

- Engineering Consultant Guidelines for Highway and Bridge Projects
- Guidelines for Bridge Structures, Standards, Approvals and Design
- Bridge Size Culverts Design and Drafting Guidelines
- Fish Habitat Guidelines for Stream Crossings
- CAN/CSA-S6-88
- Bridge Structures Design Criteria Version - 3.00

Other reference information such as bridge file records and design notes will be made available in the Departments office for the Contractors use.

1.2.11.3.3 For Highways

The Department’s design designation for the project which specifies the design speed, road top width and other basic design parameters shall not be changed.

Alberta Transportation reference documents:

- Engineering Consultant Guidelines for Highway and Bridge Projects
- Highway Geometric Design Guide

- Traffic Control Standards Manual
- Drafting Guidelines
- Pavement Design Manual
- Alberta Highway Pavement Marking Guide

Other reference information such as file records and design notes will be made available in the Department's office for the Contractor's use.

1.2.11.3.4 Preliminary Technical Review - Submission Requirements for Contract Design Change Proposals

The preliminary technical review will be conducted by the Department to assess the proposal, for equivalencies and compliance to the Department's standards, guidelines and practices. For the submission at this stage, where plans and drawings are required to illustrate the proposal, the Contractor may make use of and modify as required the Department's plans. For major design changes, the Contractor shall prepare additional sketch plans as required that reasonably represent the design alternate or change.

To permit the Department to assess the proposal, the Contractor shall provide a written submission to the Department which includes when applicable, information on the following items:

1.2.11.3.4.1 General

(i) Describe the difference between the existing Contract requirements and the proposal.

(ii) Indicate the Contractor’s Cost for Contract Changes (CCCC) as defined herein, with supporting calculations and cost estimates.

(iii) Identify potential impacts of the proposal on road users or other stake holders including but not limited to landowners, municipalities, utility companies, and other government agencies, with respect to access, usage, right-of-way agreements. The Contractor shall outline how he will resolve these issues.

(iv) Indicate the date by which the proposal must be accepted to realize the cost savings identified, and also identify the effect, if any, the proposal has on the Contract Completion Date and when applicable, the number of Site Occupancy days identified in the Contract.

(v) Identify the key human resources to be employed in preparing the proposal, including details of their past related project experience.

(vi) Where a significant change to the Contract is proposed, provide evidence that the Contractor’s Bonding Company is aware of and supports the proposal submission.

1.2.11.3.4.2 For Bridge Structures and Bridge Culverts

The following are typical requirements for a submission that involves major changes to the Department's tendered design. Items from this list will apply as appropriate to minor changes and the nature of the change.

(i) Plan View showing structure layout, roadway geometrics and alignment, stream channel and river protection works, and right-of-way limits.

(ii) Elevation View showing span(s), foundation type, stream channel section, all significant hydro technical data such as design upstream high water elevation and freeboard. Also for culvert type structures show invert elevations.

(iii) Section view showing superstructure elements such as deck, slabs, curbs, girder type, size and number, type of bridgerail proposed, etc. For culvert type structures, show invert length, geometry, and elevations, river projection works, and any special details.

(iv) Description of materials to be used and finish treatment. Timber materials will not be permitted.

(v) Pier Section showing pier type and details of pier foundation.

(vi) Abutment Elevation Section showing abutment and foundation details.

(viii) Description of bearing and deck joints.

1.2.11.3.4.3 For Highways

(i) Geometric: show any proposed changes to, horizontal alignment, vertical alignment, typical cross-section(s), right-of-way, hazards in clear zone or near clear zone, guardrail, access management.

(ii) Traffic Engineering and Control: show changes to, signing, pavement marking, railway crossings and work zone traffic accommodation.

(iii) Geotechnical: indicate, any additional testing requirements, changes in materials, slope changes or erosion control requirements.

(iv) Surfacing Design: including; first course gravel, base courses, asphalt concrete pavement, and Portland cement concrete pavement. Provide details of changes to, surfacing strategy, structural design, aggregate requirements, binder material, geometrics and clearances. Provide details of any effects the proposed changes would have on design life of the surfacing structure.

1.2.11.3.5 Detailed Design Review - Requirements for Contract Design Change Proposals

1.2.11.3.5.1 General Requirements

If the proposal is accepted, the Contractor shall complete a detailed engineering design. The design drawings shall be in a similar format and carried out to the same level of detail as the original design.

The alternate design or change shall be designed and independently checked by Professional Engineers, registered in the Province of Alberta and shall be complete in all respects, including all drawings and other information necessary to perform the work. Both the designer and the checker shall stamp the drawings.

Upon receiving the detailed design submission the Department will require a total period of eight (8) working days for reviewing the design drawings and details. The Department and its Consultant assume no responsibility for correctness or adequacy of the design as a result of this review. The Contractor's engineer will assume professional responsibility as Engineer of Record for all engineering aspects associated with the proposed changes.

1.2.11.3.5.2 For Bridge Structures and Bridge Culverts

The detailed design shall meet the Department's standards and guidelines as prescribed for loading, geometrics, hydraulics and material.

For bridge work, the Contractor shall submit the final design drawings in one full package. If fast tracking is necessary, then contingent upon Department approval, the Contractor may submit the final design drawings in two stages for a) the substructure, and b) the superstructure, in which case two - four (4) day periods will be required for design reviews. The submission for the superstructure shall include the superstructure loads.

(i) The design shall comply with the requirements of CAN/CSA-S6-88 and the requirements of Alberta Transportation "Bridge Structures Design Criteria Version - 3.00".

(ii) The Department's "Specification for Bridge Construction" shall be used for materials and construction and shall be supplemented where required and with the approval of the Department.

1.2.11.3.5.3 For Highways

The detailed design for Highways and Roads shall meet the Department's standards and guidelines for geometric standards, environmental guidelines, pavement design, address all geotechnical and erosion concerns, meet guidelines contained in Traffic Control Standards or any other applicable standards or guidelines. The detailed design shall be documented as required in the Engineering Consultant Guidelines for Highway and Bridge Projects.

1.2.11.3.6 Other Requirements And Conditions For Contract Design Change Proposals

During the detailed design process or construction phase, the Contractor shall be responsible for making adjustments or alterations at his own cost, for whatever cause, to the proposal to make it congruent with the specified requirements for a complete job.

No portion of construction can commence until the design or change has been accepted for that portion of the Work.

The Consultant will be responsible for resident engineering services during construction. The Contractor shall make provision for the involvement of his engineer as necessary. If the proposal involves inspection work which is unfamiliar or beyond the capabilities of the Department's Consultant and a specialist is required, all costs for additional or specialized inspection will be the responsibility of the Department.

In the development or preparation of the proposal, the Contractor shall not employ the Department's Consultant who is providing engineering services on this Contract.

1.2.12 PRE-CONSTRUCTION MEETINGS

1.2.12.1 **General**

Prior to commencement of the Work, a pre-construction meeting will be conducted by the Consultant. The Contractor shall ensure that his project supervisor, his designated safety representative and a representative for each sub-contractor are in attendance.

1.2.12.2 **Bridge Structures**

An additional meeting is required when fabrication of precast concrete girders, structural steel or bridgerail is involved or when any other specialized construction is included in the Contract. The Consultant will conduct this meeting after the shop drawings have been approved but before fabrication commences. The Contractor shall ensure the plant superintendent and plant manager responsible for the work and any manufacturer's representatives directly involved in the specialized work are in attendance.

1.2.13 MOBILIZATION AND DEMOBILIZATION

Where Mobilization is included as a bid item, it shall consist of the necessary work and operation including, but not limited to, the movement of personnel, equipment, supplies and incidentals to the Work, the establishment of offices, camps and other facilities necessary to undertake the Work and for expenses incurred for other work and operations which must be performed prior to the commencement of the Work.

The Department will pay for mobilization at the lump sum price bid for "Mobilization" which payment shall be compensation in full for all costs associated with mobilization. No payment for mobilization will be made until the value of the work completed on bid items other than mobilization exceeds 10% of the total tender price. Payments for interim crushing and stockpiling aggregate are not considered as value of Work completed on a bid item when payment for Mobilization is being considered. When the amount bid for Mobilization exceeds 10% of the total original Contract tender amount, the Department will withhold the portion in excess of 10% until the date of Construction Completion.

The amount bid for Mobilization will be paid only once, regardless of the number of times the Contractor mobilizes. If the Contract does not contain a bid item for "Mobilization", no direct payment will be made for costs associated with mobilization.

There will be no separate payment made for demobilization.

1.2.14 COMMENCEMENT AND SCHEDULING OF WORK

The Contractor shall commence the Work in accordance with the time limits set out in the Contract or on a date acceptable to the Department and confirmed in writing between the Contractor and the Department.

The Contractor shall commence the Work and proceed with diligence to prosecute the Work in accordance with the approved schedule in sufficient time to complete the Work on or before the completion date specified in the Contract.

The Contractor shall immediately notify the Department and the Consultant of any proposed changes to the approved schedule.

1.2.15 CONSULTANT'S AND DEPARTMENT'S ACCESS TO THE WORK

The Contractor shall provide the Consultant and the Department with suitable and safe access to all parts of the Work at any time, for the purpose of inspection and measurement, and when the Work is being carried out at night, lighting shall be provided so that all operations are plainly and safely visible.

1.2.16 SITE OFFICES FOR BRIDGE STRUCTURE CONSTRUCTION

The Contractor shall provide and maintain in a clean and safe condition an office trailer at the site for the sole use of the Consultant. The site office trailer shall be located within the Contractor's working area,

separate from the Contractor's office or any other structure, and meet the following requirements:

- minimum floor area 11 m^2, with minimum headroom of 2.4 m
- adequate lighting, heating and ventilation
- windproof, weatherproof and insulated
- lockable exterior door
- adequate windows on all sides, with screens and shades
- minimum 2 electrical receptacles
- resilient flooring material
- one plan or drafting table with one stool
- one desk - minimum 1500 x 600, and two chairs
- one two drawer filing cabinet

Details of the office, it's contents and it's proposed location shall be submitted to the Consultant for approval.

The Contractor shall provide the site office prior to the commencement of any field work and for the duration of the Contract.

The location of the trailer will be determined by the Consultant, based on the work sequence undertaken by the Contractor. The Contractor may be required to move the trailer occasionally to locate it suitably with respect to the work.

The Consultant may require the trailer to be moved about the site, and in such case will be considered as "incidental work" and no separate payment will be made.

In contracts involving multiple sites more than one trailer may be required.

In the event the Contractor fails to provide an office trailer(s) as specified, the Consultant will make the necessary arrangements for supplying the specified trailer(s). The cost of providing the office trailer(s) and all associated costs shall be the responsibility of the Contractor and monies will be deducted from the monthly progress payments accordingly.

1.2.17 TEMPORARY SUSPENSION OF WORK

1.2.17.1 **Authority To Suspend Work**

The Consultant and the Consultant's Representative shall have the authority to suspend the Work, in whole or in part, for such a period as he may deem necessary, due to conditions that he considers unfavourable for the prosecution of the Work or due to the failure of the Contractor to comply with any provision of the Contract.

In situations where the Consultant is not on site, the Department shall have the authority to suspend the Work, if in its opinion, the Contractor fails to adequately provide for the safety of the public.

Upon receipt of a notice to suspend the Work, the Contractor shall immediately suspend those operations as are specified. No such suspension shall vitiate or void the Contract, or any part thereof, or any security or obligation for the performance thereof, or relieve the Contractor of any other responsibility under the terms of the Contract including the preservation and care of the site and Material.

During a period of suspension the Contractor shall not remove without the consent of the Consultant any part of the Material or equipment previously provided for the Contract.

The Contractor shall not suspend the Work without the consent of the Consultant.

1.2.17.2 **No Compensation**

Subject to Section 1.2.17.3, the Contractor shall not have any claim for compensation or damages against the Department or Consultant for any suspension, stoppage, hindrance or delay from any cause whatsoever.

No compensation will be made to the Contractor for a suspension, stoppage, hindrance or delay of the Work due to the fault of the Contractor including, without limiting the generality of the foregoing, delays by strikes of the employees of the Contractor or sub-contractors.

1.2.17.3 **Compensation For Standby**

When the Work or any part of it is suspended by order of the Consultant for a reason which is not related to the Contractor's performance of the Work, the Department may consider a claim for payment of standby costs which may be incurred by the Contractor. When such costs are claimed they shall be legitimate, reasonable, and supported by proper documentation as required by the Consultant, and submitted in accordance with Section 1.2.55, Claims and Dispute Resolution.

The Department will not pay for standby costs related to any of the following:

- Weather or other natural conditions;
- Failure by the Contractor to carry out orders given by the Consultant;
- Any failure by the Contractor to comply with a requirement or provision of the Contract;
- Any failure by the Contractor to provide for the safety of the public or his, the Department's or the Consultant’s work force;
- Any failure by the Contractor to protect the property of the Department or others;
- Any delay occurring while defects or failures in the Work are being remedied;
- Any change in the quantity of any item of Work from the estimated quantity shown in the Contract Unit Price Schedule;
- Any equipment or work force which was not actually present and actively working on the Work immediately prior to the suspension of the Work;
- Any haul trucks or their drivers used on the Work;
- Any suspension of the Work that is less than 4 hours in duration; and
- Testing of Material or Work for compliance with Specifications and Plans.

When the Department fails to provide right-of-way necessary for access to the Work, and has not so notified the Contractor in the special provisions of the Contract, and in the Consultant’s opinion alternate work areas are not available or practical to allow continued prosecution of the Work, the Department may consider the payment of a claim for standby, which shall not in any case exceed 10 days.

When a claim for standby is considered by the Department, direct costs which, in the opinion of the Consultant, could not have been avoided by the judicious handling of forces, equipment or plant, will be paid to the Contractor in an amount that the Department may find to be fair and reasonable. No item of cost other than idle time rate of equipment and necessary payments for idle time of workers will be considered.

Compensation for standby time of workers and equipment will be determined by the Department, and in accordance with the following:

(i) The time paid for will not exceed eight hours in any one day;

(ii) Saturdays, Sundays and statutory holidays will be excluded;

(iii) Overhead and profit will be excluded; and

(iv) The idle time equipment rates will be determined by the Department.

Upon termination of the suspension by the Consultant or the Department, the Contractor shall resume operations at once.

1.2.18 HINDRANCES AND DELAYS

1.2.18.1 **Utilities**

The Consultant will notify all known utility owners or operators to adjust their utility installations as necessary, within or adjacent to the Work. All such utility adjustments will be made by the owners or operators, except as otherwise provided for in the special provisions or as specifically noted on the Plans.

It is understood and agreed that the Contractor has considered in his tender the present and proposed position of all permanent and temporary utilities. No additional compensation will be paid by the Department for any delay, inconvenience or damage sustained by the Contractor which is caused by the existence of or adjustment to the utilities.

It is further understood and agreed that the Contractor has considered in his tender the scheduling of those items of the Work essential to the adjustment of the utilities, and that the Work will be scheduled and performed at the time required to accommodate these adjustments and without additional compensation.

1.2.18.2 **Work by Others**

The Minister reserves the right at any time to contract for and perform other or additional work, on or near the Work covered by the Contract. When separate Department contracts are in effect on or near the Work, the Contractor shall conduct his work so as to minimize interference with progress or completion of work being performed by other contractors. The Contractor shall cooperate with others working on or near the Work and, in the case of dispute as to procedure or scheduling of the Work, the Department's decision shall be final and binding on the Contractor.

The Contractor shall have no claim against the Department for any inconvenience, delay or loss arising from the presence and operations of others on or near the Work.

1.2.19 ADJUSTMENT OF CONTRACT COMPLETION DATE

For the purposes of this section, seal coat contracts will be considered Slurry Seal, Double Seal Coat, Graded Aggregate Seal Coat and Chip Seal.

The Department will adjust the specified Contract completion date under the following conditions only. These conditions also apply in situations where the Contract Completion Date has been previously adjusted by the Department.

(a) The Contractor submits a written request to the Consultant as soon as possible after the occurrence of the circumstance giving rise to the request and not later than fourteen (14) days after the occurrence of the circumstance. Failure to submit a request within this prescribed time period will prejudice the Contractor's right to receive an adjustment to the completion date, unless the Contractor can demonstrate to the satisfaction of the Department that such delay did not prejudice the ability of the Department to validate the request, and

(b) The written request is accompanied by an adjusted detailed schedule of the Contractor's work to enable completion on the requested adjusted date and,

(c) The reason for the request, stated in the request, is one of the following:

(i) Completion of the Contract requires work or material in greater amounts or quantities than those estimated amounts or quantities shown in the Contract, or

(ii) The work site is not available to the Contractor through no fault of the Contractor, or

(iii) There is a delay in the availability of materials which are to be supplied by the Department, or

(iv) The Consultant suspends the Work and standby payments are due in accordance with Section 1.2.17, or

(v) There is a delay resulting from an order of a court, or from strikes or lock-outs, or

(vi) There is a delay for reasons of inclement weather, or conditions resulting from inclement weather. Such delays will be considered when the Contractor works on the roadway surface less than half a normal working day for reasons of inclement weather. A normal working day shall comprise the average duration worked by the Contractor on the preceding 5 uninterrupted working days.

Inclement weather occurring after the completion date, will not be considered as a reason for delay. Inclement weather occurring during the period between November 1 and April 30 of the following year will not be considered as a reason for delay.

(d) The circumstances precipitating the request occurred prior to the completion date and the Contractor demonstrates to the satisfaction of the Consultant that the circumstance impacted the overall project schedule, preventing completion of the Contract by the completion date.

If an adjustment to the Contract completion date is granted by the Department on any contract other than a seal coat Contract, the Department will delete the time period between November 1 and April 30 of the next calendar year in setting the adjusted Contract completion date. For example, where the specified Contract completion date is October 15, and the extension is to be 20 days, then the adjusted Contract completion date will be May 4, of the following year.

When an adjustment to the contract completion date of a Seal Coat contract is granted, the following time periods will be deleted:

(i) For Chip Seal Contracts, the period between September 16 and April 30 of the following year will be deleted

(ii) For Graded Aggregate Seal Coat, Double Seal Coat and Slurry Seal Coat Contracts, the period between September 30 and April 30 of the following year will be deleted.

1.2.20 FAILURE TO COMPLETE ON TIME

If any Work remains incomplete after the specified Contract completion date, or as adjusted by the Department under Section 1.2.19, Adjustment of Contract Completion Date, there will be deducted from money due the Contractor, the cost to the Department of any work and material reasonably expended by the Department which has been made necessary by reason of the Contractor's failure to complete the Work by the date specified in the Contract, or as adjusted, and without in any way limiting the generality of the foregoing, shall include:

(i) Liquidated Damages

The Contractor agrees to pay to the Department, an amount per day for each and every day beyond the specified or adjusted Contract completion date that the Work remains uncompleted, in accordance with the following terms:

(a) The sum of $1,350.00 per day for each calendar day until, in the opinion of the Consultant, the project is ready for the Construction Completion Inspection. This daily rate will be reduced to $ 300.00 per day in situations where the Work to be completed is only minor cleanup.

Once it has been established that the project is ready for the Construction Completion Inspection, the assessment of Liquidated Damages will totally cease. The Contractor will not be assessed liquidated damages for the time spent correcting any deficiencies identified during the Construction Completion Inspection.

(b) For all Contracts other than seal coat Contracts, regardless of the daily rate charged, there will be no liquidated damages assessed during the time period between December 1 and April 30 of the following year.

On chip seal coat contracts there will be no liquidated damages assessed during the time period between September 16 and April 30 of the following year.

On double seal coat, slurry seal coat and graded aggregate seal coat, there will be no liquidated damages assessed during the time period between September 30 and April 30 of the following year.

(c) There will be no liquidated damages assessed for days lost due to inclement weather or conditions resulting from inclement weather, that occur after the specified or adjusted completion date.

(ii) the additional cost of maintenance and repair necessary; and

(iii) the cost of accommodating traffic over, through or around portions of the Work.

The Department will deduct assessed amounts from payments due on this Contract. If there are insufficient funds to cover the assessed amounts, the Department will invoice the Contractor. The Contractor shall promptly pay the amounts invoiced. Should any amounts remain unpaid after 60 days from the date of invoice, the Department may recover such unpaid sum from any money due to the Contractor from the

Department on any Contract or account, rendering an accounting to the Contractor for any sums so recovered.

1.2.21 DURATION OF WORK AND SITE OCCUPANCY

1.2.21.1 **General**

When the Contract contains a bid item for "Site Occupancy", bidders shall indicate the number of Calendar Days required to complete the Work under the "estimated quantity" column of the unit price schedule and extend that number of days times the unit price per day as shown, to get the total bid for "Site Occupancy".

1.2.21.2 **Calculation of Calendar Days**

Calendar Days will be calculated as whole days. The assessment of calendar days will commence on the day of the first disturbance within the right-of-way. Thereafter, every day will be counted as a Calendar Day with the exception of when:

- the Contractor is prohibited from working due to restrictions imposed by local bylaws after the Contract has been awarded or as a result of directives from the Consultant or the Department.
- the Contractor schedules employee time off subject to the conditions specified herein,
- the project is delayed due to inclement weather subject to the conditions specified herein,
- the Contractor is working solely on the development or reclamation of a borrow area,
- the Contractor is working solely on the reclamation or cleanup of a gravel source,
- the Contractor is working solely on the maintenance or restoration of haul roads,
- the project is shutdown for winter, or
- the Contractor pre-schedules interruptions to continuous prosecution of the Work as a result of the desire to schedule distinct phases of the Work at different times. Distinct phases are generally defined as the larger work groups such as grading, base, or paving which require different types of equipment, however, the Consultant may approve scheduled interruptions for other components of the Work at his discretion. Any such interruptions must be identified in the Contractor's construction schedule.

  For the purposes of this specification, line painting and guardrail construction will not be considered distinct phases of work.

1.2.21.3 **Employee Time Off**

The Contractor will be granted a maximum of eight non-charged days per thirty day period for the purpose of allowing employee time off, providing:

- the Consultant is given at least seven days notice,
- there is no construction ongoing which requires the presence of the Consultant and
- no more than five consecutive days are taken at one time.

The thirty day period will start at the commencement of work as defined above and any of the time-off days not taken in a specified thirty day period will not be permitted to be used in subsequent periods. When the estimated number of Calendar Days required to complete the project is less than thirty, the number of allowable days off for this purpose will be prorated.

1.2.21.4 **Inclement Weather**

A day on which the Contractor is unable to work on the roadway, or works less than half of a normal working day for reasons of inclement weather, or conditions resulting from inclement weather, shall not be counted as a Calendar Day.

Towing traffic or blading the road surface to facilitate the passage of traffic will not be considered as "work on the roadway."

Ripping, drying and/or re-laying material to restore the material to the condition it was prior to the occurrence of inclement weather will also not be considered "work on the roadway."

On a day which the Contractor works less than a normal working day on the roadway for reasons of inclement weather, but works at least half of a normal working day, that day will be counted as a Calendar Day.

A normal working day shall comprise the average duration worked by the Contractor on the preceding 5 uninterrupted working days.

1.2.21.5 **Working During Periods of Inclement Weather or Pre-scheduled Interruptions**

During periods of inclement weather or during pre-scheduled interruptions of the Work when, in the opinion of the Consultant, the Contractor is not performing work such as earthwork, granular base course or asphalt concrete paving, other work normally subject to site occupancy charges may proceed without the assessment of Calendar Days. Such work shall include but not be limited to clearing, seeding, guardrail, permanent highway signing, highway lighting, pavement marking, temporary and permanent environmental protection, fencing, culvert rip-rap and trimming backslopes.

The performance of such work at any other time prior to the Construction Completion inspection as detailed in Section 1.2.53, Construction Completion and Acceptance, will result in the assessment of Calendar Days.

1.2.21.6 **Exclusions from Site Occupancy**

The following items will be excluded from Site Occupancy regardless of when they are completed:

(i) the development or reclamation of borrow areas
(ii) the development or reclamation of gravel sources
(iii) the maintenance or restoration of haul roads
(iv) the production of aggregates
(v) construction of milled rumble strips
(vi) The preparation and installation of temporary environmental measures as detailed in the department manual entitled "Environmental Construction Operations (ECO) Plan Framework.

1.2.21.7 **Completion of Line Painting**

When the Contract includes a line painting component, the Department will decide the priority of expeditious completion of line painting based on traffic volumes and other safety considerations and will identify the project in the special provisions as either; Priority Line Painting or Non-Priority Line Painting.

1.2.21.7.1 Non-Priority Line Painting

Subject to the exceptions detailed in Section 1.2.21.2, Calculation of Calendar Days, line painting must be completed within 5 days of the completion of surfacing work. During this five day period, calendar days will be counted for those days on which the Contractor is performing line painting or other work necessary to prepare the project for final inspection. If, after the five day period, the line painting has not been completed, calendar days will be counted until the line painting is complete.

1.2.21.7.2 Priority Line Painting

Subject to the exceptions detailed in Section 1.2.21.2, Calculation of Calendar Days, calendar days will continue to be counted until all Work including line painting is complete and the project is ready for the Construction Completion inspection as detailed in Section 1.2.21.9.

1.2.21.8 **Completion of Guardrail Construction**

Subject to the exceptions detailed in Section 1.2.21.2, Calculation of Calendar Days, guardrail construction must be completed within 5 days of the completion of surfacing work. During this five day period, calendar days will be counted for those days on which the Contractor is performing guardrail construction or other work necessary to prepare the project for the Construction Completion inspection. If, after the five day period, the guardrail construction has not been completed, calendar days will be counted until the guardrail construction is complete.

1.2.21.9 **Conclusion of Site Occupancy**

Subject to the exceptions specified in this Section 1.2.21.9, assessment of Calendar Days will cease entirely only once in the opinion of the Consultant, the project is ready for the Construction Completion inspection as detailed in Section 1.2.53, Construction Completion and Acceptance. Calendar Days will not be assessed during the period from the date of completion of the entire Work to the actual date of the Construction Completion inspection, during the completion of any deficiencies identified through the Construction Completion inspection or when the Contractor is completing repairs of pavement segregation only.

For the purposes of assessing Site Occupancy charges only, the construction of milled rumble strips and reclamation or restoration of borrow areas, gravel sources or haul roads will not need to be completed in considering whether or not the project is ready for the Construction Completion inspection.

1.2.21.10 **Statements, Extensions and General**

The Consultant will, on a weekly basis, prepare a statement for the Contractor showing the number of Calendar Days worked on the Contract during that week. In the event that the Contractor disagrees with the number of Calendar Days shown on the statement, he shall within one week of the date of such statement, notify the Consultant in writing of reasons for the disagreement, otherwise the number of Calendar Days shown on the statement shall be considered final.

An increase in the number of Calendar Days to complete the Work will be considered for an increase in quantities, late delivery of Department supplied materials, design changes to the project, or any other reason which in the opinion of the Consultant is outside the control of the Contractor, or could not have been reasonably foreseen by the Contractor.

If the Contractor believes there is an entitlement to an extension of the number of Calendar Days required

to complete the Work, he shall, prior to the completion of the Work, submit a written request to the Consultant setting out the reasons for the request, justifying the number of additional days required.

1.2.21.11 **Payment**

Payment for "Site Occupancy" will be made as follows:

If the Contractor completes the Work in the exact number of days entered in the "Site Occupancy" bid item, no payment will be made.

If the Contractor completes the work in fewer Calendar Days than the number entered in the "Site Occupancy" bid item, a payment equal to the unit price per day as shown, multiplied by the difference between the estimated and actual number of Calendar Days will be made.

If the Contractor completes the Work in more than the number of Calendar Days entered in the "Site Occupancy" bid item, an assessment equal to the unit price per day as shown, multiplied by the difference between the estimated and actual number of Calendar Days will be made and charged to the Contractor. This assessment will be deducted from any monies due the Contractor.

Those provisions for Duration of Work in no way negates or mitigates the conditions of Sections 1.2.19, Adjustment of Specified Contract Completion Date, 1.2.20, Failure to Complete on Time or Section 1.2.14, Commencement And Scheduling of Work.

1.2.22 DEFAULT

1.2.22.1 **Causes And Notice**

A Contractor who:

(i) fails to begin the Work under the Contract within the time specified;

(ii) fails to prosecute the Work with sufficient workers and equipment, or with sufficient Material to ensure the prompt completion of the Work;

(iii) in the opinion of the Department performs the Work unsuitably;

(iv) neglects or refuses to remove Material, or to perform anew Work rejected as defective and unsuitable;

(v) discontinues the prosecution of the Work;

(vi) fails or refuses to place additional equipment on the Work in order to complete the work within the specified time and when so ordered by the Department;

(vii) fails to promptly pay his creditors for labour, services, equipment, supplies and materials used or reasonably required for use in the Work; or

(viii) fails to promptly repair any defect or failure discovered in the Work within the warranty period;

shall be deemed to be in default of the Contract.

A Contractor who is deemed to be in default of the Contract will be given notice in writing by the Department declaring and specifying the default and the Contractor shall upon receipt of the notice diligently proceed to remedy or rectify the default.

1.2.22.2 **Failure To Remedy**

If the Contractor fails to proceed diligently to remedy or rectify the default within 6 calendar days of receipt of the notice from the Department, the Department may, without violating the Contract, take the prosecution of the Work out of the hands of the Contractor and may:

(i) appropriate or use any Material at the site of the Work to complete the Work;

(ii) enter into an agreement with some other person for the completion of the Work;

(iii) compel the Surety to complete the Work; or

(iv) use such other methods as in the Department's opinion may be required for the completion of the Work.

1.2.22.3 **Costs and Claims**

All costs incurred by the Department as a result of the default, including the cost of completing the Work and repairing any defect or failure, will be deducted from any money due or which may become due to the Contractor. If the costs incurred by the Department exceed the sum which would have been payable under the Contract, then the Contractor, and Surety if any, shall be liable and shall pay to the Department the amount of the excess up to the specified amount of the security.

The Contractor shall not have any claim for compensation or damages against the Department for any stoppage or delay caused by or resulting from the prosecution of the Work having been taken out of the hands of the Contractor.

1.2.23 ANNULMENT WITHOUT FAULT OF CONTRACTOR

The Minister shall have the right at any time to annul the Contract upon giving at least 15 calendar days notice, in writing, to the Contractor, in which event the Contractor shall cease Work and shall be entitled to payment under the terms and conditions of the Contract for the Work done by him up to the time of such annulment.

The Department will reimburse the Contractor for those costs verified by the Department, which are directly chargeable to that portion of the Contract not performed by reason of annulment, and which the Department deems as justifiable.

1.2.24 SUPPLEMENTAL WORK

Supplemental Work shall include work which is outside the scope or intent of the Contract.

Supplemental Work may be identified by the Department at its discretion. In the event the Department wishes the Contractor to undertake Supplemental Work, terms and conditions covering the completion of Supplemental Work will be mutually agreeable to the Department and the Contractor and will be incorporated into the Contract by way of a separate agreement. Payment for Supplemental Work will be made in accordance with the applicable provisions for Extra Work as detailed in Section 1.2.25.

If terms and conditions suitable to both the Department and the Contractor cannot be negotiated, the Department reserves the right to contract with others for the completion of the Supplemental Work.

1.2.25 EXTRA WORK

1.2.25.1 **General**

Extra Work shall include work not specified in the Contract or of a class not included in the Contract but is required to achieve the intent or scope of the Contract.

Extra Work ordered by the Consultant in writing shall be done by the Contractor. Extra Work will not be paid for unless the Contractor receives a written order for it from the Consultant. Authorized Extra Work will be paid for by the Department at the unit prices in the Contract. If, in the opinion of the Consultant, there is no applicable Contract unit price, then all labour, equipment and material must be approved by the Consultant prior to any Extra Work being done, and it will be paid for as detailed in the remainder of Section 1.2.25 or at the new unit prices agreed to by both the Department and the Contractor.

1.2.25.2 **Labour**

For all labour directly involved in the Extra Work operation, the Contractor will be paid the actual cost of labour including the wages at the scale being paid on the Contract Work, and including payments made to, or on behalf of the workers, for holiday pay, Workers' Compensation Board assessment, insurance and pension payments, plus 20 % of the total of the extra work labour account.

1.2.25.3 **Equipment**

For each piece of equipment used directly in the extra work operation, including trucks but excluding small tools, the Contractor shall receive payment:

(i) at the rates shown in the Equipment Rental Rates Guide and Membership Roster as issued by the Alberta Roadbuilders and Heavy Construction Association; or

(ii) for third party equipment rental accounts, at the rates invoiced by the third party, provided these rates were approved by the Consultant prior to the commencement of the Extra Work; or

(iii) at the agreed price or prices as stated in the Consultant’s extra work order.

1.2.25.4 **Equipment Rental Rates Guide and Membership Roster**

The Equipment Rental Rates Guide and Membership Roster is the latest version in effect at the time of tendering identified as “Equipment Rental Rates Guide and Membership Roster an Alberta Roadbuilders and Heavy Construction Association Publication."

If the Alberta Roadbuilders and Heavy Construction Association (ARHCA) revises its “Equipment Rental Rates Guide” before work on the Contract is completed, the schedule containing the higher rates for a particular piece of equipment will apply.

1.2.25.5 **Purchased Material**

For all Material purchased by the Contractor, solely to perform or incorporate into the Extra Work, as required by the Consultant, the Contractor will receive payment:

(i) at the agreed price as stated in the Consultant's extra work order to which no allowance will be added; or

(ii) if there is no agreed price, at the amount shown on the supplier's invoices to which will be added 15%.

1.2.25.6 **Supervision**

For supervision required directly on the extra work operation, the Contractor will be paid the actual cost of superintendent's or foreman's wages at the scale being paid on the Contract Work, including statutory payments made to them or on their behalf for holiday pay, Workers' Compensation Board, insurance and pension payments, plus 20 % of the total of the account.

If the supervisory personnel is also engaged on work other than the extra work, only that portion attributable to the extra work will be paid for by the Department.

1.2.25.7 **Transportation of Workers and Equipment**

The vehicles used in the transportation of the workers and small tools required exclusively for the extra work shall be considered as equipment and will be paid for on the basis as provided in Section 1.2.25.3 for the period for which the vehicles are required.

The transportation of heavy construction equipment hauled or otherwise moved to the project exclusively for the Extra Work, or when necessary from separated points on the job to the site of the Extra Work, will be paid for at the applicable rates in accordance with Section 1.2.25.3, provided that the means of transporting the equipment has been previously authorized by the Consultant.

1.2.25.8 **Payment for Extra Work**

The compensation provided in this section shall be payment in full for all charges including overhead and profit, and for the use of small tools for which no rental is allowed.

The Contractor shall present his claim for payment for Extra Work before the fifteenth day of the month following that in which such Extra Work was performed, supported by proper vouchers giving details as to dates, quantities, rates, third party invoices and such other supporting documentation as the Consultant requires.

1.2.26 PAYMENT AND HOLDBACK

1.2.26.1 **Payment**

The total payment made to the Contractor in accordance with the Contract shall constitute full compensation for the Work completed and in place, including the furnishing of all Material, tools, machinery, equipment, labour and work incidental thereto as well as any and all expenses incurred by reason of any cause whatever, except as otherwise provided herein.

The Department will make monthly progress payments to the Contractor for the Work completed based on estimates prepared by the Consultant.

1.2.26.2 **Holdback**

The Department will retain holdback in the amount of 10% of the value of each progress estimate.

1.2.26.3 **Alternatives To Holdback**

1.2.26.3.1 Requirements

As an alternative to retaining holdback in the amounts indicated in Section 1.2.26.2, the Department will accept an Irrevocable Letter of Credit or a Release of Holdback Bond, subject to the following requirements:

(i) The substitution of the Irrevocable Letter of Credit or Release of Holdback Bond for holdback shall be subject to the approval of the Department.

(ii) The Irrevocable Letter of Credit shall be provided by a Domestic Chartered Bank as listed in the Bank Act, "Schedule A, Domestic Chartered Banks", "Schedule B, Foreign Chartered Banks", or the Alberta Treasury Branch.

(iii) The amount of the Irrevocable Letter of Credit or Release of Holdback Bond shall be 10 % of the Contract total tender amount and shall stay in force for 6 months after the specified Contract completion date.

(iv) The Surety's written approval of the Contractor's request for use of the Irrevocable Letter of Credit shall be submitted with the request.

(v) The Irrevocable Letter of Credit or Release of Holdback Bond shall be worded the same as the Sample in the Contract.

(vi) Should the time to complete the Contract extend beyond the specified Contract completion date, the Contractor may be required to provide the Department with an Irrevocable Letter of Credit or Release of Holdback Bond with a revised expiry date. Where the Contractor is required to provide for this extension in time, the Contractor shall, within 14 days of being notified of the requirement, provide to the Department the Irrevocable Letter of Credit or Release of Holdback Bond with the revised expiry date.

(vii) Sections 1.2.26.4, 1.2.26.5 and 1.2.26.6 will also apply to an Irrevocable Letter of Credit or Release of Holdback Bond used in lieu of holdback.

1.2.26.3.2 Drawing Funds

The Department will draw funds on the Irrevocable Letter of Credit or Release of Holdback Bond to cover the following:

(i) To re-establish Contract holdback in the event that the Contractor fails to provide a required revised Irrevocable Letter of Credit or Release of Holdback Bond with an extended expiry date.

(ii) To re-establish Contract holdback in the event that the Department requires funds to resolve deficiencies in any item noted in Section 1.2.26.6.

The cumulative amount of funds drawn by the Department will not exceed the specified amount of holdback that the Department would otherwise have retained up to that time.

The Department will notify the Contractor not less than 14 days before drawing funds on the Irrevocable Letter of Credit or Release of Holdback Bond.

1.2.26.4 **Increase in Holdback**

The Department may increase the amount of holdback retained by the total amount of any outstanding third party claims, deficiencies in the work or unpaid back charges.

1.2.26.5 **Reduction in Holdback**

At the request of the Contractor the Department may at its discretion reduce the amount of holdback where there are only minor deficiencies which, for acceptable reasons, cannot immediately be corrected or where the Department has received a Statutory Declaration which indicates amounts outstanding under "Exceptions." The amount of the reduction and the revised expiry date of any Irrevocable Letter of Credit or Release of Holdback Bond shall be at the discretion of the Department. The Contractor shall provide the Surety's written approval before substitution of an Irrevocable Letter of Credit for a reduced amount.

1.2.26.6 **Release of Holdback**

After a minimum of 45 days has expired from the date of Construction Completion, the Department will release the full amount of the holdback to the Contractor provided that all of the following have occurred:

(i) All Work has been completed and accepted by the Department and the Contractor has complied with all the terms of the Contract excluding his obligations under Section 1.2.54, Contractor's Warranty and Final Acceptance.

(ii) There are no outstanding third party claims filed with the Department.

(iii) The final payments have been calculated by the Consultant and accepted by the Department and there is no recovery required from the Contractor on any account, including overpayment, liquidated damage, or penalty.

(iv) The Department has received the Workers' Compensation Board clearance, and a Statutory Declaration satisfactory to the Department indicating "No Exceptions."

(v) The Contractor has provided the Department with written confirmation that the Contractor is in full compliance with all environmental approvals, permits, licences and/or written authorizations for the project.

If the Contractor fails to meet his obligations with respect to any of these items, the Department may use holdback funds to rectify the deficiency, in accordance with the terms of the Contract and the Public Works Act.

1.2.27 AUTHORITY OF THE DEPARTMENT

The Department will be the ultimate judge of the Work and Material and its decision on all issues regarding quality and quantity, or as to the meaning or intention of the Contract shall be final. Full compensation will not be made for any Work performed, nor Material or thing provided, until the Department has accepted such Work or Material. Submission of written progress or final estimates by the Consultant shall be considered acceptance for payment purposes only.

1.2.28 AUTHORITY OF THE CONSULTANT

The Consultant will provide administration of the Contract as described in the Contract Documents.

The Consultant will be both the initial interpreter of the requirements of the Contract Documents and the initial judge of the acceptability of the Work. Claims and other matters in question relating to the performance of the Work or the interpretation of the Contract Documents shall be referred initially to the Consultant in writing for decision which he will give in writing within a reasonable time. Notwithstanding that the Consultant is not a party to this Contract, the Contractor agrees that there shall be no duty on the Consultant to observe or discover defects or deficiencies in the Work but only to rule on such matters concerning the performance of the Work as may be brought to his notice or as he may observe. Should the Contractor hold decisions of the Consultant to be at variance with the Contract Documents, or to involve changes in Work already built, fixed, ordered or in hand in excess of the Contract, or to be given in error, he shall notify the Consultant before proceeding to carry them out. In the event of the Consultant and the Contractor failing to agree as to such excess or error and the Consultant deciding such disputed Work should be carried out, the Contractor shall act according to such decision and pursue the matter further through the process detailed in Section 1.2.55, Claims and Dispute Resolution.

The Consultant will review and accept written warranties and related documents required by the Contract and provided by the Contractor.

Nothing contained in the Contract Documents shall create any contractual relationship between the Consultant and the Contractor, his subcontractors, any manufacturer, fabricator, supplier or distributor, or other agents, employees or other persons performing any of the Work.

Any reference to the Consultant in any provisions in the Contract Documents, excluding or limiting the Consultant's duty, responsibility, or liability, shall be deemed to include every director, officer, agent, and employee of the Consultant, and any persons shall be entitled to the benefit of all such exclusions or limitations of liability.

1.2.28.1 **Orders Of The Consultant**

The Consultant will be the Department’s representative during construction and until the Contractor has been provided with a Construction Completion Certificate indicating the Department's acceptance of the Work and the commencement of the Warranty period. The Consultant will have authority to act on behalf of the Department to the extent provided in the Contract Documents.

All orders and instructions given at any time by the Consultant with respect to the Work, or the conduct thereof, shall be promptly and efficiently performed and complied with by the Contractor to the satisfaction of the Consultant.

Whenever in the Contact Documents the terms “as ordered”, “as directed”, “as required”, “as allowed”, “as approved”, or terms of like effect or import are used, or the adjectives “reasonable”, “suitable”,

"acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used to describe requirement, direction, review or judgement of the Consultant as to the Work, it is intended that such requirement, direction, review or judgement will be solely to evaluate the Work for general compliance with the design concept for the Project (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall never indicate that the Consultant has authority or responsibility to supervise or manage performance of the Work or authority to undertake responsibility contrary to the provisions of this Contract.

1.2.28.2 **Construction Methods and Equipment**

The Consultant will not be responsible for construction means, methods, techniques, sequences or procedures, or for superintending the Contractor's Work or for the Contractor's failure to perform the Work in accordance with the Contract Documents or the Contractor's compliance with good construction practice or for the acts or omissions of the Contractor, his subcontractors, any manufacturer, fabricator, supplier or distributor, or their agents, employees or other persons performing any of the Work. All of these matters will be the responsibility of the Contractor. However, the Consultant has a duty to take appropriate action to bring the Contractor into compliance with the Contract.

1.2.28.3 **Defective Work**

The Consultant will have authority to reject work which in his opinion does not conform to the requirements of the Contract Documents. Whenever he considers it necessary or advisable, he will have authority to require special inspection or testing of work whether or not such work then be fabricated, installed or completed. However, neither the Consultant's authority to act nor any decision made by him either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Consultant to the Contractor, his subcontractors, any manufacturer, fabricator, supplier or distributor, or their agents, employees or other persons performing any of the Work.

When any defective work, whether the result of poor workmanship, damage through the Contractor's carelessness or use of defective material supplied by the Contractor, is found to exist prior to the date of Construction Completion, the Contractor at his expense, shall promptly remove, replace or otherwise remedy the defective work, to conform to the Specifications in a manner acceptable to the Consultant.

Should the Contractor fail to comply promptly with any order given by the Consultant under this Section, the Department may cause the defective work or material to be remedied, removed or replaced, and deduct the costs incurred from any money due or to become due to the Contractor.

1.2.28.4 **Unauthorized Work**

Any work done or material supplied by the Contractor which is beyond the lines, grades, or descriptions shown on the Plans and Specifications or established by the Consultant, or without required notification, will be considered as unauthorized and may not be paid for.

Upon order of the Consultant, unauthorized work or material shall be remedied, removed or replaced by the Contractor at his expense, in a manner acceptable to the Consultant.

Should the Contractor fail to comply promptly with any order made under this Section, the Department may cause unauthorized work or material to be remedied, removed or replaced, and deduct the costs incurred from any money due or to become due to the Contractor.

1.2.29 AUTHORITY OF THE CONSULTANT'S REPRESENTATIVE

The Consultant's Representative is authorized to inspect all Work done and Material furnished. Such inspection may extend to any part of the Work, and to the preparation, fabrication or manufacture of the Material to be used.

The Consultant's Representative is placed on the Work to keep the Consultant and Department informed as to the progress of the Work and as to the manner in which it is being performed. He has the authority to reject defective Material and Work and to prohibit any work method or procedure which will result in a finished product which will fail to meet the standards required by the Specifications or Plans.

The Consultant's Representative is not authorized to alter or waive provisions of, nor to issue instructions contrary to, the Specifications or Plans. He is not authorized to give final acceptance of any portion of the Work.

The Consultant's Representative will not act as foreman or superintendent for the Contractor.

The Consultant's Representative will exercise such additional authority as may from time to time be delegated to him by the Consultant.

1.2.30 PRESERVATION OF TRAFFIC MARKINGS

On projects that have existing paint and traffic markings, the chainage of the end points of no passing zones shall be recorded in a field book. The Contractor shall provide this information to the Consultant prior to commencing paving operations and the field book will become the property of the Department after completion of the Work.

1.2.31 STAKES, MARKS AND ENGINEERING TESTS

When the Consultant provides to the Contractor summaries of engineering test results taken on or about the Work by the Consultant, the Contractor must satisfy himself as to the meaning and correctness of the engineering test results.

The Contractor shall not take advantage of any apparent error or omission in the Plans, Specifications, stakes, marks, engineering tests, or other measurements done or provided by the Consultant, but shall immediately bring such apparent error or omission to the attention of the Consultant. The Consultant will make corrections and interpretations as may be necessary for the fulfilment of the intent of the Plans and Specifications.

The Department will consider claims for payment of the Contractor's documented extra costs which have resulted from incorrect stakes, marks or engineering tests performed by the Consultant, which neither the Contractor nor the Consultant has recognized in time to prevent the occurrence of such extra costs or which have been drawn to the attention of the Consultant by the Contractor but have not been corrected in a reasonably prompt time. Such claims must be made in accordance with Section 1.2.55, Claims and Dispute Resolution.

1.2.32 CONTRACTOR'S PROJECT SUPERVISOR

The Contractor shall maintain a competent project supervisor on the Work who shall be present on the site of the Work during its progress. The project supervisor shall be considered the lawful representative of the Contractor, shall be fully authorized to act for him for all aspects of the Work, including the work of

all subcontractors/owner operators, and shall receive such communications as may be given by the Consultant.

1.2.33 COMMUNICATIONS

While communication of any notice, order, direction, consent, offer, or other communication may be given in any reasonable manner, it is agreed that important communications between the Contractor and the Department or Consultant, shall be in writing.

Any important communication required or permitted to be given by the Department or Consultant to the Contractor may be personally delivered to the Contractor or his Project Supervisor, or delivered or mailed to the office of either, and shall be deemed to have been received on the day it was delivered or on the fifth calendar day after it was mailed.

Any important communication required or permitted to be given by the Contractor to the Department or Consultant may be personally delivered, or delivered or mailed to its respective office, and shall be deemed to have been received on the day it was delivered or on the fifth calendar day after it was mailed.

Written communications may also be given by FAX transmission and will be deemed to have been received if a FAX transmittal confirmation report can be produced showing receipt at the proper location.

Communications will be sufficient which express, in general language and without detail, the matters communicated, and no objection shall be taken to the form thereof.

1.2.34 WAGES AND HOURS OF WORK

All persons who perform work or labour in the construction of the Work shall be paid wages as are generally accepted as current for comparable workers in the district in which the Work is performed. No workers shall be required to work for more than the number of hours authorized by law in any day, week or month, except for the protection of life or property, or other such emergency. If any dispute arises as to what is a generally accepted rate of wages, or the number of hours of work, the matter will be determined by the Department, whose decision shall be final.

1.2.35 PAYMENT FOR LABOUR AND MATERIAL

The Contractor shall promptly pay, or ensure that prompt payment is made, for all labour, services, equipment, supplies and Material used for, on or about the Work, including any sum due from the Contractor, any subcontractor or any person, for the labour or services of any subcontractor, foreman, worker or other person, or for the use of plants, machinery or camp supplies. In the event of failure by the Contractor at any time to do so, or if the Department has reason to believe that such payments will not be promptly made, the Department may retain out of any money due on any account to the Contractor from the Department such amount as the Department may deem sufficient to satisfy the same, giving him notice of such claims, requesting him to settle them directly and withholding the balance until the claims are satisfied. The Department may pay directly to any claimant such amount as the Department determines is owing, rendering to the Contractor the balance due after deducting the payments so made.

When the liabilities of the Contractor under the Contract exceed the money owed to him on any account by the Department, the Contractor or the Surety shall pay all such claims as are certified by the Department to be correct.

1.2.36 NOTICE OF CLAIMS INFORMATION

The Public Works Act (Alberta) applies to this project. The Builders Lien Act (Alberta) does not apply. For the purposes of interpreting the "Notice of Claim" provisions under Section 14 of the Public Works Act, the claim shall be deemed to be a claim under section 14(2) in which the notice of claim shall be sent by registered mail not sooner than 30 days nor later than 90 days after the last day on which the labour, equipment, material or services were provided.

The Contractor shall post, at his project field office or other conspicuous location accessible to employees, subcontractors, truckers, material suppliers, et cetera, copies of the following:

- Standard Claim Form
- Bond Notice
- Section 14 of the Public Works Act regarding Notice of Claim
- The notice entitled "Notice to Claimants"

which shall be protected in a legible condition for the duration of the project. Copies of these documents will be provided to the successful Bidder prior to execution of the Contract.

1.2.37 RECORDS OPEN FOR INSPECTION

The Contractor's payrolls, time records, invoices, statements, and any other financial documents, data or records which may in the Department's opinion have any relation to the Contract shall be at all times open for inspection and copying by the Department. The Contractor shall assist the Department in every possible way in this inspection.

1.2.38 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT

Any information collected or generated by the Contractor in the course of the performance of the Contract is the sole property of the Department and it is subject to the Freedom of Information and Protection of Privacy Act as well as all other legislation and regulations governing the management of information and records.

1.2.39 LABOUR ACCOMMODATION

Where accommodations are supplied by the Contractor for workers engaged in the Work under the Contract, they shall be reasonably satisfactory, and where necessary, the Contractor shall make provisions for proper housing, feeding, sanitary facilities and medical attention.

1.2.40 TRUCK WEIGH SCALES

When payment by weight is specified, the Contractor shall provide silo scales or platform scales and a scale house.

The use of a particular silo scale shall be subject to the approval of the Consultant. Platform scales shall be of sufficient length and capacity to accommodate in a single loading any truck, including pups or trailers that is used. The scale house shall be weatherproof, heated and large enough to provide reasonable working accommodations for the scaleperson and required furnishings.

All weigh scales must be certified by Measurement Canada of the Federal Department of Consumer and Corporate Affairs. The most recent certificate for a scale shall be displayed at all times. In the event a

certified scale is modified in any way, it must be re-certified prior to being used.

Prior to use on this Contract and in each instance that a certified weigh scale is moved and set up, the Contractor shall test the weigh scale using the procedures established by Measurement Canada. This test shall be performed to ensure that the weigh scale conforms with the current standards required by Measurement Canada of the Federal Department of Consumer and Corporate Affairs. The Consultant must be in attendance during the entire testing process.

The Consultant may, when he deems it necessary, verify the accuracy of the weigh scale at any time and the Contractor shall provide all equipment, facilities and operating staff required to verify the weigh scale and shall cooperate fully in the verification process.

Verifying weigh scales by comparing the weight of a loaded vehicle over a grain elevator scale will not be accepted.

The Consultant will provide a scaleperson at the Contractor's weigh scales for the purpose of weighing materials. The weight so determined shall be the basis for payment.

The Consultant will not operate controls for loading material into trucks. This shall be done by the Contractor.

All costs associated with providing and installing the truck weigh scales and scale house and the testing or certification of the weigh scales, shall be the responsibility of the Contractor and no separate payment will be made.

1.2.41 HIRED TRUCKS

The Contractor shall ensure that all privately owned trucks hired for the haul of granular and earth materials shall have Alberta Class 1 registration in accordance with the Traffic Safety Act.

Each truck used for hauling shall be equipped with a CB radio with which they shall communicate hauling information with the Consultant's checker during unloading operations. Additionally, the Contractor shall supply compatible, portable CB radios to the gravel checkers for the duration of the haul. The Contractor shall ensure that all radio sets are maintained in proper working order and that power packs or batteries for portable sets are supplied as needed.

1.2.42 DUE CARE, CLAIM SETTLEMENT AND HOLD HARMLESS

The Contractor shall hold harmless the Minister, his employees and agents from any and all claims, demands, actions and costs whatsoever, that may arise directly or indirectly out of any act or omission of the Contractor, his employees, agents or sub-contractors, in the performance of the Work.

The Minister shall hold harmless the Contractor, his employees and agents from any and all claims, demands, actions and costs whatsoever, that may arise directly or indirectly out of any act or omission of the Minister, his employees or agents in the performance of the Work.

Such hold harmless shall survive the Contract.

The Contractor shall ensure that his forces and those of all subcontractors use due care to ensure that no person is injured and no person's property damaged in the prosecution of the Work. Without restricting the generality of the foregoing, the Contractor shall, at his own expense, make such provisions as may be

necessary to avoid any such injury or damage.

All claims for injury, loss or damage arising in connection with the Work will be referred to the Contractor who shall deal with each claim in a fair and reasonable manner. The Contractor shall respond to each claimant in writing, setting out the Contractor's position with respect to the claim.

It is the Departments intent that all claimants fully understand the claims resolution process. To assist the claimant in this regard, the Department has available an information pamphlet outlining the process. When contacted by a claimant, the department will provide a copy of the pamphlet to the claimant and then refer the claim to the Contractor. In situations where the Contractor is contacted by a claimant directly, the Contractor shall immediately advise the claimant that a pamphlet outlining the claims resolution process is available from the local Alberta Transportation Office. The Contractor shall then deal with the claim as described above.

If the Contractor settles the claim, he shall provide the Department with written proof that the matter has been resolved. If the Contractor is unable to settle the claim or considers the claim to be invalid, he shall provide the Department with written reasons for rejecting the claim.

The Department will refer unresolved damage claims of less than $1,500.00 to an independent adjuster, who will decide on the validity and value of the claim. The adjuster will be appointed by the Department.

If the adjuster decides that the claim is unfounded, the Department will bear the cost of the assessment. In all other cases, the Contractor shall pay the adjuster's fee and the claim and provide the Department with written proof that he has done so.

The Department may retain from money due the Contractor the amount of each claim pending its resolution, including payment to the claimant and the adjuster, where applicable.

1.2.43 PRECAUTIONS AS TO FIRE

The Contractor shall at his own expense take special precautions to prevent and extinguish uncontrolled fire occurring on or about the Work.

1.2.44 OCCUPATIONAL HEALTH AND SAFETY ACT

The Department assigns prime contractor responsibilities, as specified in the Occupational Health and Safety Act, to all parties with which it enters into contracts and agreements. On highway and bridge construction projects this would typically include the Contractor, the Consultant and various Utility Companies.

During the course of the project, the work sites of the Contractor, Consultant and Utility Company may be separated by time and/or space or, may be in the same general vicinity or may be adjacent, depending on the circumstances on the project at any given point in time. It is a requirement of all Department contracts and agreements that the Contractor, Consultant and Utility Companies working within the project limits, coordinate their respective activities, as outlined herein, to ensure a safe project. However, it is not the Department's intent that any of these parties be responsible to ensure that the other parties, or the other parties' subcontractors, have adequate health and safety process for their respective activities.

1.2.44.1 **Prime Contractor**

1.2.44.1.1 Designation of Prime Contractor

The Contractor shall familiarize himself, his staff and his subcontractors with the terms of the Occupational Health and Safety Act and Regulations thereunder to ensure complete understanding respecting the responsibilities given and compliance required. The Contractor acknowledges that he is and assumes all of the responsibilities and duties of, the Prime Contractor as defined by the Occupational Health and Safety Act, and that he shall, as a condition of the Contract, comply with the Occupational Health and Safety Act and the regulations thereunder.

1.2.44.1.2 Coordinating Activities

The Contractor shall coordinate his activities on the project with those of the Consultant and the Utility Company. When the Consultant and/or Utility Company are conducting activities within the project limits the Contractor shall liaise with the Consultant and/or Utility Company as the case may be, and jointly develop a health and safety system or process for the affected worksites. The health and safety system or process agreed to by the parties must be in writing. Any changes required to the health and safety system must be agreed to by all affected parties and must also be in writing. Documenting the written health and safety system or process, including any required changes shall be the responsibility of the Contractor.

For the purposes of coordinating activities, the contact persons for the Contractor, Consultant and Utility Company shall be identified at the project preconstruction meeting. The responsibility to initiate "contact" for coordinating activities shall reside with the party entering a project or site on which work has commenced. This responsibility to initiate contact shall apply regardless of whether or not the worksites are separated by time and/or space, are in the same general vicinity or are adjacent.

1.2.44.1.3 Resolving Disputes Related to Coordination of Activities

If the parties cannot agree on a process or system that addresses the safety concerns of all parties, work at the affected worksites shall cease and this matter shall be referred to the Consultant. However, if the Consultant is one of the parties involved in the dispute, the matter shall be referred to the Department. The Consultant or Department as applicable, after review, will decide which party shall be responsible for resolving the disputed safety issue. Such decision shall be final and binding upon all parties.

1.2.44.1.4 Responsibility for Subcontractors/Owner operators

The Prime Contractor shall, to the extent required by the Occupational Health and Safety Act, establish and maintain a Health and Safety system or process to ensure compliance to the Act by his subcontractors/owner operators.

1.2.44.2 **Worksite Hazards**

The Contractor has the responsibility to identify worksite hazards and shall develop operational occupational safety policies, procedures and plans which are specific to the Work to ensure the safety of every person at the construction site and the public traveling through the site. When requested by the Consultant, the Contractor shall provide copies of these safety policies, procedures and plans prior to the commencement of the Work, along with verification that they have been submitted to Alberta Human Resources and Employment, Workplace Health and Safety.

If Alberta Human Resources and Employment, Workplace Health and Safety conducts a worksite inspection which results in "orders" being issued to the Contractor, the Contractor shall immediately supply copies of these orders to the Consultant.

The Consultant may suspend work in accordance with Section 1.2.17.1 in cases of recognized imminent danger or when the Contractor fails to comply with safety orders issued or fails to rectify previously identified worksite hazards. The Consultant's interpretation of a worksite hazard will be considered as final in all cases.

1.2.44.3 **Accident Investigations**

In the event of an injury or accident as defined by Workplace Health and Safety regulations, involving employees of the Contractor or his subcontractors, the Contractor shall conduct an accident investigation in accordance with Section 13 of the Occupational Health and Safety Act. In addition, the Contractor shall supply a copy of this investigation report to the Department and the Consultant within 72 hours of the occurrence.

1.2.44.4 **Safety Meetings**

While the Work is in progress, the Contractor's project supervisor shall conduct safety meetings prior to the commencement of Work on each major work phase or monthly whichever occurs first. The Consultant or his designate, shall be invited to attend.

1.2.44.5 **Scaffolding, Falsework and Temporary Protective Structures**

All scaffolding, falsework and temporary protective structures shall be designed for the loads they are required to carry. They shall be engineered and designed for safety in all respects, and shall meet the requirements of the Occupational Health and Safety Act. Drawings shall be stamped by a Professional Engineer, registered or eligible for registration in Alberta. The Contractor's site superintendent (Project Supervisor) shall verify all components are as shown on the drawings before use. A copy of these drawings must be retained on site at all times the system is in use.

1.2.44.6 **Subcontractors/Owner Operators**

The Contractor shall, to his satisfaction, ensure that any subcontractors/owner operators are able to comply with all health and safety requirements before commencing work.

1.2.45 CLEAN PREMISES

During the course of the Work the Contractor shall keep the premises in a neat and tidy condition satisfactory to the Consultant. The Contractor shall upon the completion of the Work, remove all temporary structures and clear away all rubbish and surplus and waste Material remaining on or about the Work and leave the premises in a neat and tidy condition satisfactory to the Consultant. If these requirements are not met, the Consultant may give written notice to the Contractor requiring him to remedy the situation. If the Contractor fails to remedy the situation within 14 days of receipt of the notice, the Department may cause the situation to be remedied and may deduct the cost thereof from any money owing to the Contractor.

The Contractor shall be responsible for the disposal of all debris, un-needed or unsuitable materials and components from the demolition, modification or repair of existing bridge structures. Disposal shall be

done in a manner suitable to the Consultant. Written approval from the owner of the disposal site shall be submitted, and evidence of his acceptance of the disposal site cleanup will be required.

1.2.46 DAMAGE TO WORK

The Work shall be at the risk of the Contractor and he shall bear all loss or damage arising from any cause, excepting acts of the Queen's enemies, which may occur to the Work prior to the date of Construction Completion. If any such loss or damage occurs before the construction completion inspection, the Contractor shall at his own expense immediately repair, restore and re-execute the lost or damaged Work so that the Work, or the portions thereof, shall be completed within the specified time.

1.2.47 CONTRACTOR'S ACCESS TO THE SITE

Access to the site of the Work and hauling materials and equipment to the site shall be the Contractor's responsibility. The Contractor shall ensure that adequate access for all activities is provided and maintained until Contract completion. He shall identify the haul roads he proposes to use, and obtain the necessary approvals in writing from the road authority. Haul of equipment and materials to the job site shall be in accordance with Specification 4.5, Hauling.

The Contractor is also advised that the approach fills for major bridges are normally constructed to a subgrade elevation lower than the "Finished Roadway" elevation indicated on the Drawings. It is the Contractor's responsibility to construct ramps or other facilities, if vehicular access to the bridge deck is required for his operation.

No claims for extra costs or time extensions will be considered on account of access conditions, or imposed road bans or load restrictions.

1.2.48 DEMURRAGE AND DAMAGES

The Contractor shall be responsible for the prompt loading, unloading and delivery of all Materials for the Work and shall be responsible for any demurrage and storage charges. In the event of demurrage or damage charges being paid by the Department, that amount shall be deducted from money owing to the Contractor.

1.2.49 ACCOMMODATION OF TRAFFIC

1.2.49.1 **General**

The Contractor shall:

- make suitable provisions, including the use of detours, to accommodate all vehicular and pedestrian traffic safely and with a minimum of inconvenience through or around the Work,
- provide, install, maintain and protect traffic control devices such as signs, barriers, fences and lights at his own expense and in accordance with Specification 7.1, Temporary Construction Signing,
- install, maintain and protect at his own expense any additional traffic control devices that the Department chooses to provide,
- provide the required number of flagpersons, during all periods of active equipment operations which may affect normal traffic operations,

- control his operations to ensure normal school bus operations are not interfered with,
- ensure uninterrupted access to developments along the project,
- obtain prior approval from the Consultant before changing or disrupting existing accesses and road crossings,
- carry out construction operations in one continuous operation at road crossings, intersections and entrances for each phase of the work,
- when working in large cut or fill areas, stage construction as shown on Dwg. CB6-2.3M30, and as approved by the Consultant, and
- provide and use such other methods or equipment necessary to accommodate traffic safely through the work site.

The Consultant has the right to require the Contractor to modify his operations if, in the opinion of the Consultant, traffic is being unduly hindered or public safety is being compromised.

The Contractor shall promptly make any modifications to the traffic accommodation operations deemed necessary by the Consultant. The Consultant's representative may suspend work in accordance with Section 1.2.17.1 in cases where in his opinion, the Contractor fails to adequately provide for the safety of the public, for re-occurring safety issues or when the Contractor fails to comply with orders issued by the Consultant regarding traffic accommodation operations.

The Contractor shall remove or cover all traffic control devices when not essential for the safe accommodation of traffic, in order to eliminate unnecessary inconvenience to the traffic.

The Contractor shall coordinate his traffic accommodation measures with those of other forces at or adjacent to the Work, as required, to accommodate traffic safely and conveniently. This shall not relieve the Contractor of his responsibility for the safe accommodation of traffic over the whole of the Work.

Prior to any prolonged shut down of construction, the Contractor shall ensure that any disturbed roadway surface is restored to a condition suitable for traffic operations approved by the Consultant.

1.2.49.2 **Flagpersons**

When construction operations or work zone conditions cause interruption, delay or hazard to the traveling public or anyone on the worksite, that requires the use of flagpersons, responsible flagpersons shall be continuously maintained for the direction and control of traffic. The Contractor shall ensure that flagpersons are instructed in and use proper traffic control procedures appropriate for the prevailing conditions. Flagpersons shall have proof of certification from a recognized training program on traffic control procedures through construction zones. The Department will recognize traffic control programs administered by the Alberta Construction Safety Association, however the Department reserves the right to accept or reject certification from any other institute. The provision of flagpersons is considered incidental to the Work and will not be paid for separately.

Flagpersons shall be dressed in clean white uniforms or coveralls, orange hardhats and fluorescent red-orange overvests for maximum visibility, and shall be equipped with the traffic control paddles specified in the Plans. The fluorescent red-orange overvests shall have 50 mm wide reflective yellow striping with a minimum total length of 60 cm on the front and 120 cm on the back.

During hours of darkness, flagpersons shall be additionally equipped with a red signal hand-light of sufficient brightness to be clearly visible to approaching traffic and flagging stations shall be illuminated by overhead lighting. Signs indicating hazardous conditions and signs requiring increased attention shall be marked with flashers.

1.2.49.3 **Detours**

Subject to the approval of the Consultant, detours may be utilized to carry traffic around the Work.

When traffic is diverted entirely off the right-of-way, the Contractor shall at his own expense establish and maintain a detour which shall be complete with signs at every intersection in accordance with the Plans and Specifications.

When the Consultant directs that a detour road be constructed, the construction including graveling will be paid for at the applicable unit prices.

When a secondary or local road is used as a detour, the Contractor shall at his own expense maintain and leave it in a condition as good as it was, in the opinion of the Consultant, prior to its use as a detour, including regravelling if required.

1.2.49.4 **Removal and Salvage of Existing Signs and Guideposts**

All existing signs and guideposts which must be removed in the prosecution of the Work shall be carefully salvaged by the Contractor. Critical signs necessary for the protection of traffic such as railroad crossing signs or stop signs shall be maintained. Maintenance, removal and salvage of signs and guideposts will not be paid for separately but shall be considered incidental to the Work.

1.2.49.5 **Roadway Maintenance and Graveling**

When the Work requires disturbance of the surface of an existing roadway which is carrying public traffic, the Contractor shall, at his own expense keep the disturbed areas of the traveled lanes well graded, free of potholes and of sufficient width for the required number of travel lanes.

Prior to any prolonged shut down of construction, the Contractor shall ensure that any disturbed roadway surface is restored to a condition suitable for traffic operations as approved by the Consultant. The Contractor will not be responsible for normal winter snow and ice control for traffic accommodation.

When in the opinion of the Consultant surfacing gravel is required for traffic accommodation on areas disturbed by the Contractor prior to the completion of the Work on these areas, the Contractor shall promptly provide and place crushed surfacing gravel to the satisfaction of the Consultant. For detours, payment for providing and placing this crushed surfacing gravel shall be in accordance with Section 1.2.49.3, Detours. For haul roads from gravel pits, payment for providing and placing this crushed surfacing gravel shall be in accordance with Specification 4.5, Hauling. For roads other than detours and haul roads from gravel pits, the provision and placing of crushed surfacing gravel shall be at the Contractor's expense, except that the Department will pay for the truck haul of the gravel as extra work and, if the Contract has a designated source of gravel, the Department will provide, at its source, the pit-run gravel to be crushed.

If the Contractor fails to promptly maintain the road and apply gravel, the Department may make other arrangements to have the work done, and deduct the cost thereof from any money owing to the Contractor.

The Contractor will not be responsible for maintenance of those areas of an existing roadway which are to be constructed or reconstructed but which have not yet been disturbed by the Contractor's construction or hauling activities.

1.2.49.6 **Sequential Arrowboards**

When specified in the special provisions, the specifications or directed by the Consultant, the Contractor shall use a sequential arrowboard for the accommodation of traffic. The Contractor shall supply a sequential arrowboard conforming to the following specifications:

(i) Minimum size 0.75 metres x 1.52 metres.
(ii) 12 volt solid state circuitry.
(iii) Minimum 25 amber sealed beam, hooded lamps.
(iv) Fully adjustable light intensity on all arrowboard lights.
(v) Operating modes which include:

(a) sequential left arrow or chevron
(b) sequential right arrow or chevron
(c) sequential double arrow or chevron
(d) horizontal bar
(e) all four lamps in the extreme corners of the panel flashing simultaneously at 35-50 flashes per minute with the flashing lights lit for 50% of the time.

1.2.49.7 **Dust Abatement**

The Contractor shall keep detours and disturbed roadways within the project limits which carry traffic free of excessive dust. In this case, "disturbed roadways" shall mean sections of roadway under construction and/or sections of roadway being used by the contractor for hauling of equipment or materials. The Contractor shall supply and apply all dust abatement materials at his expense.

If the Contractor fails to promptly undertake dust abatement measures, the Department may make other arrangements to have the work done, and deduct the cost thereof from any money owing to the Contractor.

Dust abatement requirements for haul roads are detailed in Specification 4.5, Hauling.

1.2.49.8 **Traffic Accommodation for Bridge Construction**

Traffic accommodation for bridge construction shall also include the provision of adequate staff to monitor and maintain the operation of all traffic control devices (TCD). These workers shall be qualified, trained and experienced in traffic control and must be knowledgeable in the operation of the TCD's and other related equipment. These workers shall be provided vehicles equipped with revolving warning lights and suitable communication devices to contact others for assistance if and when required. At the preconstruction meeting the Contractor shall identify those workers who will be responsible for monitoring the TCD's.

The Contractor shall ensure that all traffic control devices are operational on a continuous 24 hour per day basis. During periods when there are no construction activities, the Contractor shall site inspect all traffic control devices and traffic control signage at minimum 6 hour intervals. All site inspections shall be documented and when requested be available for the Consultant's review. The Contractor shall also be responsible for maintaining and protecting, at his own expense, any additional traffic control devices that may be provided by the Department or by others within the construction zone. The construction zone is defined as being at any location between the first signs in either direction of the project.

The Contractor shall provide a site specific detailed plan of his proposed traffic control a minimum of two weeks before the start of work, for examination by the appropriate authorities. The applicable drawings shown in the Traffic Accommodation in Work Zones manual are referenced as minimum requirements. The Contractor may use these plans to develop suitable detailed traffic control plans taking into account site specific conditions which may impact this work. A detailed traffic control plan is required for each bridge site.

The Contractor shall not commence any work which may interfere with public traffic, until the proposed traffic control plan has been reviewed by the Consultant and the traffic control is in place. Traffic control shall be in place only during the time it is applicable to the work on the bridge site. Traffic control lights shall be adjusted to the traffic demands encountered.

The Contractor shall minimize inconvenience to traffic as much as possible, and provide the widest traffic roadway width as practical. The minimum traffic roadway width, as shown or specified, shall be maintained and be available to public traffic at all times.

The Contractor shall anticipate and as practical accommodate wide load vehicles which may have disregarded roadway width restrictions. No separate or additional compensation for accommodation of wide load traffic will be paid.

During the course of the work, traffic control measures will be reviewed and assessed by the Consultant, and may require modifications, including the addition of signs and arrowboards as deemed necessary, from time to time to suit traffic conditions. The Consultant may also require the Contractor to reschedule his work activity in order to minimize any adverse impact on public traffic.

For bridge construction contracts where public traffic does not pass within hazardous distance of the Contractor's work, public access to the site will normally be excluded by signs, barricades, temporary barriers, or guardrail, erected by others. The Contractor shall at all times maintain such signs and barriers in position, and shall replace them immediately after temporary removal for purposes of his own access. Prior to the commencement of any work, he shall supply, erect, securely fasten down, and maintain standard reflectorized barricades, for the width of the roadway adjacent to each abutment. The Contractor shall ensure that all barricades are in place and properly maintained throughout this Contract or until the bridge is opened to public traffic.

When the Contract contains a bid item for Traffic Accommodation for Bridge Construction, these items shall be site specific and will be full compensation for complete signing and traffic accommodation at bridge construction sites.

1.2.50 SAFEGUARDING UTILITY INSTALLATIONS

1.2.50.1 **Contractor's Responsibility**

The Contractor shall assume full responsibility for safeguarding all existing and relocated utility installations during the progress of the Work.

"Utility installations" shall mean:

> Utilities and facilities which are located on, in or near the right-of-way and which may be affected by the construction, and shall include but not be limited to pipelines, drainage works, irrigation works, water works, sewage works, power facilities, telephone facilities, cable facilities and related appurtenances.

While the Department and Consultant makes every effort to collect and present complete details concerning utility installations, no responsibility will be assumed by the Department or Consultant for the correctness and completeness of its information, and the Contractor shall have no claim on that account.

1.2.50.2 **Liaison and Location**

The Contractor shall be responsible to ensure that all utility installations are located and clearly marked on the ground before commencing his construction operations. The Department or Consultant may provide information respecting the existence of known utility installations, such as power, telephone, pipeline, coaxial or fibre-optic cables or other utilities. However, the Contractor shall be responsible for contacting all affected utility owners or operators to determine the existence and location of all utility installations, maintaining liaison with the utility owners or operators concerning the adjustment of all utilities and coordinating his operations in compliance with Section 1.2.18, "Hindrances and Delays".

1.2.50.3 **Precautionary Measures**

The Contractor shall take all precautionary measures as may be necessary when working over or adjacent to utility installations whether above or below ground and shall control his equipment and method of construction to prevent damage to any utility and its appurtenances.

Under no circumstances shall the Contractor carry out any construction operations over or adjacent to any utility until the required adjustments and protection as required for the proposed construction have been completed. Additionally, he shall provide at least 48 hours notice to the utility owner or operator in advance of commencing his construction operations in that area. After completion of the utility work by the utility owner or operator, the Contractor shall continue to work in close liaison with the utility owner or operator and, if the utility owner or operator so requires, ensure that a representative of the affected utility owner or operator is present at all times during active equipment operations at that location. The Contractor shall ensure that no equipment crosses or operates over or under any utility installation at locations other than where required protection has specifically been provided, and he shall work in close cooperation with the utility owner or operator in the execution of the Work. When construction is involved in the vicinity of any unprotected utility installation, the Contractor shall exercise extreme caution to ensure that the utility installation is not damaged by the construction equipment or applied loads. When haul road or equipment crossings are required at locations other than where the Department has specifically arranged for the crossing, it shall be the Contractor's responsibility to determine, provide and install any protective works necessary and to observe any other precautions which are required.

1.2.50.4 **Work In The Vicinity Of Utilities**

The Contractor shall perform work in the vicinity of utility facilities in accordance with the following requirements. Any known additional specific requirements for work in the vicinity of utilities and coordination with the owners and/or operators will be listed in the special provisions under the particular utility.

1.2.50.4.1 Telephone Facilities

When there are telephone facilities which are affected by the Work, the applicable telephone company may carry out the required relocation of their facilities concurrently with the construction operations.

In those areas where it is not immediately feasible to relocate the buried cable to the final location, the telephone company may temporarily place a cable along the right-of-way boundary and bury it upon completion of grading operations.

1.2.50.4.2 Power Lines

1.2.50.4.2.1 General

When there are power facilities within the limits of this project, alterations to the facilities will be carried out by the applicable power company concurrently with the grading operations.

The Contractor, in undertaking any work near existing powerlines shall comply with the Regulations under the Electrical Protection Act.

1.2.50.4.2.2 Additional Clearing for Power Line

Prior to the commencement of power line relocation, the Contractor shall first carry out the necessary right-of-way clearing. The clearing for power lines may also include clearing an additional strip (up to 6 metres wide) immediately adjacent to the right-of-way, payment for which will be made at the applicable unit price bid for "Clearing" or "Clearing and Timber Salvage." When the Contract does not contain bid items for clearing or clearing and timber salvage, any required clearing will be considered incidental to the Work. It shall be the Contractor's responsibility to maintain liaison with the power company to ensure that the necessary land clearances have been arranged.

1.2.50.4.3 Pipelines

1.2.50.4.3.1 General

The companies named within the Special Provisions have pipelines located within the limits of this project. Any adjustment work will be carried out by the Pipeline Owner/Operator concurrently with the construction operations.

When the magnitude and degree of complexity of the adjustments required, prevents the Contractor from working in the vicinity of a pipeline, the Contractor shall arrange his operations clear of those pipelines until the required adjustments are completed and permission to construct in their vicinity is received.

The Contractor shall not have any claim for compensation or damages against the Department for any stoppage, delays, inconvenience or damage sustained by him due to any interference from the pipelines, or the operation of moving them.

1.2.50.4.3.2 Precautionary Measures to be Taken when Working in the Vicinity of Pipelines

Prior to the commencement of construction operations, the Contractor shall review the project with representatives of each pipeline company and the Consultant to determine the location and specifics of each pipeline within the project limits. Upon completion of this step the Contractor may begin his operations, and shall carry out all work in the vicinity of pipelines in accordance with the following precautionary measures.

(i) The Contractor, being fully aware of the location of all pipelines, shall mark the location of the same so their positions are readily identifiable to all work forces.

(ii) Under no circumstances shall work be commenced within 30 metres of any pipeline until the required adjustments (if any) have been completed and a written crossing agreement has been received from the affected company.

(iii) The Contractor shall contact the company representative 72 hours prior to commencing construction operations within 30 metres of a pipeline so arrangements may be made to have a company representative or his delegate present during the period machinery is being employed within 30 metres of a pipeline. Absolutely no work shall be undertaken within these limits until a company representative is present at the site and has authorized the same.

(iv) No operations involving the use of machinery shall be commenced within 5 metres of a pipeline until the line has been hand exposed, its location accurately referenced, and any required protection is put in place and/or adjustment to the pipeline is complete. The exposure and backfilling of the pipelines shall be undertaken by the Contractor under the direct supervision of the Consultant and the pipeline company's representative.

The exposure and backfilling of pipelines will not be paid for separately, but shall be included in the unit prices for the applicable classes of excavation.

(v) If the Contractor proposes to move any construction equipment across the pipeline right-of-way prior to the commencement of construction operations, the Contractor shall use timbers or a pad of earth if the pipeline company so desires or the Consultant so directs. This protection shall be constructed to specifications established by the pipeline company and the Consultant.

All labour, equipment, materials and incidentals as may be required for the protection of a pipeline and the safe execution of work, will not be paid for separately but shall be included in the applicable bid items contained in the tender.

(vi) Clearing required within 30 metres of a pipeline shall be carried out using suitable hand operated tools, and burning or burial of debris within 30 metres of a pipeline is strictly prohibited. The method of removal and disposal of the debris shall require the approval of the Consultant.

This work will be paid for at the applicable unit price bid for "Clearing" or "Clearing and Timber Salvage" and no separate or additional payment will be made. When the Contract does not contain bid items for clearing or clearing and timber salvage, any required clearing will be considered incidental to the Work.

(vii) The Contractor shall not store, park or drive any equipment, materials and/or vehicles over or along any pipeline right-of-way except as reasonably necessary in the actual construction of the roadway.

(viii) Notwithstanding the foregoing, the Contractor shall conduct his operations in the vicinity of all pipelines in accordance with the Pipeline Act of Alberta, the National Energy Board Regulations and other related legislation.

1.2.50.4.3.3 Pipeline Accidents

The Contractor is advised that in the event of a pipeline accident, all work is to cease immediately and he is to contact the Pipeline Company involved as well as the local area office of the Energy and Utilities Board (EUB).

1.2.50.4.4 Coordination With Irrigation Authority

(a) The Contractor shall coordinate closely with the irrigation authority at all times. The Contractor shall not interrupt or interfere with the Irrigation Flow during Irrigation Season without prior agreement of the Irrigation authority.

(b) In general, construction which will interfere with normal seasonal irrigation flow shall be undertaken only during the off irrigation season. The normal irrigation season is from May 1st to September 30th, both dates approximate. Allowance should be made for spring floods and for drain-down time in the fall.

(c) The Contractor shall remove, prior to spring runoff, any crossings constructed during the off-irrigation season which will interfere with normal irrigation flow.

(d) When work is undertaken in the vicinity of irrigation installations, the Contractor shall take all precautionary measures as may be necessary and shall control his equipment and method of construction to prevent any damage to the irrigation installations. In the event of damage, the Contractor shall immediately, at his own expense, repair and restore to its original condition any installation so damaged.

1.2.50.4.5 Highway Streetlighting

When the Contract contains a street lighting relocation and/or installation component, the Contractor shall coordinate construction activities with the applicable utility owner/operator.

When there are existing street lighting facilities within the right-of-way which are to be revised or added to by other forces, the Contractor shall liaise with the other forces and the applicable utility company to ensure that there are no undue delays to the scheduling. Particular care shall be taken to ensure that the required underground electrical conduit as shown on the drawings is installed in a timely manner and that the underground electric cable and pole bases are installed by the other forces in advance of the final embankment finishing.

To facilitate grading operations and conduit installation, it may be required that the power supply be provided via temporary overhead power lines while the existing underground power cables are disconnected. Procedural arrangements for the provision of temporary overhead power service and detour lighting will be made with the Utility Company by the Consultant.

1.2.50.4.6 Railway Crossing Construction

1.2.50.4.6.1 General

When work is undertaken within the limits of the railway right-of-way for the construction of new crossings, or haul of embankment construction material across the railway tracks, the Contractor shall coordinate his operations with the railway company and shall ensure that the following precautionary measures are observed.

(a) Prior to commencing equipment operations within the railway right-of-way, the Contractor shall provide 3 weeks notice to the Track Supervisor of the applicable railway company as listed in the Special Provisions.

The Contractor shall determine from the railway company possible additional measures which may be required for the protection of their personnel and facilities, including any supplementary insurance coverage beyond that stipulated in Section 1.2.10. The cost of this insurance coverage will not be paid for separately, but shall be considered to be included in the applicable unit prices bid.

(b) At the discretion of the Track Supervisor, a flagperson will be employed to protect the trains and operating equipment. Normally the railway company will provide the flagperson upon receipt of three work days notice to the Track Supervisor. If a flagperson is required and the railway company does not provide one, the Contractor will be required to supply the flagperson. Regardless of whom supplies the flagperson, the Department will pay the cost of this flagperson.

(c) The crossing shall only be used by rubber-tired equipment.

(d) A temporary mat shall be placed over the rails to facilitate the movement of tracked equipment.

(e) The railway shall be maintained free of dirt, debris and obstructions at all times.

(f) The crossing shall not be used for other than the purpose herein provided.

(g) The Contractor shall determine the exact location and depth of any underground railway signal or telecommunication cables prior to commencing construction operations. These cables shall be located by means of hand digging by the Contractor's forces under direct supervision of a representative of the railway company.

No extra payment will be made or charges allowed for work done in connection with locating the cables. Additionally, the Contractor shall be held wholly and solely responsible for any damages to these cables that may be attributed to his operations.

(h) The Contractor shall be fully responsible for his work operations adjacent to the rail line when working within the railway right-of-way and indemnify and hold harmless the Department in accordance with Section 1.2.42.

1.2.51 ENVIRONMENTAL MANAGEMENT

1.2.51.1 **Environmental Legislation, Regulations, Approvals, and Permits**

The Consultant will obtain the environmental approvals, permits, licences, and/or authorizations required for the tendering of the project.

The Contractor shall familiarize himself with all applicable federal and provincial legislation and regulations concerning environmental protection and shall conduct his activities in accordance with such legislation and regulations, including, but not necessarily limited to, the provincial Environmental Protection and Enhancement Act and Water Act and the federal Fisheries Act and Navigable Waters Protection Act.

The Contractor shall comply with the conditions of all environmental approvals, permits, licences and authorizations issued for the project. The Contractor shall obtain any further environmental approvals, permits, licences and/or authorizations as may be required for the project.

The Contractor shall provide the Department with written confirmation of his full compliance with all approvals, permits, licences and/or written authorizations before the full amount of holdback will be released.

The Contractor shall also familiarize himself with all applicable Codes of Practice issued by Alberta Environment and shall conduct his activities in accordance with such Codes of Practice, including, but not necessarily limited to, the Code of Practice for Asphalt Paving Plants (under the Environmental Protection and Enhancement Act) and the Code of Practice for Watercourse Crossings (under the Water Act).

1.2.51.2 **Environmental Construction Operations Plan**

The Contractor shall prepare and implement an Environmental Construction Operations Plan for each phase of the project in accordance with the Department manual entitled "Environmental Construction Operations Plan (ECO Plan) Framework," July 2001 version. The Plan shall detail temporary environmental control measures that the Contractor shall undertake to comply with all applicable legislation, regulations and approvals during the course of construction and during "winter shut down."

The Environmental Construction Operations Plan shall not cover any permanent or long term environmental or erosion control devices or work specified in the Contract.

The Contractor shall submit the Environmental Construction Operations Plan to the Consultant at least 14 calendar days prior to the pre-construction meeting. The Consultant will review the Environmental Construction Operations Plan and communicate any concerns to the Contractor at least 7 calendar days prior to the pre-construction meeting. The Contractor shall address any issues or concerns regarding the proposed Environmental Construction Operations Plan to the satisfaction of the Consultant prior to the commencement of the Work.

The finalization of the Plan to the mutual satisfaction of the Consultant and the Contractor does not constitute an approval or assurance from the Consultant or the Department that the “temporary environmental control measures” detailed in the Environmental Construction Operations Plan are sufficient to ensure compliance with all applicable legislation, regulations or conditions of approval. The Contractor is ultimately responsible to ensure all measures, used on the project, are sufficient to ensure compliance with all applicable authorities. This may mean increasing the number of installations, providing alternate devices or modifying procedures.

If at any time during the project, it is determined that the devices or procedures detailed in the Environmental Construction Operations Plan (any specific measures, locations or quantities proposed) are insufficient, the Contractor shall modify the Plan accordingly.

The cost of preparing the Environmental Construction Operations Plan and the performance of all Work necessary to ensure compliance with the applicable legislation, regulations or conditions of approval (with the exception of removing and disposing of material from silt containment ponds and sediment barriers) will be incidental to the Work and will not be paid for separately.

1.2.51.3 **Disposal of Waste Materials**

The Contractor shall not release, dump, spill or dispose of any substance(s) into the environment that causes or could cause impairment of or damage to the environment or human health or safety. The Contractor shall clean up any wastes arising from the Work and any other substance(s) that causes or could cause impairment of or damage to the environment or human health or safety, and should he fail to do so, the Department may, without further notice, arrange the clean-up of such wastes and/or other substance(s)

at the expense of the Contractor.

The Contractor shall remove and dispose of any inert solid waste materials resulting from the Work in a manner acceptable to the appropriate regulatory agencies and the Consultant and prior to completion of the Work. The Contractor may temporarily store such material in interim stockpiles on the disturbed land.

1.2.51.4 **Reporting Procedures for Spills of Deleterious or Hazardous Materials**

During the construction, any releases of silt or other deleterious substances into a body of water or watercourse shall be immediately reported to the Consultant, Alberta Environment and the Federal Department of Fisheries and Oceans (1-800-222-6514).

In the event of the release of silt or other deleterious substance into a body of water or watercourse, the Contractor shall take all reasonable measures to contain the release and repair any damage at his expense.

Spills or releases of hazardous materials and/or any other substances that cause or could cause impairment of or damage to the environment or human health or safety shall also be immediately reported to the Consultant and Alberta Environment and, if a body of water or watercourse is involved, the Consultant, Alberta Environment and the Federal Department of Fisheries and Oceans (1-800-222-6514). The Contractor shall take all reasonable measures to contain the spill and cleanup and any such work shall be performed in accordance with the applicable legislation and regulations at the Contractors expense.

1.2.51.5 **Environmental Protection Devices or Procedures**

1.2.51.5.1 Permanent Environmental Protection Devices

The Contract documents may specify the use of various erosion control or environmental protection devices at specific locations throughout the project. These are items that are considered necessary for environmental protection for some period of time following the completion of construction. The timing of the installation or construction of these devices and the quantities required will be specified in the Contract or determined by the Consultant. These devices will be paid for at the applicable unit price bid for the specific device used.

1.2.51.5.2 Temporary Environmental Protection Devices or Procedures

All other environmental protection or erosion control devices or procedures required to ensure compliance with the applicable legislation, regulations or approvals during construction are deemed to be necessary only as “temporary environmental protection measures” and shall be the direct responsibility of the Contractor. This shall include the responsibility for determining the quantities, nature and locations of such devices or procedures and the timing of each event. The Contractor shall, to the extent possible, identify these devices or procedures in his Environmental Construction Operations Plan.

No separate payment will be made for any “temporary environmental protection measures” undertaken by the Contractor regardless of whether or not the temporary measure is detailed in the Contractor’s Environmental Construction Operations Plan or whether or not the Contract contains a bid item for the device(s) or procedure(s) used, with the exception that payment will be made for any "temporary erosion control device" which the Consultant directs is to remain in place following the Construction Completion Inspection.

1.2.51.5.3 Maintenance of Environmental Protection Devices

The Contractor shall maintain all permanent erosion control devices to the extent required and as directed by the Consultant, up to the time of Construction Completion.

The Contractor shall monitor and maintain temporary erosion control devices at all times throughout construction and during periods of shutdown, to the extent required to protect the environment.

Payment for maintaining temporary and permanent erosion control devices will be considered incidental to the Work, with the exception of removing and disposing of silt from silt containment ponds and sediment barriers. Removing and disposing of material from silt containment ponds and sediment barriers will be paid for as Extra Work in accordance with Specification 1.2, General.

1.2.52 GOODS AND SERVICES TAX

This is to certify that the property and/or services ordered/purchased hereby are being purchased by Alberta Transportation, which is part of the Alberta Crown or is listed as a tax free Alberta Government agency, and are therefore not subject to the Goods and Services Tax.

This applies to all payments made by the Department to the Contractor under this Contract. The tender prices shall exclude any allowance for the Goods and Services Tax.

1.2.53 CONSTRUCTION COMPLETION AND ACCEPTANCE

Upon notice from the Contractor of completion of the entire Work, the Department and Consultant will make an inspection of the Work accompanied by the Contractor's representative. If the Work is found to be completed in accordance with the Contract, that inspection shall constitute the construction completion inspection and the Consultant will issue a Construction Completion Certificate to the Contractor indicating the Department's acceptance of the Work and the start of the warranty period.

If the inspection discloses any unsatisfactory Work, the Consultant will give the Contractor a list of deficiencies and the Contractor shall immediately correct the deficiencies. Upon correction of the deficiencies, another inspection will be made and, provided the Work has been satisfactorily completed, the Consultant will issue a Construction Completion Certificate to the Contractor.

1.2.54 CONTRACTOR'S WARRANTY AND FINAL ACCEPTANCE

During the warranty period, the Contractor shall warrant the Work to be free from any defect or failure and to withstand climatic, maintenance and normal operational conditions. Generally, the warranty period shall be two years for bridge structures and one year for other Work, and shall commence on the date of Construction Completion as determined by the Department. Unless otherwise shown in the special provisions, the following contract work will not require a warranty:

- grade construction (with the exception of areas directly over culvert installations) which is not receiving granular base course or pavement surfacing under the Contract,
- stand alone crushing contracts,
- stand alone clearing contracts, or
- permanent erosion control devices.

Work requiring warranty periods different from the above, will be identified in the special provisions.

The Contractor shall repair at his own expense any such defect or failure which occurs in the Work prior to the expiry of the warranty period. The Department will notify the Contractor in writing during the warranty period of repairs required and the Contractor shall promptly make these repairs. These repairs are a performance requirement of the Contract, and shall be assured by the security provided.

If the Contractor fails to do the repairs promptly or to the satisfaction of the Department, the Department may then make other arrangements to have the repairs done, the cost of which shall be a debt due and owing by the Contractor and the Surety to the Department. Specific requirements concerning the timing of any warranty work required for seeding are detailed in Specification 2.20, Seeding.

Upon completion of all above requirements, a Final Acceptance Certificate will be issued by the Department.

1.2.55 CLAIMS AND DISPUTE RESOLUTION

1.2.55.1 **Claims Resolution Process**

The resolution of claims arising between parties to this Contract, is subject to the following structured process:

1.2.55.1.1 Claims

If a situation or occurrence arises between the Department and the Contractor, in connection with or arising out of the Contract or the execution of the Contract Work, which results in a difference in opinion between the parties as to payment or compensation required under the Contract or the time required to complete the Contract, such situation or occurrence shall be considered a claim.

1.2.55.1.2 Resolution of Claims

Where the Department or the Contractor considers that a Claim has arisen under the Contract, the Department or Contractor shall issue a Notice of Claim to the other party.

A Notice of Claim shall be in writing and shall state the details of the claim. A Notice of Claim issued by the Contractor to the Department pursuant to this Contract shall be served to the Consultant.

A Notice of Claim shall be served as soon as possible after the occurrence of the circumstance giving rise to the Claim and not later than seven (7) days after the occurrence of the circumstance, or the claimant becoming aware of the circumstance. Failure to serve a Notice of Claim within this prescribed time period will prejudice the claimant's right to proceed with the Claim, unless the claimant can demonstrate that such delayed Notice did not prejudice the ability of the other party to take action to minimize any additional costs resulting from the Claim.

The Parties shall make bona fide efforts to resolve a claim and the Work shall proceed without delay during the claims resolution process. Attempts to resolve claims shall sequentially follow the administrative review structure as follows:

1. Consultant
2. Regional Director
3. Executive Director, Program Management Branch

The Department or the Contractor may not unilaterally proceed to litigation without agreement of the other party.

In the event the claim is not resolved to the satisfaction of both parties through this process and the claimant wishes to pursue the matter further, it is incumbent upon the claimant to issue a Notice of Dispute in accordance with Appendix A, Mandatory Dispute Resolution Process of the document entitled "Dispute Resolution Process for Government of Alberta Construction Contracts."

1.2.55.2 **Dispute Resolution Process**

Claims which escalate into disputes, shall follow the processes identified in the document entitled "Dispute Resolution Process for Government of Alberta Construction Contracts", Appendices A, B, C, D, & E. In the event of a conflict between the aforementioned Appendices and other provisions of the Contract, the Appendices shall govern.

All references to Owner in the "Dispute Resolution Process for Government of Alberta Construction Contracts" shall mean the Department.

Any Notice of Dispute issued by the Contractor to the Department pursuant to this Contract shall be served to:

Executive Director,
Program Management Branch
2nd Floor, Twin Atria Building
4999-98 Avenue
Edmonton, AB,
T6B 2X3
FAX: 422-2822

TABLE OF CONTENTS

2.1 CLEARING

2.1.1 GENERAL

2.1.1.1 **Description**

Clearing shall consist in general of cutting, piling, removing and burning or otherwise disposing of trees, brush, stumps, logs and roots from areas specified on the plans, or as designated by the Consultant.

2.1.1.2 **Clearing in Forest Protection Areas**

The Contractor's attention is drawn to the Alberta Forest and Prairie Protection Act and the associated regulations, thereunder pertaining to Fire Permit and Brush Disposal requirements in the forest protection area.

2.1.1.3 **Clearing in Municipal Districts and Counties**

The Contractor shall obtain permission to undertake the burning of clearing within Municipal Districts and Counties from the local authority.

2.1.2 METHODS

2.1.2.1 **Clearing - General**

The Contractor shall cut trees and brush, remove all roots, and remove, pile and burn all trees (except trees to be preserved), brush, stumps, logs and roots within the limits of the right-of-way, and also from such areas as may be required for offtake ditches, channel changes, easements, borrow pits, etc., as directed by the Consultant. All underbrush and down trees protruding into the right-of-way are to be disposed of in the same manner. Timber, brush, stumps, logs or roots shall not be piled upon adjacent lands, and the limits of the right-of-way shall be left in proper condition for fencing.

All tree branches extending into the right-of-way, which hang within 6 m of the ground, shall be cut off close to the trunk in a neat and workmanlike manner.

2.1.2.2 **Preservation of Trees**

The Consultant may require the Contractor to preserve, certain trees within the right-of-way. Underbrush, down timber, snags and roots shall be removed from the vicinity of such preserved trees to a clear space within the right-of-way, and there burned.

2.1.2.3 **Clearing and Timber Salvage**

Areas to be cleared and salvaged will be identified by the Consultant. Generally, salvage shall be required where trees have a stump diameter of 125 mm or greater.

The Contractor shall fell, topp, limb and deck timber designated as salvageable, to the satisfaction of the Consultant. The salvaged timber shall be piled in areas designated and approved by the Consultant.

2.1.2.4 **Dangerous Trees**

The Consultant may require the Contractor to cut down unsafe trees which are located outside the areas designated for clearing.

2.1.2.5 **Burying Clearing Debris**

During periods of extreme fire hazard in forest protection areas fire permits may be refused, in which event the Consultant may allow disposal of brush and clearing debris by burying under soil cover.

Where burying is allowed, trees, brush, stumps, logs and roots from clearing operations shall be placed at locations on the Work as directed by the Consultant, consolidated to the highest degree practicable and covered with a minimum of 1.5 m of mineral soil. The completed disposal area shall present a neat, levelled appearance.

2.1.2.6 **Fire Damage Prevention**

The Contractor shall be solely responsible for ensuring all fires are totally extinguished. If a fire results from an improperly extinguished fire, the Contractor may be held responsible for the damage.

2.1.3 MEASUREMENT AND PAYMENT

Clearing and Clearing and Timber Salvage will be measured in hectares based on horizontal measurements. No allowance will be made for uneven or sloping ground.

Payment for clearing will be made at the unit price bid per hectare for "Clearing." This payment will be full compensation for all clearing operations including disposal by either burning or burying and the removal of dangerous trees.

No allowance will be made for cutting and removing grain, grass, weeds or shrubs.

Payment will not be made for the clearing of Contractor's access to the work or Contractor's campsites. Any such clearing shall be piled and burned, and the cleared areas left in a neat and tidy condition.

Payment for clearing and timber salvage will be made at the unit price bid per hectare for "Clearing and Timber Salvage". This payment will be full compensation for all clearing and timber salvage operations.

TABLE OF CONTENTS

2.3 GRADING

2.3.1 GENERAL

2.3.1.1 **Description**

Grading consists of the excavation of soil materials, the salvage of select soil materials, the operation of borrow areas and the construction of embankment. This Work includes the removal and/or satisfactory placement of all materials necessary for the construction and preparation of embankments, slopes, drainage works and connections to the required alignment, grade and cross-sections. It also includes the excavation for culverts, underdrains, and foundation pits for bridges, trestles, buildings and other structures.

2.3.1.2 **Dimensions of Excavations and Embankments**

The dimensions of the excavations and embankments shall be, in accordance with the typical sections accompanying these specifications, but the dimensions of any or all excavations and embankments may be increased or decreased at any time by the Consultant as conditions and circumstances may determine.

2.3.2 MATERIALS

2.3.2.1 **General Description of Suitable and Unsuitable Materials**

The following provides a general description of the materials typically encountered during grading construction and how such materials shall be handled in the course of performing the Work. Specific requirements concerning the use of these materials are specified elsewhere in this specification.

Materials considered as "suitable" shall be used for backfilling and constructing embankments. Materials considered as "unsuitable" shall either be disposed of or salvaged depending on the nature of the material.

Vegetation, roots, stumps and refuse are considered as unsuitable materials. Such materials shall be disposed of in a manner satisfactory to the Consultant.

Topsoil excavated from inside and outside the right-of-way is considered as an unsuitable material. Topsoil shall be salvaged and subsequently handled as specified elsewhere in this specification.

Subsoil excavated from inside the right-of-way is considered as a suitable material. Subsoil excavated from outside the right-of-way or from a roadway which is to be obliterated is considered as an unsuitable material and shall be salvaged and subsequently handled as specified elsewhere in this specification.

All other excavated material obtained from inside or outside the right-of-way, will be considered a suitable material, regardless of the moisture content of the material.

During the performance of the Work, the Consultant will be the final authority in determining suitable and unsuitable materials.

2.3.2.2 **Reservation of Special Materials**

Whenever gravel, stone or other material which has the potential of being suitable for special use by the Department is found, the Department shall be immediately notified.

When required by the Department, such materials shall be reserved and deposited in suitable locations identified by the Department.

2.3.2.3 **Description of Topsoil and Subsoil**

In this specification, the terms Topsoil and Subsoil are used to describe separate select soils requiring specific handling during construction. The following general descriptions are provided to assist the Contractor in distinguishing these select soils in the course of performing the Work. The specific handling requirements for Topsoil and Subsoil are specified elsewhere in this specification.

The uppermost layers of soil both inside or outside the right-of-way may consist of any or all of the following.

- Topsoil is the uppermost layer of soil that:

  (i) contains the majority of plant roots
  (ii) is normally referred to as the plough layer in agriculture soils
  (iii) is typically darker in colour than the subsoil layer.

- Subsoil is the layer of soil directly below the topsoil layer that:

  (i) contains the lower portion of the root zone
  (ii) is typically lighter in colour than the topsoil layer.

2.3.3 CLASSES OF EXCAVATION

All excavation, for whatever purpose, will be classified as specified herein. The classifications for Solid Rock, Channel Excavation, Common Excavation and Borrow Excavation stipulate excavating and placing the material. In the event the excavated material is unsuitable, the term “excavating and placing” shall be taken to mean “excavating and stockpiling” or “excavating and disposing”, as the case may be.

2.3.3.1 **Solid Rock Excavation**

Solid Rock Excavation shall include the removal from their original position of rock in solid beds or masses, and boulders or detached rock having a volume of one half cubic metre content or more and placing of the material.

2.3.3.2 **Channel Excavation**

Channel Excavation shall include the excavation and placing of material excavated for the improvement of existing water courses, water course channel realignments, and off-set muskeg drainage ditches located parallel to the roadway and not forming the normal contiguous roadway ditch. Excavation for a ditch section which is adjoining the roadway embankment shall not be classed as Channel Excavation.

Channel Excavation shall include material excavated for the installation of culverts down to the culvert invert elevation, and will also include sub-excavation for culvert base construction. In cut sections, channel

excavation shall only be that material excavated for culvert installation subsequent to undercut excavation as shown on the drawings. In fill sections, channel excavation shall only be that material excavated below original ground.

Channel Excavation shall also include any trench excavated for the installation of perforated pipe sub-drains.

Any material excavated during channel excavation operations which meets the specification for Solid Rock Excavation, as described in Section 2.3.3.1, shall be so classified.

2.3.3.3 **Common Excavation**

Common Excavation shall consist of the excavation and placement of material obtained from within the right-of-way, subject to the exceptions specified herein. Common Excavation shall also consist of the excavation and placement of material obtained as prescribed in sub-section 2.3.3.5 (i).

Any such material excavated from stockpile and redistributed over a disturbed area shall also be classified as Common Excavation.

The following are exceptions to the classification of Common Excavation:

(i) any material excavated from within the right-of-way which conforms to the description of Solid Rock Excavation, shall be so classified.

(ii) any material excavated from within the right-of-way which conforms to the description of Channel Excavation, shall be so classified.

2.3.3.4 **Borrow Topsoil Excavation**

Borrow Topsoil Excavation shall consist of the excavation and salvage of topsoil, and subsoil separately from borrow areas and borrow area haul roads. Such materials excavated from a stockpile and redistributed on borrow areas and borrow area haul roads shall also be classified as "Borrow Topsoil Excavation".

2.3.3.5 **Borrow Excavation**

Borrow Excavation shall consist of the excavation and placing of material obtained from locations outside the right-of-way with the following exceptions:

(i) The excavation of roadways which are being obliterated will be classified as Common Excavation.

(ii) With the exception of topsoil and subsoil excavated from outside the right-of-way as described in 2.3.3.5 (i), all other topsoil and subsoil excavated from outside the right-of- way will be classified as Borrow Topsoil Excavation.

2.3.3.6 **Common and/or Borrow Excavation Loaded to Trucks**

Common and/or Borrow Excavation Loaded to Trucks shall consist of the excavating, loading to trucks and placing of material obtained from locations inside the right-of-way or borrow areas as shown on the plans or as designated in the Special Provisions. Any material not designated to be loaded to trucks will not be so classified.

2.3.4 CONSTRUCTION

2.3.4.1 **General Requirements**

2.3.4.1.1 Restraining of Livestock

The Contractor shall erect and maintain such temporary fences as may be required to prevent livestock or other animals from straying upon the right-of-way or adjoining property or upon borrow area perimeters. The Contractor shall at all times provide against the escape of livestock or other animals through openings made by him in right-of-way or other fences.

2.3.4.1.2 Towing Traffic

Where necessary during grading operations, the Contractor shall, upon orders in writing from the Consultant, provide sufficient men and equipment to hookup and tow vehicular traffic through the Work. The amount and type of equipment to be used in towing traffic will be stipulated and approved in the orders by the Consultant. The Contractor shall be responsible for any damage caused by such towing.

2.3.4.1.3 Equipment Operation on Paved Surfaces

Where the location of excavation material necessitates the hauling across or on an existing paved roadway the operation shall be carried out as follows:

(i) Haul across an existing roadway shall be limited to a single equipment crossing point for each borrow site approved by the Consultant.

(ii) Where haul across a road is by conventional earth moving equipment, an earth pad or steel plates of sufficient dimensions shall be placed on the existing road surface so that no damage to the highway surface or roadbed is incurred. Steel plates may remain in place throughout the use of the crossings.
Unless otherwise permitted by the Consultant, earth pads shall be placed no sooner than daybreak and removed no later than sunset each day that haul operations are in progress. In all cases, the use of earth pads on existing roads must be addressed by the Contractor in the Traffic Accommodation Strategy.

(iii) Where haul along or across a road is undertaken by trucks, the prevalent load limit restrictions for haul along roadways or over bridges shall apply. Haul of excavation material on the existing roadway will only be permitted until completion of sufficient new grade.

(iv) Under no circumstances shall regular grading equipment be allowed to operate on the existing highway surface or use the highway surface as a haul road.

(v) Dust abatement material shall be applied when necessary.

Repair of any damage incurred in the pavement or subgrade structure, as a result of the haul operations, shall be the sole responsibility of the Contractor. The damage shall be repaired and the surface restored to a condition equivalent to that which existed prior to the commencement of haul operations.

2.3.4.1.4 Preservation of Survey Monuments

The Contractor shall preserve all survey monuments and property marks along and adjacent to the roadway. The Contractor shall use suitable precautions to protect from damage or disturbance such survey monuments and property marks until their location has been witnessed, or otherwise referenced, and he shall not remove them until directed by the Consultant.

2.3.4.1.5 Slides

All material in slips, slides and subsidences shall be removed by the Contractor and either properly disposed of or used in the Work.

2.3.4.1.6 Construction, Surfacing, Maintenance And Removal Of Staged Construction

Sections of new highway which are used for traffic operation prior to the application of base course shall conform to the permanent grade section, with temporary connections constructed at the end points as required. Immediately upon completion of the grading (or in the case of an alignment revision, immediately prior to instituting traffic thereon), the roadway shall be gravel surfaced and sprayed with asphalt or other dust abatement material. The Contractor shall be responsible for continuously maintaining the surface in a satisfactory bladed and dust-free condition until the application of the base course.

As practical and where required by the Consultant, the material removed from the temporary connections shall be utilized for grade construction.

2.3.4.2 **Solid Rock Excavation**

2.3.4.2.1 Rock Cuts

All rock cuts shall be excavated to below grade, to a depth determined by the Consultant and then backfilled to grade with suitable material.

In solid rock cuts, where pockets which will not drain are formed below the design roadway elevation by blasting, the Contractor shall, at his own expense, provide drainage by ditching to a free outlet as determined by the Consultant, and backfilling both the pockets and the trench to an elevation 0.30 m below profile grade with broken rock or coarse gravel.

2.3.4.2.2 Overbreak

Overbreak will be considered as that portion of rock which is excavated, displaced or loosened outside and beyond the slopes or grade as established by the Consultant, regardless of whether any such overbreak is due to blasting, to the inherent character of any formation encountered, or to any other cause.

If any rock slide occurs as a result of overbreak, all slide debris will be considered as overbreak.

Overbreak material may, as approved by the Consultant, be used to replace material which would otherwise have to be obtained from other sources, or shall be disposed of to the satisfaction of the Consultant.

2.3.4.2.3 Pre-Shearing

Where required by the Consultant, the Contractor shall pre-shear rock faces to minimize overbreak and produce a stable slope.

2.3.4.2.4 Trimming Rock Slopes

Slopes undercut at the base, or destroyed in any manner by act of the Contractor, shall be resloped by the Contractor at his own expense to the slope as staked by the Consultant.

The slopes shall be carefully scaled down, and all rocks and fragments likely to slide or roll down the slopes removed to the satisfaction of the Consultant.

2.3.4.3 **Catch Water Ditches**

Catch water ditches shall be constructed in accordance with the typical plans, where shown on the profile drawings and/or where designated by the Consultant. In the case of a catch water ditch along the top of an excavation, the Consultant may require that the catch water ditch be constructed prior to commencement of excavation.

2.3.4.4 **Common Excavation**

All topsoil in disturbed areas or to the limits shown on the plans or in the Special Provisions or where designated by the Consultant, shall be salvaged for reuse. Any required stockpiling of topsoil material shall be performed to minimize topsoil losses and contamination of the topsoil and surrounding materials.

Following the excavation and salvage of topsoil, all other material shall be excavated to the extent specified in section 2.3.4.7 and as shown on the plans, or as determined by the Consultant. Suitable material shall be used for constructing embankments. Any unsuitable material encountered shall be disposed of in a manner satisfactory to the Consultant.

2.3.4.5 **Borrow Topsoil Excavation**

All topsoil, and subsoil materials from borrow and borrow haul road areas shall be separately excavated, salvaged, stockpiled and reused in accordance with the requirements for development and reclamation of borrow areas specified in Section 2.3.4.6, Borrow Excavation.

2.3.4.6 **Borrow Excavation**

2.3.4.6.1 General

The use of Borrow Excavation for constructing embankments will be allowed only after all Common Excavations have been completed and the resulting suitable material hauled into the embankment, or after all the economic possibilities of obtaining further material by the widening of roadway excavations or ditches have been exhausted.

Borrow areas shall be regular in width and, if required, shall be connected with ditches and drained to the nearest watercourse. Particular care shall be taken to work the area so as to cause a minimum of damage and inconvenience to the land owner. On completion of the Work, borrow areas shall be trimmed and left in a neat and uniform condition. The Contractor shall not operate or park equipment in the borrow

locations outside of the limits of the actual borrow area, haul roads or stockpile sites. Any areas disturbed, compacted or otherwise affected by the Contractor's operations shall be reclaimed to its original condition.

Borrow areas will be staked out and cross-sectioned by the Consultant before the Contractor begins work therein. Any material excavated from borrow areas previous to measurement will not be paid for. When a borrow area is provided by the Contractor, the Contractor shall provide proof of landowner consent and the right-to-enter for Department employees and the Consultant.

Borrow areas provided by the Department, may be entered only with the permission of the Consultant. Such areas, may be subject to revisions, additions or deletions at the discretion of the Consultant. The Contractor shall be prepared to accept such borrow location arrangements as will ultimately be made by the Consultant and shall have no claim against the Department on this account. Changes in borrow locations could result in the required use of soil material of undetermined characteristics, and may also affect the equipment fleet required to undertake the Work, as well as the quantities associated with the Work.

The Contractor shall not change the location of a borrow area provided by the Department, without prior approval of the Consultant.

When the construction of access or haul roads for borrow areas are required, the location and dimensions of the access roads shall be subject to the approval of the Consultant.

2.3.4.6.2 Notification Requirements

The Contractor shall inform the Consultant at least ten days before starting:

(i) annual activities at the borrow site;

(ii) any salvage of topsoil, subsoil materials;

(iii) any replacement of topsoil, subsoil materials.

If the borrow area is provided by the Contractor, the Contractor shall also inform the local Reclamation Inspector of the appropriate regulatory agency within this same time frame.

2.3.4.6.3 Pre-Disturbance Assessment of Borrow Areas

A pre-disturbance assessment shall be completed for each borrow area in accordance with the procedures detailed in the document "Alberta Transportation Pre-Disturbance Assessment Procedures For Borrow Excavations For Road Construction, May 2002". The pre-disturbance assessment must be completed in advance of any construction related activity at the site.

When a borrow area is provided by the Department, the pre-disturbance assessment of the site will be completed by the Consultant. The Contractor shall provide the Consultant with adequate notice of his intention to commence construction activities at the borrow site such that the Consultant has sufficient time to complete the pre-disturbance assessment. The Consultant will provide the Contractor with a copy of the completed pre-disturbance assessment.

When a borrow area is provided by the Contractor, the Contractor shall complete the pre-disturbance assessment of the site. The Contractor shall not employ the Consultant to complete the assessment.

The Contractor shall provide the Consultant with a copy of the completed pre-disturbance assessment at least 3 days prior to the commencement of construction operations in the borrow area.

2.3.4.6.4 Conservation of Topsoil, Subsoil on Borrow Areas and Stockpile Sites

The Contractor shall excavate, salvage and stockpile the topsoil, and subsoil in a manner which prevents contamination of one material with another. A minimum distance of 3 m is required between stockpiles of different materials. The materials shall be stockpiled separately in a safe, stable and accessible location.

If topsoil is to be stockpiled for periods exceeding 2 months or when required by the Consultant, the Contractor shall protect the stockpile from erosion by applying an approved seed mixture or other approved biodegradable soil stabilizer.

The Contractor shall suspend the excavation, salvage and stockpiling of topsoil and subsoil materials when wet, frozen or other adverse conditions are encountered.

The Contractor shall not construct stockpiles at locations where they are subject to erosion. The Contractor shall maintain erosion and drainage control in the vicinity of all borrow areas and stockpiles to the satisfaction of the Consultant and shall ensure that surface drainage does not adversely affect adjacent lands, watercourses or future reclamation operations.

2.3.4.6.5 Buffer Zones

The Contractor shall ensure an undisturbed buffer zone exists between the disturbed borrow areas and adjacent land and permanent structures. For property boundaries, road allowances and permanent structures, normal buffer zones shall be 4 m or equal to the depth of excavation whichever is greater.

Dugout borrows shall be a minimum of 40 m from the right-of-way or 70 m from the highway centreline; whichever is greater. For watercourses or waterbodies a minimum 30 m wide buffer is required.

Stockpiles shall not be situated within 30 m of a watercourse or permanent structure or within 4 m of adjacent property boundary.

Extended buffers shall be implemented where local conditions dictate.

2.3.4.6.6 Reclamation

2.3.4.6.6.1 General

The Contractor shall reclaim borrow areas and borrow area haul road in accordance with the applicable legislation and the requirements of the specifications.

Borrow reclamation shall be performed as soon as possible after completion of excavation operations in any borrow area. Notwithstanding the requirement for expeditious reclamation of borrows, reclamation may not be permitted to proceed, if in the opinion of the Consultant, there is insufficient time left in the season to allow vegetation to root and minimize soil erosion of the reclaimed areas.

2.3.4.6.6.2 General Reclamation Conditions For Landscape Borrows or Disturbed Areas Around Dugouts, Borrow Haul Roads and Stockpile Sites

No work of any kind shall take place on frozen or wet surface areas, or using frozen or wet material.

Upon completion of the excavation operations, the Contractor shall contour the site to match the surrounding lands and to ensure positive drainage. The entire area shall be scarified to a minimum depth of 0.5 m or to the depth of compaction, whichever is greater. Where large clay clumps or ridges are prevalent, discing shall be performed following scarification. All rocks larger than 70 mm maximum dimension shall be removed. Subsoil material shall only be used for contouring the site with the approval of the Consultant and the local Reclamation Inspector from the appropriate regulatory agency. Topsoil material shall not be used to contour the site.

The Contractor shall replace all soil levels uniformly in lifts in the reverse order that they were removed. The Contractor shall disc each replaced soil layer.

Topsoil shall be evenly redistributed over the entire area and rocks, roots and stumps removed. Redistribution of topsoil shall only be done in suitable weather conditions. The Contractor shall not perform such Work when wind conditions are such that material is being carried beyond the designated work areas or that the material is not being uniformly applied.

In areas where dry soils are encountered discing and harrowing may destroy soil structure and lead to loss through wind erosion. When these types of areas are encountered, the Contractor shall contact the local Reclamation Inspector from the appropriate regulatory agency to explore alternative procedures for site reclamation..

Rock picking shall be performed to ensure rock content of the reclaimed land does not exceed the rock content prior to disturbance. If rock content prior to disturbance is not known, the Consultant will use adjoining land to determine the extent of rock picking required.

Material salvaged from dugout borrow excavations shall generally not be replaced inside the dugout.

2.3.4.6.6.3 Seeding of Reclaimed Areas

The Contractor shall seed reclaimed sites in accordance with Specification 2.20, Seeding and the following:

(i) Areas to be seeded shall be fine graded to a uniform surface and be loose to plow depth at the time of seeding. Such fine grading shall be performed in a manner which does not affect the distribution of topsoil or result in excess compaction.

(ii) All disturbed areas resulting in exposed soils within borrow areas and haul roads shall be seeded.

(iii) Seed shall consist of a species mixture compatible to adjacent areas unless otherwise required by the Consultant.

Alternate seeding preparation methods may be necessary for dry soils. Small areas may be seeded by hand.

Where necessary, temporary fences along borrow area perimeters may be required to control livestock or to restrict entry.

2.3.4.6.7 Post-Disturbance Assessment of Borrow Areas

The Contractor shall immediately notify the Consultant when reclamation at a borrow site is complete.

A post-disturbance assessment shall be completed for each reclaimed borrow site in accordance with the procedures detailed in the document "Alberta Transportation Post-Disturbance Reclamation and Assessment Procedures for Borrow Excavations for Road Construction, May 2002", with the exception that the vegetation component of the assessment will not be required.

The post-disturbance assessment must be completed within 15 days following the completion of the reclamation work at the site.

When a borrow site is provided by the Department, the post-disturbance assessment of the site will be completed by the Consultant. The Consultant will provide a copy of the assessment to the Contractor within 15 days following the completion of the assessment.

When the borrow site is provided by the Contractor, the Contractor shall complete the post-disturbance assessment of the site. The Contractor shall not employ the Consultant to complete the assessment. The Contractor shall provide the Consultant with a copy of the completed post-disturbance assessment within 15 days following the completion of the assessment.

2.3.4.6.8 Acceptance of Reclaimed BorrowSites

Each reclaimed borrow site will be assessed for compliance with the requirements of the specifications and the reclamation criteria specified in "Alberta Transportation Post-Disturbance Reclamation Criteria and Assessment Procedures for Borrow Excavations for Road Construction", with the exception that the vegetation criteria component will not apply.

A reclaimed borrow site which does not comply with the requirements of the specifications and the reclamation criteria shall be rectified by the Contractor at his expense. In such cases the site will be re-assessed for compliance with the specifications and the reclamation criteria. The Contractor will be charged $1,500.00 for each additional post-disturbance assessment required.

2.3.4.7 **Constructing Roadways**

2.3.4.7.1 Embankments

Embankment shall be constructed by placing, shaping, adjusting the moisture content where necessary and compacting excavation materials. Only suitable materials shall be used for constructing the embankment except as otherwise approved by the Consultant under the specific conditions specified herein.

The embankments shall be constructed in conformity with the lines, grades, and cross-sections shown on the plans, or staked on the ground by the Consultant.

2.3.4.7.2 Constructing New Roadways

2.3.4.7.2.1 Fill Sections

All topsoil shall be salvaged unless otherwise shown on the plans or in the special provisions.

If the exposed surface is 0.6 m or greater below the design subgrade surface it shall be bladed and compacted, and backfilled using suitable materials and in successive layers, to the required lines and grades.

If the exposed surface is less than 0.6 m below the design subgrade surface, excavation shall be carried out

to 0.6 m below the design subgrade surface, or to the elevation as determined by the Consultant and the suitable excavated material shall be used to construct embankments. The exposed surface shall then be bladed and compacted, and backfilled using suitable materials and in successive layers, to the required lines and grades.

2.3.4.7.2.2 Cut Sections

Where the design subgrade surface is in cut and following the excavation and salvage of topsoil, excavation shall be carried out to a depth of 0.6 m below the design subgrade surface, and the suitable excavated material shall be used to construct embankments. The exposed surface shall be bladed and compacted, and the excavated area backfilled using suitable materials and in successive layers, to the required lines and grades.

At the transition point from a cut section to a fill section , excavation shall be done to 1.0 m below design subgrade surface or to the elevation as determined by the Consultant, for a distance of 60 m in both directions from the transition point and the suitable excavated material shall be used to construct embankments. The exposed surface shall then be bladed and compacted, and then backfilled using suitable materials and in successive layers, to the required lines and grades.

2.3.4.7.2.3 Hillside Benching

When embankments are to be made on a hillside of a nature that will, in the opinion of the Consultant, preclude a proper bond between the existing and the newly placed materials, the existing ground on which the embankment is to be placed shall be benched before embankment construction is commenced. The extent of the benching required including the height of the vertical bench cuts will be determined by the Consultant. Otherwise, before any embankment is placed on a smooth, firm surface, the existing ground shall be scarified to obtain a bonding of the new material with the existing ground. .

2.3.4.7.3 Reconstructing Existing Roadways

2.3.4.7.3.1 Grade Widening

Where existing roadbeds are being widened or the existing embankments and roadway ditches extended, the sideslopes, the affected ditch bottoms and backslopes shall be denuded of all vegetation. Any topsoil from these disturbed areas shall be excavated and salvaged. Side-slopes shall be benched one level at a time (starting at the ditch bottom) in order to obtain bonding between the existing grade and the new embankment. Attempts to obtain bonding by the use of vertical cuts for the full depth of the embankment will not be permitted. In all cases, cuts shall not be steeper than 0.5 horizontal to 1 vertical. Suitable material excavated from the benching operation and any reconstruction of the ditches and back-slopes shall be used for constructing embankments.

Where required by the Consultant, any unsuitable material in the existing grade shall be excavated, disposed of and replaced with suitable material. Generally the unsuitable material shall be disposed of to the satisfaction of the Consultant. However, the Consultant may require that the unsuitable material be used in the new sideslopes, provided that, in the opinion of the Consultant, it will not adversely affect the structural integrity of the roadway.

When it is necessary to cut the roadway surface for construction of the last bench, the Contractor shall control traffic such that it is not permitted to travel within 0.5 m of the edge of the surface cut.

The length of surface cut shall not exceed 1 km or a length as established by the Consultant. The Contractor shall promptly backfill sections of exposed vertical cut to provide safe accommodation of traffic.

For any location where surface cutting is required, the Contractor shall erect orange coloured, reflectorized traffic delineators along the pavement edge at intervals of 20 m, all in a manner acceptable to the Consultant.

When base course construction does not immediately follow grade widening or when the surface cut is longer than 1 km, the Contractor shall promptly place and compact a wedge of suitable material in the cut area adjacent to the roadway surface. This wedge of material shall be tapered to a slope no steeper than 3 horizontal to 1 vertical.

2.3.4.7.3.2 Embankment Placed on Existing Road

Prior to the placement of embankment on an existing roadbed, material within the roadbed designated by the Consultant as unsuitable, shall be excavated and replaced with material approved by the Consultant. Generally, the unsuitable material shall be disposed of to the satisfaction of the Consultant. However, the Consultant may require that the unsuitable material be used in the new sideslopes, provided that, in the opinion of the Consultant, it will not adversely affect the structural integrity of the roadway.

To obtain bonding between the existing and new embankment materials on sideslopes, the existing roadbed sideslopes shall be denuded of vegetation, any topsoil excavated and salvaged and where required by the Consultant, benched as described in Section 2.3.4.7.3.1.

Where a new embankment of 0.3 m or less is placed on an existing road which is not surfaced with asphalt material, the existing surface shall be scarified to a depth of 0.15 m unless otherwise required by the Consultant. The moisture content in this scarified material shall be adjusted, as required, and the material shall be compacted to the density requirements in accordance with the Specifications.

2.3.4.7.4 Placing Material

2.3.4.7.4.1 Use of Rock Material

Where rock is being used in the embankment, such rock shall be carefully distributed and the interstices filled with finer suitable material, as approved by the Consultant, to form a dense compact mass. Any large rocks encountered during the construction of the embankment in the final finishing operations which the Consultant determines to constitute a hazard to traffic, due to size or protrusion from the finished embankment surface, shall be removed and disposed of to the satisfaction of the Consultant.

2.3.4.7.4.2 Snow, Ice or Frozen Material

Embankment material shall not be placed on frozen earth, snow or ice, nor shall frozen soils, ice or snow be placed in any embankment. Any frozen material in the embankment shall be removed and disposed of at the Contractor's expense before proceeding with further embankment construction.

2.3.4.7.4.3 Grade Settlement

Embankment shall be constructed so that after settlement is complete the required grade and cross-section is attained at all points. If at any time before the time of Construction Completion the embankment settles below the required grade, it shall be brought back to the required grade by the Contractor. This work will

be paid for at the applicable unit price bid for the class of material used.

2.3.4.7.5 Moisture Adjustment and Compaction

2.3.4.7.5.1 Layer and Density Requirements

Unless otherwise specifically permitted by the Consultant, all material placed in embankments shall be spread and bladed smooth in successive layers, not to exceed 0.15 m in depth when compacted and to the full width of the cross-section. Each layer shall be compacted by means suitable to the Consultant to a minimum of 95 percent of the maximum dry density established by the Moisture-Density Relation tests using Standard Compaction, with the exception of the upper 0.30 m, which shall be compacted in 0.15 m layers to a minimum of 100 percent. The material in each layer shall be compacted at the optimum moisture content, unless otherwise required by the Consultant. In case of controversy, the degree of compaction and/or moisture content will be determined by a moisture-density test before the succeeding layer is placed.

2.3.4.7.5.2 Test Methods

The Consultant will from time to time take samples and carry out testing and inspection of the materials incorporated or being incorporated into the Work. The Contractor shall cooperate with the Consultant for such sampling, testing and inspection. Such inspection shall not relieve the Contractor from any obligation to perform all the Work strictly in accordance with the requirements of the Contract.

Various alternative test methods may be used by the Consultant to confirm that specification requirements are being met.

In cases of dispute regarding the degree of compaction and/or moisture contents, all testing to confirm compliance with the Specifications will be carried out by the Consultant, using the most recent edition of the following standard test methods.

	Test Descriptions	Method No.
1.	Classification of Soils for Engineering Purposes	ASTM Designation D2487 (1)
	a) Determining the Liquid Limit of Soils	AASHTO Designation T 89
	b) Determining the Plastic limit and Plasticity Index of Soils	AASHTO Designation T 90
	c) Particle Size Analysis of Soils	AASHTO Designation T 88
2.	Soils Identification, Hand Method	ATT-29
3.	Moisture-Density Relation	
	a) Standard Compaction, - 5 000 µm Material	ATT-23
	b) Standard Compaction, + 5 000 µm Material	ATT-19
	c) One-Point	ATT-20
4.	Density	
	a) In-Place, Sand Method	ATT-9
	b) In-Place, Balloon Method	ATT-8
	c) In-Place, Nuclear Method	ATT-11
5.	Moisture Content	
	a) Oven Method, Soil and Gravel	ATT-15, Part I
	b) Microwave Oven Method	ATT-15, Part IV
	c) Speedy Moisture Teller	ATT-44
	d) In-Place, Nuclear Method	ATT-11
6.	Correction Factors, Nuclear Moisture-Density Measurements	ATT-48

NOTES:

(1) As modified by the Prairie Farm Rehabilitation Administration (PFRA) to include medium plastic clay with the symbol CI.

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

(3) 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.

2.3.4.7.5.3 Compaction Operations

Compaction over the entire surface area of each layer shall be obtained by the use of tamping rollers, or other equipment to meet the specified density requirements. Hauling equipment will not be accepted in lieu of compaction equipment. Compaction to the specified density shall be obtained uniformly throughout

each layer.

2.3.4.7.5.4 Construction on Muskeg or Yielding Ground

Where the embankment to be placed traverses muskeg or yielding ground and it is not possible to place the initial embankment lift in a 0.15 m compacted depth, the Contractor may, upon approval of the Consultant, construct the first embankment lift to a depth sufficient to support the construction equipment. All embankment to be constructed above this support will be constructed in 0.15 m compacted depths, as hereinbefore specified.

2.3.4.7.5.5 Moisture Content Adjustments For Compaction

2.3.4.7.5.5.1 Drying

Where moisture content tests indicate that material being used for embankment is above optimum moisture, the material shall be thoroughly disced and worked until a uniform optimum moisture content is reached.

The use of lime or any other material to assist in drying wet material shall be entirely at the Contractor's discretion.

2.3.4.7.5.5.2 Water for Compaction

Where moisture content tests indicate the material for embankment is below optimum moisture, water shall be added. The material shall be thoroughly disced and broken down, water added in amounts as required, and the material thoroughly worked to mix the water uniformly throughout the soil prior to commencing compaction operations.

2.3.4.7.6 Obliteration Of Existing Roadway

When sections of the existing roadway, accesses and crossings, are obliterated upon completion of the new roads or when approved alternative roads are operational, any topsoil and subsoil from the area to be obliterated shall be excavated and salvaged separately. The material excavated from the obliteration operation shall be utilized for embankment construction or disposed of as determined by the Consultant.

Obliteration of existing roadway also consists of reclamation of the areas to a neat and tidy condition comparable to that of the adjacent ground, and to the satisfaction of the Consultant. The subsoil shall be redistributed uniformly over the disturbed area and then the topsoil shall be placed over the area in accordance with Specification 2.6, Topsoil Placement.

2.3.4.8 **Approach Fills for Bridge Structures (Other Than Bridge Culverts)**

2.3.4.8.1 Preparation of Existing Ground

Prior to the placement of embankment on the existing ground where bridge approach fills are to be located, and in order to allow unrestricted pile penetration, all areas where piles are to be driven shall be cleared of obstructions such as pavement, granular and soil cement materials, compacted subgrade, boulders or rock of any nature, trees, stumps and any other undesirable debris. Where the subsurface of the area is known to contain boulders, they shall be removed to a minimum depth of two metres below the existing ground surface. All the materials removed shall be utilized or disposed of as determined by the Consultant.

The locations where bridge piling is to be located shall be as shown on the plans or as determined by the Consultant.

2.3.4.8.2 Placing Material in Bridge Approach Fills

Construction of approach fill embankments shall be undertaken in accordance with Sections 2.3.4.7.4, Placing Material, and 2.3.4.7.5 Moisture Adjustment and Compaction, excepting that the embankment material shall be free of stones, rocks or other solid material greater than 150 mm.

2.3.4.8.3 Finishing Bridge Headslopes

Bridge headslopes shall be accurately trimmed, particularly at the intersection of the toe of the headslope with the underpassing roadway or with the bank of a stream, to the lines, grades and cross-sections as shown on the plans or as determined by the Consultant.

Drainage requirements shall be constructed to the lines and grades as shown on the plans or as determined by the Consultant.

2.3.4.9 **Overhaul**

Overhaul will occur when excavated material is hauled (other than by trucks), more than 300 m and placed in embankments or disposed of as specified herein.

Overhaul will apply to suitable material under the classifications of Common, Solid Rock, Channel and Borrow Excavations when such material is deposited at locations as provided by the plans, or as designated by the Consultant. Overhaul will not apply to unsuitable material under these classifications unless the Consultant specifically requires that such material be hauled more than 300 m.

Overhaul will not apply to topsoil and subsoil or other unsuitable materials from borrow and borrow haul road areas unless the Consultant specifically requires that such material be moved outside the disturbed borrow area and the haul to move the material to such locations outside the disturbed borrow area is greater than 300m. Overhaul will not apply in situations where such materials are hauled more than 300m within the limits of the disturbed borrow area.

2.3.4.10 **Finishing Previous Clearing**

The Contractor shall remove and dispose of any stumps, debris and new tree growth within the limits of the previously cleared areas.

2.3.5 FINISHING, INTERIM ACCEPTANCE OF ROADWAY SURFACES AND MAINTENANCE

2.3.5.1 **Finishing**

The Contractor shall, as soon as practicable, bring the excavations and embankments to the correct widths, lines and grades.

Backslopes that are 2 metres and greater in height and with a slope steeper than 3m horizontal to 1 m vertical shall be scarified to reduce the potential for erosion. A typical method for scarifying such backslopes shall be "walking a dozer" over the entire slope, operating the equipment in a direction perpendicular to the roadway. All other backslopes shall be finished in the normal manner.

A maximum of 2 km of grade shall be in the rough at any one time. However, where no traffic accommodation is required through the Work, up to 5km of grade may be in the rough.. In these situations, having more than 2 km of grade in the rough at any one time will be subject to the prior approval of the Consultant.

As soon as the excavations and embankments are completed to the correct widths, lines and grades, the Contractor shall maintain the roadway with a blade machine.

2.3.5.2 **Interim Acceptance of Roadway Surfaces**

Roadway surfaces which have been entirely completed (constructed and finished) in accordance with the plans and specifications will be eligible for inspection and interim acceptance by the Consultant under the following conditions:

(i) The roadway surface is not being covered with granular base course under this Contract.

(ii) The section of roadway surface being considered for interim acceptance is not less than 1 kilometre in length and is contiguous to a section of roadway surface previously accepted.

Interim acceptance shall apply to the roadway surface only, and shall not relieve the Contractor of his responsibility to complete other portions of the roadway such as the sideslopes, ditches and backslopes in accordance with the plans and specifications.

Acceptance of the other portions of the roadway will not be made on an “interim” basis and will only be considered once the entire project is completed and ready for the Construction Completion Inspection as detailed in Specification 1.2, General.

In addition, interim acceptance of a roadway surface shall not relieve the Contractor of his responsibility to repair any failures occurring in the roadway surface prior to the Construction Completion Inspection which, in the opinion of the Consultant, are workmanship related.

2.3.5.3 **Maintenance Requirements and Responsibilities**

2.3.5.3.1 Uncompleted Roadway Surface

Maintenance shall be at the Contractor's own expense and shall continue daily, or at frequent intervals, depending on the effects of traffic and weather upon the uncompleted portion of the roadway. Ditches and culverts shall be kept free from obstructions so that water will flow freely at all times.

For the purposes of determining maintenance responsibilities and requirements, a roadway surface which is being covered by granular base course under this Contract will be considered an “uncompleted roadway surface”.

2.3.5.3.2 Roadway Surface Accepted on an Interim Basis

Maintenance of roadway surface which has been accepted on an interim basis shall be performed by the Contractor at intervals as determined by the Consultant. Payment for maintenance of a roadway surface which has been accepted on an interim basis, will be made as Extra Work in accordance with Specification 1.2, General.

2.3.6 METHOD OF MEASUREMENT AND PAYMENT

2.3.6.1 **General**

The unit of measure of all classes of excavation will be the cubic metre, and the quantity paid for will be the actual number of cubic metres of material excavated, as measured in its original position and as accepted and recorded by the Consultant.

No payment will be made for material excavated or placed outside the limits indicated by the construction stakes, unless such work has been authorized by the Consultant. Material placed outside the limits indicated by the construction stakes shall be removed as directed by the Consultant, and this work will not be paid for.

The construction and removal of temporary equipment crossings and haul crossings and the restoration of the surrounding area and the repair of any damage to the pavement or subgrade structure as a result of hauling operations will not be paid for separately but shall be at the Contractor's expense.

No separate payment will be made for the supply, installation and removal of temporary fences other than those associated with borrow areas. All costs will be considered incidental to the Work.

2.3.6.2 **Towing Traffic**

The cost of towing through the Work, except through those portions of the Work which require towing of traffic due to the Contractor's failure to diligently prosecute the work to completion, will be paid for as Extra Work, in accordance with the following conditions:

(i) Equipment used will be paid for at the approved hourly rate times the actual hours used for towing, as approved by the Consultant.

(ii) Attachments to the equipment such as scarifiers, dozer blades and winches, will not be paid for unless actually used and previously authorized by the Consultant.

(iii) Payment for approved standby time will be made only for the equipment operator; no payment will be made for the standby towing equipment.

(iv) With prior authorization of the Consultant, payment will be made for a vehicle used by the equipment operator when the operator is on standby.

2.3.6.3 **Slides**

There will be no separate payment made for material from slips, slides and subsidences which is removed and disposed of or used in the Work, unless such occurrences were beyond the control of the Contractor and not preventable by the use of due care and diligence.

Payment for the removal of slides beyond the control of the Contractor will be made at the contract unit price for the class of excavation involved.

2.3.6.4 **Maintenance and Traffic Accommodation**

Gravel surfacing on the sections of graded highway, staged construction, detours and temporary connections utilized for traffic accommodation shall be performed and paid for in accordance with Specification 3.3, Gravel Surfacing.

The cost of maintenance including the supply and application of asphalt or other dust abatement material will not be paid for separately but shall be incidental to the Work.

The construction and removal of temporary wedges at surface cut areas will not be paid for separately but will be considered incidental to the Work.

Removal of temporary connections will be paid for as "Common Excavation".

2.3.6.5 **Solid Rock Excavation**

Solid Rock Excavation will be paid for at the unit prices bid (if any) for the applicable class of excavation being performed at the location where the solid rock is encountered, such as Borrow, Channel or Common Excavations, plus an additional payment per cubic metre for "Solid Rock Excavation - Premium".

Pre-shearing, pre-splitting, line drilling, cushion blasting, perimeter blasting, buffer blasting or any such techniques that may be used for excavation by blasting will not be paid for separately, but shall be included in the unit price bid for “Solid Rock Excavation - Premium”.

Overbreak which, with the approval of the Consultant, is used to replace material that would otherwise have to be obtained from other sources, will be paid for on the basis of classification of the replaced material. Any overbreak which is not used to replace other material will not be paid for and shall be removed at the Contractor's own expense. Any additional restoration work required due to overbreak shall be at the Contractor's expense.

2.3.6.6 **Channel Excavation**

Channel Excavation will be paid for at the unit price bid per cubic metre for "Channel Excavation", This payment will be full compensation for all labour, equipment, tools and incidentals necessary to complete the Work.

2.3.6.7 **Common Excavation**

Common Excavation will be paid for at the unit price bid per cubic metre for "Common Excavation". This payment will be full compensation for all labour equipment, tools and incidentals necessary to complete the Work.

The excavation and utilization or disposal of existing surfacing and subgrade materials resulting from obliteration operations will be classified and paid for as "Common Excavation." This payment shall include conditioning of the material as may be required for its satisfactory incorporation into embankment construction, and all work required to complete the restoration of the area except the replacement of the subsoils and topsoil, both of which will be paid for as topsoil placement in accordance with Specification 2.6, Topsoil Placement.

2.3.6.8 **Borrow Topsoil Excavation**

Borrow Topsoil Excavation will be paid for at the unit price bid per cubic metre for "Borrow Topsoil Excavation". This payment will be full compensation for the excavation and separate stockpiling of the topsoil and subsoil materials from the borrow areas.

Payment will also be made at the unit price bid per cubic metre for "Borrow Topsoil Excavation", for the excavation from the separate subsoil and topsoil stockpiles and the proper redistribution of such materials over the borrow areas. This payment will be full compensation for rock removal, scarifying, redistribution, deplaning and discing and any other operations necessary to complete the Work in accordance with the requirements of this specification and the reclamation criteria in the "Alberta Transportation Post-Disturbance Reclamation and Assessment Procedures for Borrow Excavations for Road Construction, May 2002", with the exception that the vegetation component of the assessment will not be required.

If all of the materials from a borrow area are placed in stockpile and subsequently all redistributed over the borrow area, the measurement for the second operation shall be taken as equal to the quantity originally measured in its original position. If all of the materials are not redistributed over the borrow area, the measurement for the second operation shall be based on measurements of the stockpiles before and after redistribution.

No additional payment will be made for handling material in layers.

2.3.6.9 **Borrow Excavation**

Borrow Excavation will be paid for at the unit price bid per cubic metre for "Borrow Excavation", measured as specified herein,. This payment will be full compensation for all labour, equipment, tools and incidentals necessary to complete the Work. Scarifying and trimming of borrow surface and removal of rocks larger than a 70 mm maximum dimension prior to and after the redistribution of topsoil, and the smoothing, trimming and maintenance of borrow haul roads, will not be paid for directly, but will be considered as incidental to Borrow Excavation.

Borrow Excavation used in the construction of haul roads to borrow areas, as directed by the Consultant, will be paid for at the unit price bid per cubic metre for "Borrow Excavation". Where, upon completion of haul, the material in the haul road is excavated and deposited as directed by the Consultant, the excavation of this material will be paid for at the unit price bid per cubic metre for "Borrow Excavation", measured as specified herein. This payment will be full compensation for required restoration of the borrow haul road areas and disposal areas, including all equipment, tools, and incidentals necessary to complete the work prescribed.

When the Contractor has been directed by the Consultant to excavate unsuitable borrow material, including stones or rocks, and not place this material in the embankment, this excavation will be paid for at the unit price bid per cubic metre for "Borrow Excavation". Subsequent disposal of this unsuitable material, including stones or rocks, will not be paid for directly, but will be considered as incidental to borrow excavation.

The cost of erecting and removing temporary fences associated with borrow areas will be paid for as Extra Work, in accordance with Specification 1.2, General.

2.3.6.10 **Common and/or Borrow Excavation Loaded to Trucks**

2.3.6.10.1 Excavation and Loading to Trucks

The unit of measure of common and/or borrow excavation loaded to trucks will be the cubic metre, as measured in its original position.

Common and/or borrow excavation loaded to trucks and construction of embankment will be paid for at the unit price bid per cubic metre for "Common and/or Borrow Excavation Loaded to Trucks". This payment will be full compensation for all labour, tools, equipment and incidentals necessary to complete the Work.

2.3.6.10.2 Truck Haul of Common and/or Borrow Excavation

When the Contract contains a bid item for the payment of truck haul of Common and/or Borrow Loaded to Trucks, on the cubic metre kilometre basis, truck haul will be measured and determined in the following manner:

The number of cubic metre kilometres of truck haul of common and/or borrow excavation to be paid for will be the product of the number of cubic metres of truck haul material, as measured in its original position, and the actual haul distance in kilometres, or fractions thereof.

The haul distance will be the actual distance between the centres of mass of the truck haul material in its original position and after placing. No free haul distance will be applied.

The haul distance for roadway excavation will be measured along the centreline of the highway. The haul distance for material obtained from borrow pits will be measured along the shortest practical route, as designated by the Consultant.

The quantities of truck haul, determined as provided herein, will be paid for at the unit price bid per cubic metre kilometre for "Truck Haul of Common and/or Borrow Excavation". This payment will be full compensation for all labour, equipment, tools, and incidentals necessary to complete the work.

2.3.6.11 **Catch Water Ditches**

Catch water ditches constructed in accordance with the typical plans will be measured for payment by length in metres.

Catch water ditches will be paid for at the unit price bid per lineal metre for "Catch Water Ditches". This payment will be full compensation for all equipment, tools and incidentals necessary to complete the work.

2.3.6.12 **Constructing Embankment**

The cost of placing, compacting, moisture adjustment and finishing of materials in embankments will not be paid for directly, but will be considered included in the unit prices bid for the various classes of excavation used to construct the embankment.

2.3.6.12.1 Preparation of Existing Ground

The cost of preparing the ground following the excavation of any material, scarifying and compacting the exposed surface, denuding and benching of the existing highway embankment slopes, scarifying and benching hillsides, scarifying and compacting existing road embankment to obtain bond, shall be considered as incidental to the Work, and no direct payment will be made.

Where the subgrade is excavated below design subgrade surface, reconstructed in 0.15 m layers and compacted, the excavation will be paid for at the unit price bid per cubic metre for the class of material excavated.

The required excavation and disposal of unsuitable material encountered in existing roadbeds or encountered in the preparation of the existing ground surface will be paid for at the unit price bid per cubic metre for "Common Excavation".

2.3.6.12.2 Rock Materials Used in Embankment

Relatively finer material used for filling the interstices in embankments constructed of rock, concrete or other solid material will be paid for at the applicable unit price bid for the class of material used.

Removal and disposal of rock, concrete or other solid material from the finished embankment surface shall be considered incidental to the grading operation, and no direct payment will be made.

2.3.6.12.3 Compaction

Compaction will not be paid for directly, but shall be considered part of the work paid for as excavation of the various classes as designated and measured as specified herein.

2.3.6.12.4 Water for Compaction

Water required for moisture content adjustment of embankment materials will not be paid for separately. Payment for supplying, applying and incorporating water in embankment material will be considered included in the unit prices bid for the various classes of excavation.

2.3.6.12.5 Drying Wet Material

All work necessary to dry wet material will not be paid for separately , but shall be included in the unit prices bid for the various classes of excavation. In the event the Contractor chooses to use lime or some other material to assist in drying wet material, the supply and use of lime or other such material shall be entirely at the Contractor’s expense.

2.3.6.13 **Approach Fills for Bridge Structures (Other Than Bridge Culverts)**

2.3.6.13.1 Preparation of Existing Ground

The material excavated for the preparation of existing ground for bridge approach fill construction will be classed according to Section 2.3.3, Classes of Excavation. The material excavated will be measured and paid for in accordance with the unit price bid for the applicable class of material excavated in accordance with Section 2.3.6.1, General; Method of Measurement and Payment.

2.3.6.13.2 Placing Material

The placing and compacting of material in bridge approach fills will not be paid for directly, but will be considered part of the work paid for as excavation of the various classes as designated and measured as specified herein.

Payment for drying wet material including the supply and use lime or any other such drying material will be in accordance with section 2.3.6.12.5, Drying Wet material.

Payment for water for compaction will be in accordance with Section 2.3.6.12.4, Water for Compaction.

2.3.6.14 **Overhaul**

When the Contract contains a bid item for the payment of overhaul on the cubic metre kilometre basis, overhaul will be measured and determined in the following manner:

The number of cubic metre kilometres of overhaul to be paid for will be the product of the number of cubic metres of overhauled material, as measured in its original position, and the overhaul distance in kilometres.

The overhaul distance will be the distance between the centres of mass of the overhauled material in its original position and after placing, less 300 m free haul.

The haul distance for roadway excavation will be measured along the centreline of the roadway. The haul distance for material obtained from borrow pits or for material hauled to disposal sites will be measured along the shortest practical route, as designated by the Consultant.

The quantities of overhaul, determined as provided above, will be paid for at the unit price bid per cubic metre kilometre for "Overhaul". This payment will be full compensation for all labour, equipment, tools, and incidentals necessary to complete the work.

When the Contract does not include a bid item for the payment of overhaul, the cost of overhauling material will be considered included in the unit prices bid for the various classes of excavation being hauled and no separate or additional payment will be made.

2.3.6.15 **Finishing Previous Clearing**

Finishing previous clearing will not be measured and paid for separately, but shall be considered incidental to the Work.

2.3.6.16 **Seeding**

Seeding of reclaimed areas will be measured and paid for in accordance with Specification 2.20, Seeding.

2.3.6.17 **Reservation of Special Materials**

Material excavated during the progress of the Work, which is reserved for future use by the Department and stockpiled in locations as designated by the Department, will be paid for at the unit prices bid per cubic metre of excavation for the various classes of material excavated.

2.3.7 CONSTRUCTION COMPLETION

In addition to the specific requirements included in this specification, the conditions requisite for suitable and completed Work will be a roadway which is smooth and compact over the entire width, firm side slopes with regular shoulder lines, clean side ditches, satisfactory approaches, intersections and entrances, and smooth and/or scarified back slopes as applicable.

In addition, the finished roadway surface shall be in compliance with the tolerances specified in specification amendment AMC_S116 referenced in the Contract.

All loose stones, clods, weeds, trash, etc., shall be removed from the roadway or other work, side slopes, ditches and back slopes. All improperly compacted material in the roadway or other work shall be excavated, brought to optimum moisture content if required and recompacted at the Contractor's own expense.

On the side slopes and back slopes, and in the bottom of ditches, all projecting boulders shall be removed or broken off at least flush with the lines and grades, and the resultant cavities, if any, backfilled.

All borrow sites must be reclaimed in accordance with the requirements of the specifications and the reclamation criteria specified in "Alberta Transportation Post-Disturbance Reclamation Criteria and Assessment Procedures for Borrow Excavations for Road Construction". Any remedial work necessary to achieve these requirements will be at the Contractor's expense.

TABLE OF CONTENTS

2.4 CULVERTS

2.4.1 GENERAL

2.4.1.1 **Description**

This specification covers the installation of pipe culverts less than 1500 mm equivalent diameter.

Abbreviations for the various types of culverts when indicated on the plans or used in the specifications are as follows:

C.S.P.	Corrugated Steel Pipe
C.S.P. Arch	Corrugated Steel Pipe Arch
R.C.P.	Reinforced Concrete Pipe
R.G.R.C.P.	Rubber Gasket Reinforced Concrete Pipe
P.P.	Polyethylene Pipe
C.A.P.	Corrugated Aluminum Pipe
C.A.P. Arch	Corrugated Aluminum Pipe Arch
C.M.P.	Corrugated Metal Pipe (General Term for Corrugated Steel and Aluminum Pipe)

2.4.2 MATERIALS

2.4.2.1 **Culvert Material**

The Contractor shall supply pipe culvert material in accordance with Specification 5.23, Supply of Corrugated Metal Pipe and Pipe Arches by Contractor, Specification 5.24, Supply of Polyethylene Pipe by Contractor and Specification 5.16, Reinforced Concrete Pipe and Related Junctions, Fittings and Materials as applicable.

2.4.2.2 **Gravel Material for Culverts**

When the Contract stipulates, the Contractor shall produce gravel material for culvert backfill in accordance with Specification 3.2, Aggregate Production and Stockpiling for the designation and class of materials specified. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate.

2.4.3 CONSTRUCTION

2.4.3.1 **Excavation and Preparation of Base**

Excavation for the culvert base shall be to a depth of not less than 0.3 m below the invert grade, and shall be of sufficient width to permit assembly of the pipe and the operation of compaction equipment on either side of the pipe. All soft, yielding, or unsuitable material at this level shall be removed to a depth as directed by the Consultant, and replaced with gravel or other acceptable material to provide a firm foundation of uniform density throughout the entire length of the pipe.

On completion of excavation for the culvert base and the removal and replacement of any soft, yielding or unsuitable material the Contractor shall compact the exposed surface to uniform density. The Contractor shall then construct the culvert bed to the established elevation using gravel material or other material acceptable to the Consultant. The culvert bed shall be compacted in accordance with Specification 2.3, Grading. The width of the culvert bed shall be 3 times the culvert diameter.

When the culvert installation is in rock, excavation for the culvert base shall be carried out to a depth of not less than 0.2 m below the invert grade. The width of the culvert bed shall be a minimum of 1.5 times the diameter of the pipe.

Where gravel bedding or backfill is used, impervious, compacted clay cut-offs shall be constructed at both ends of the culvert as shown on drawing CB6-2.4M1.

2.4.3.2 **Installation**

2.4.3.2.1 General

The culvert shall be installed on the prepared base, true to the designed lines and grades unless otherwise established by the Consultant. Separate sections shall be securely joined together in accordance with the manufacturer's instructions. Coupler bands shall be used for metal and polyethylene pipe and unless otherwise specified, rubber gasket type joints shall be prepared and made between sections of reinforced concrete pipe. At all coupling and joint areas and at areas of concrete pipe that have external bells, depressions shall be constructed in the culvert bed so that the pipe is uniformly supported along its entire length.

The Contractor shall use due care when installing pipe to avoid damaging the pipe. Damaged pipe shall be removed and replaced by the Contractor at his expense.

2.4.3.2.2 Installation of Corrugated Metal Pipe and Pipe Arches

When required, elbows shall be installed to accommodate sharp changes in gradient or direction of the pipe.
Pipe shall be carefully handled to prevent damage to the protective coating. Any damage to coatings shall be repaired by the Contractor at his own expense in accordance with CAN 3-G401.

2.4.3.2.3 Installation of Reinforced Concrete Pipe

Reinforced Concrete Pipe shall be placed beginning at the downstream or lower end of the culvert. The pipes shall be placed with the bell or grooved ends facing upstream.

Pipe shall be joined using either a wedge and block or mechanical pipe pullers to bring the pipe to the homed position. Joints shall not be deflected beyond the manufacturer's recommended maximum.

End sections shall be anchored to adjacent sections by tie bars, where provided. Lifting holes and holes for engaging bars shall be filled with mortar and finished flush with the pipe surface.

2.4.3.2.4 Installation of Polyethylene Pipe

The culvert bed shall be shaped to the curvature of the pipe to a depth of 75 mm using a template.

Blocking shall not be used to bring the pipe to grade. The pipe shall be placed on the prepared base to the lines and grades as established by the Consultant, with the separate sections securely joined with the applicable welds and gasket joints as specified in Specification 5.24, Supply of Polyethylene Pipe. Temporary hold downs shall be used to maintain the position of the pipe during installation.

Sections of pipe with a minimum length of 6 m shall be used on each end of each culvert.

2.4.3.2.5 Installation of Downdrains

When required, downdrain pipes shall be installed as shown on the drawings, at the locations as shown on the plans or designated by the Consultant. A trench shall be excavated to the established depth and grade required for the installation of the downdrain pipe and connecting elbows, and its bottom surface shall provide a uniform, firm foundation throughout the length of the installation, with sufficient width to permit satisfactory jointing and thorough compaction of the backfill material around the pipe.

2.4.3.2.6 Extension of Existing Culverts

Extensions to existing culverts will be considered as new installations. Where an existing culvert is to be extended, the removal, salvage and reinstallation of the existing sloped end sections may be required as shown on the drawings or as directed by the Consultant.

Where the existing pipe was manufactured to imperial dimensions and the new pipe is manufactured to metric dimensions and a mismatch occurs at the joint, the Contractor shall caulk the joint with oakum to obtain a water resistant joint.

2.4.3.3 **Backfilling**

2.4.3.3.1 General

Backfill under the haunches and immediately adjacent to the pipe extending from the culvert base up to an elevation of 30 percent of the vertical height of the pipe shall be comprised of select gravel or soil material, as directed by the Consultant. Backfill immediately adjacent to the pipe above this level shall be comprised of select soil material. All backfill material shall be free from frozen lumps and organic material. Backfill within 300 mm of the pipe wall shall be free from stones of diameter larger than 80 mm.

All backfill material shall be placed in layers not exceeding 0.15 m in depth. Each layer shall be thoroughly compacted at optimum moisture content by means of pneumatic or other mechanical tamping equipment. Backfill and compaction layers shall be brought up simultaneously and evenly on both sides of the pipe filling all corrugations and ensuring firm contact with the entire bottom surface of the pipe. This compaction procedure shall be continued until the backfill reaches a minimum elevation of 0.3 m above the top of the pipe, or greater if necessary to carry the weight of construction equipment without damage to the pipe.

Backfilling of the remainder of the culvert excavation, beyond the immediate region of the pipe, shall be carried out in accordance with Specification 2.3, Grading. Compacting equipment shall be operated parallel to the longitudinal axis of the culvert, until sufficient fill has been placed to proceed with construction of the embankment in the normal manner.

The remaining construction of the grade embankment over the installation may then proceed in accordance with Specification 2.3, Grading.

2.4.3.3.2 Backfilling Polyethylene Pipe

The minimum height of fill above the top of the pipe is 0.6 m rather than the 0.3 m indicated on drawing CB6-2.4M1 and stated in Section 2.4.3.3.1.

Immediately after backfill is completed, the Contractor shall saw cut the sloped ends at a ratio of 4:1 as shown on drawing CB6-2.4M9.

2.4.3.4 **Hand-Laid Riprap**

Immediately following completion of culvert installation, hand-laid riprap shall be placed in accordance with Specification 2.5, Riprap.

2.4.3.5 **Removal**

2.4.3.5.1 Removal, Salvage and Reinstallation of Existing Culverts

Where removal and salvage of existing culverts or drainage structures from the roadbed, ditches, or other waterways is specified, the Contractor shall carefully excavate, remove and store the material at locations suitable to the Consultant. Salvaged materials shall be reinstalled in accordance with these specifications.

2.4.3.5.2 Removal and Disposal of Existing Culverts

Where removal and disposal of existing culverts or drainage structures from the roadbed, ditches, or other waterways is specified, the Contractor shall remove and dispose of the material at locations suitable to the Consultant.

2.4.3.5.3 Culvert Installation and Removal on Roadways in Service

Where culvert installation or removal must take place on roadways which must remain in service during construction, the Contractor shall carry out his installation or removal by either building and maintaining a detour or by working on one half of the roadway while maintaining flagperson controlled and adequately signed traffic flow on the other half. Prior to any disruption of the roadway, the Contractor shall submit to the Consultant details of his installation procedures and traffic control measures and obtain written approval from the Consultant prior to proceeding with the Work.

2.4.3.5.4 Grouting Abandoned Culverts

When directed and/or at the locations shown on the mosaic plan and profiles, the Contractor shall completely fill existing culverts with a permanent cementitious fill material with a minimum compressive strength of 0.5 MPa to prevent future collapse of the culverts.

The filling of the culverts shall be carried out using methods and materials approved by the Engineer. The Contractor shall take precautions during filling operations to ensure that no blow outs or disruptions of the existing roadway occur.

When a replacement culvert is being installed, the replacement culvert shall be in operation before grouting of the abandoned culvert begins.

2.4.4 MEASUREMENT AND PAYMENT

2.4.4.1 **Excavation for Removal of Existing Culverts**

Measurement and payment for excavation for the removal of existing culverts, including the excavation of existing base or surfacing courses, will be in accordance with Specification 2.3, Grading.

2.4.4.2 **Removal, Salvage and Reinstallation of Existing Culverts**

Measurement for the removal, salvage and reinstallation of existing culverts and drainage structures including sloped ends, will be made in metres based on the total invert length of pipe removed and reinstalled.

Payment will be made at the unit price bid per metre for "Culverts - Remove, Salvage and Reinstall" for the various types and sizes of culvert specified. This payment will be full compensation for removing and salvaging the pipe, preparing the culvert bed, reinstalling the pipe, backfilling and the supply and placement of hand-laid riprap.

When a culvert is identified by the Consultant to be salvaged and the culvert is damaged by the Contractor during the removal operations due to his negligence, the Contractor shall replace the damaged culvert at his own expense.

2.4.4.3 **Removal and Disposal of Existing Culverts**

Measurement for the removal and disposal of existing culverts and drainage structures will be made in metres based on total invert length of pipe removed.

Payment will be made at the unit price bid per metre for "Culverts - Remove and Dispose" for the various types and sizes of culvert specified. This payment will be full compensation for removing and disposing of all the culvert pipe material.

2.4.4.4 **Excavation for Culvert Installation**

Measurement and payment for excavation for culvert installation will be in accordance with Specification 2.3, Grading. Where the Contractor chooses to construct embankments before installing culverts, there will be no payment for subsequent excavation of these embankment materials.

2.4.4.5 **Supply and Installation of Culverts**

Measurement for the supply and installation of culverts, and downdrains will be made in metres based on the total invert length of pipe installed, including elbows and sloped end sections.

Payment will be made at the unit price bid per metre for "Culverts - Supply and Install" for the various types and sizes of culvert specified. This payment will be full compensation for supplying all culvert pipe materials including couplers and appurtenances, preparing the culvert bed, installing the pipe, backfilling and the supply and placement of hand-laid riprap.

No separate payment will be made for the installation of oakum in joints. Payment for this work will be included in the unit price bid for supplying and installing the culverts.

2.4.4.6 **Gravel Material For Culverts**

Measurement of gravel material for culverts will be made in cubic metres. Payment will be made at the unit price bid per cubic metre for "Granular Backfill - Culverts." This payment will be full compensation for processing, hauling and placing the gravel material.

Payment for the supply of aggregate used for gravel material for culverts will be made in accordance with Specification 5.2, Supply of Aggregate.

Acceptable material obtained from within the highway right-of-way or from borrow locations will not be classified and paid for as "Granular Backfill - Culverts", but it will be classified and paid for as "Common Excavation" or "Borrow Excavation" and "Overhaul" in accordance with Specification 2.3, Grading.

2.4.4.7 **Culvert Installation and Removal on Roadways in Service**

No separate payment will be made for the staging of construction required for installation or removal of a culvert in a roadway in service. The cost of this work will be considered incidental to the Work.

Where the construction of detours is required, the construction and subsequent removal of detours will be measured and paid for at the applicable unit prices bid for the work involved. Maintenance of detours will be at the Contractor's expense.

2.4.4.8 **Grouting of Abandoned Culverts**

The Contractor shall provide a means of measuring the volume of material used to fill the culverts.

Payment will be made at the unit price bid per cubic metre for "Grouting of Abandoned Culverts". This price will include the costs of supply of all materials, equipment and labour for filling the pipes and all work incidental to the completed work.

TABLE OF CONTENTS

2.5 RIPRAP

2.5.1 GENERAL

2.5.1.1 **Description**

This specification covers the supply and placement of riprap. Riprap is a protective covering consisting of hand-laid or randomly deposited rock, sacked concrete or sacked cement stabilized material which is placed around culvert inlets and outlets and along slopes, embankments and ditches.

2.5.2 MATERIALS

2.5.2.1 **General**

All riprap material shall be supplied by the Contractor and shall be resistant to weathering and water action and shall not consist of sandstone or shale. Where sources of rock riprap material exist within the right-of-way limits of the project, or in gravel pits, or other locations under the jurisdiction of the Department, the materials may, with the approval of the Consultant, be provided free of cost to the Contractor.

2.5.2.2 **Random Rock Riprap**

Random rock riprap shall consist of a graded mixture of sound, durable stone or pit-run gravel. The gradation of the mixture shall be such that 50 percent of the riprap consists of material having a least minimum dimension of 250 mm.

2.5.2.3 **Hand-Laid Riprap**

2.5.2.3.1 General

The Contractor has the option of supplying Hand-Laid Rock Riprap, Sacked Concrete Riprap or Sacked Cement Stabilized Riprap all of which will be classed as Hand-Laid Riprap.

2.5.2.3.2 Rock Riprap

Hand-laid rock riprap material shall consist of sound, durable stones that meet the following Class 1M gradation requirements:

CLASS 1M RIPRAP **(Nominal Diameter of 175 mm)**	**Equivalent Diameter (mm)**	**Percentage (by weight) of Riprap Greater than Equivalent Diameter**
	300	0%
	200	20% to 50%
	175	50% to 80%
	125	100%
Note: Sizes are equivalent spherical diameter, and are for guidance only. The minimum dimensions of any single rock shall not be less than one third of its maximum dimension		

2.5.2.3.3 Sacked Concrete Riprap

Concrete shall be manufactured in accordance with Specification 5.5, Supply of Portland Cement Concrete, for Class "S" Concrete.

Upon approval of the Consultant, clean, well graded pit-run gravel, in lieu of separated sand and gravel, may be used in the manufacture of concrete.

2.5.2.3.4 Sacked Cement Stabilized Riprap

Cement stabilized material shall be manufactured in accordance with Specification 3.9, Cement Stabilized Base Course unless otherwise approved by the Consultant.

2.5.2.3.5 Burlap Sacks

Sacks for sacked riprap shall be 370 mm x 685 mm, 285 g burlap of approximately 0.03 m^3 capacity. The bags shall be of sufficient strength to permit them to be lifted by the top corners of the bag when filled with the applicable materials.

2.5.3 CONSTRUCTION

2.5.3.1 **Placing Random Rock Riprap**

Random riprap gravel shall be dumped over the area to be treated, until the required depth is attained. Manual handling of the material may be required.

2.5.3.2 **Placing Hand-Laid Riprap**

2.5.3.2.1 General

Hand-laid riprap shall be placed at culvert inlets and outlets and at other locations as directed by the Consultant. Riprap aprons as shown on Dwg. No CB6-2.5 M1 will only be required when specified in the special provisions or shown on the plans.

2.5.3.2.2 Placing Rock Riprap

The stones shall be placed with their beds at right angles to the slope, the larger stones being placed first in the bottom courses and graduating to the smaller stones at the top. Stones shall be laid in close contact so as to break joints, and in such manner that the weight is carried by the earth and not by the adjacent stones. The spaces between the larger stones shall be filled with spalls, securely rammed into place. The finished work shall present an even, tight surface as shown on the drawings.

2.5.3.2.3 Preparation of Base for Sacked Concrete or Sacked Cement Stabilized Riprap

The base shall be formed by excavating, filling and shaping to the required depth below and parallel to the finished surface of the riprap. The entire base shall be thoroughly compacted to provide a smooth and firm foundation of uniform density.

2.5.3.2.4 Placing Sacked Concrete or Sacked Cement Stabilized Riprap

Each burlap sack shall be filled to 70 percent of its capacity with concrete or cement stabilized material, securely sewn or stapled to form a straight edge closure, and immediately placed in its final position on the prepared base. The filled sack shall be placed to conform to the prepared base and adjacent sacks already in position, to form a closely moulded, smooth surface of uniform average depth of not less than 125 mm.

All joints between rows shall be staggered to pattern, and all dirt and debris shall be removed from tops of sacks before successive courses are placed.

Not more than five courses of sacks shall be placed in any tier before such time as initial set has taken place in the first course of any such tier.

Following placing, the sacked concrete or sacked cement stabilized riprap shall be kept moist for a period of twenty-four hours, by sprinkling water, moist earth covering, or other satisfactory means as approved by the Consultant.

2.5.4 MEASUREMENT AND PAYMENT

2.5.4.1 **Random Rock Riprap**

Measurement of random rock riprap will be by the cubic metre of material incorporated into the Work.

Payment will be made at the unit price bid per cubic metre for "Riprap - Random - Supply and Place". This payment shall be full compensation for supplying, processing, hauling and placing the material.

2.5.4.2 **Hand-Laid Riprap**

Payment for the supply and placement of hand-laid riprap including any required riprap aprons will be included in the unit price bid for the various types and sizes of culvert installations and will not be paid for separately.

Hand-Laid Riprap placed at locations other than aprons or culvert inlets and outlets will be measured by the square metre. Payment will be made at the unit price bid per square metre for "Hand-Laid Riprap - Other Locations". This payment will be full compensation for supplying, processing, hauling and placing the material.

TABLE OF CONTENTS

2.6 TOPSOIL PLACEMENT

2.6.1 GENERAL

Topsoil placement shall consist of the placing and finishing of select topsoil material on the areas designated on the plans or as directed by the Consultant, for the purpose of establishing vegetation for erosion control.

Generally, those areas containing highly erodible soils such as sand, those areas containing sterile soils such as gravel, and those areas containing exposed subsoil which is subjected to highly erosive action such as in the case of flow channels, will be considered for a covering of topsoil.

2.6.2 MATERIALS

2.6.2.1 **Topsoil**

Topsoil shall consist of a natural, friable surface soil of organic character, suitable for agricultural purposes. Topsoil shall be free of objectionable quantities of sub-soil, roots, stones and other deleterious substances.

Topsoil shall be obtained from within the highway right-of-way, unless otherwise directed by the Consultant.

The excavation and removal of topsoil from any source shall be under the direction of the Consultant, insofar as the selection of material and/or the exact location of excavation is involved.

2.6.3 CONSTRUCTION

2.6.3.1 **General**

The excavation of the topsoil shall be carried out to the lines and depths as established by the Consultant. Topsoil shall be selected as to quality during excavation. Excavated material which, in the opinion of the Consultant, is not suitable for use as topsoil shall be disposed of as directed by the Consultant.

Topsoil placement shall be undertaken as either a single or two phase operation.

When topsoil placement is done in a single operation, the excavated topsoil shall be moved directly to its final position without intermediate stockpiling.

When done in two phases, the first phase of the work shall consist of excavating select topsoil from the designated sources and hauling to stockpile sites. Generally, stockpile sites shall be located within the highway right-of-way. The location of all sites shall be subject to the approval of the Consultant.

The second phase shall be undertaken when the highway grade is near completion. In this operation, the topsoil shall be excavated from the stockpiles, hauled and placed in its final position.

Upon completion of excavation, stockpile sites shall be trimmed to present a neat and tidy appearance, fences removed for purposes of entry shall be replaced, and debris resulting from the operation shall be removed and disposed of, all in a manner satisfactory to the Consultant.

2.6.3.2 **Preparation of Placement Areas**

Before placing the topsoil, the areas to be covered with topsoil shall be shaped to the uniform lines prescribed. The surface shall then be loosened to a minimum depth of 50 mm, by means of discs, spike-tooth harrows, or other means satisfactory to the Consultant.

2.6.3.3 **Placing Topsoil**

Topsoil shall be uniformly spread on the prepared areas, to the minimum required depth of 70 mm, or a greater depth as directed by the Consultant. If there is insufficient topsoil to attain a 70 mm depth throughout the Work, the Consultant may direct spreading topsoil to a lesser depth or over a lesser area. After spreading, all hard lumps shall be broken down and all rocks larger than 70 mm in dimension, roots, stumps, and other foreign matter shall be removed and disposed of in a manner satisfactory to the Consultant. After the topsoil has been spread, it shall be satisfactorily compacted. The area covered with topsoil shall be left in a condition suitable for seeding or planting, without additional preparation of any nature.

At the completion of topsoil placement, the adjacent roadway surface shall be cleaned of all debris resulting from the operation, and the completed work left in a neat and tidy condition.

2.6.4 MEASUREMENT AND PAYMENT

2.6.4.1 **Excavation**

Measurement and payment for excavation from the original source will be in accordance with Specification 2.3, Grading, for the classification of soil as described.

Excavation from intermediate stockpiles, where applicable, will be paid for at the unit price bid per cubic metre for "Common Excavation", in accordance with Specification 2.3, Grading. The quantity will be determined by cross-section measurement of the intermediate stockpiles.

2.6.4.2 **Overhaul**

Measurement and payment for overhaul will be made in accordance with Specification 2.3, Grading, except that for measurement of overhaul, distribution of topsoil will be considered to be of uniform depth over the area of topsoil placement. When intermediate stockpiling of topsoil is done, overhaul of topsoil material will be paid for from the source to the stockpile and from the stockpile to the final placement position, with 300 m of freehaul in each operation.

2.6.4.3 **Topsoil Placement**

Topsoil placement will be measured by the square metre of surface topsoiled based on horizontal measurements. No allowances will be made for uneven or sloping ground.

Payment will be made at the unit price bid per square metre, regardless of depth, for "Topsoil Placement". This payment will be full compensation for preparing the surface and placing the topsoil material.

Work on areas which were not specifically designated for topsoil placement, but were disposal areas or embankments constructed of surplus topsoil material, will not be classified or paid for as "Topsoil Placement", but will be paid for in accordance with Specification 2.3, Grading.

TABLE OF CONTENTS

2.7 UNDERGROUND ELECTRICAL CONDUITS

2.7.1 GENERAL

2.7.1.1 **Description**

This specification covers the supply and installation of underground electrical conduit and appurtenances.

2.7.2 MATERIALS

All materials shall be supplied by the Contractor in accordance with Drawings CB6-2.7M1 and CB6-2.7M2 and the following:

2.7.2.1 **Conduit**

The Contractor shall supply the conduit with all necessary couplings, fittings and cement. Flexible conduit for underground electrical installation shall be heavy duty 75 psi medium density polyethylene made to quality assurance Z299.3.

Rigid conduit for underground electrical installation shall be polyvinyl chloride pipe, type DB2 conforming to CSA Standard B196-1, or latest revision, or as permitted under Clause 446 of the Electrical Utility Regulations, Alberta Labour.

2.7.2.2 **Fish Wire**

Fish wire (brace wire) shall be 3.66 mm soft galvanized wire with a minimum weight of 2.5 kg per 30.5 m of wire.

2.7.2.3 **Conduit Locating Pins**

Conduit locating pins shall be 450 mm X 12 mm bent steel, deformed bars, or 300 mm X 10 mm spikes, as required.

2.7.2.4 **Select Backfill Material**

Select backfill material may be the previously excavated material free of lumps and stones larger than 25 mm in diameter, sand, uncrushed rock not exceeding 25 mm in diameter, or crushed rock not exceeding 16 mm in diameter.

2.7.3 CONSTRUCTION

2.7.3.1 **General**

The conduit shall be installed by either the trench excavation or pushed conduit method in accordance with Drawings CB6-2.7M1 and CB6-2.7M2. Underground conduit shall normally be trench excavated except where underground conduit is designated to be placed under existing pavement or surfacing structure, in which case the conduit shall be installed by the pushed conduit method.

The fish wire shall be placed in the conduit and wound around the conduit locating pins for future assistance in locating the ends of the conduit.

Conduit required to be installed concurrently with a grading operation shall be installed upon completion of the subgrade construction.

2.7.3.2 **Trench Excavation**

A trench shall be excavated to the depth and grade required, and a base shall be formed to provide a firm foundation of uniform density throughout the length of the trench. The trench shall be no wider than necessary to permit satisfactory installation of the conduit and thorough compaction of the backfill material around the conduit. The excavation shall be performed in such a manner as to cause the least possible damage to the adjacent embankment surface and other improvements.

Excavation through roadways open for use by public traffic shall be performed in such a manner that not more than one traffic lane is restricted at any time.

2.7.3.3 **Pushed Conduit**

Installation by means of augering, drilling, or pushing shall be classified as pushed conduit. Pushed conduit shall be installed at a minimum depth of 0.8 metres below the existing surface. The Contractor shall not be allowed to cut the existing surface without permission from the Consultant. Permission to cut the existing surface will not be considered unless the Contractor has made a minimum of three workmanlike attempts at each crossing and has been unable to successfully install the conduit by pushing.

The diameter of the auger or drill bit shall not exceed the diameter of the conduit by more than 50 mm.

2.7.3.4 **Placing Conduit and Backfill**

The conduit shall be placed in the prepared trench. Select backfill material shall be used in the first 0.15 m layer of backfill and shall be left untamped. The remaining backfill comprised of the previously excavated material or select backfill material shall be placed in layers not exceeding 0.15 m in depth and shall be thoroughly compacted for the full limits of the trench. Excess excavated material shall be deposited in embankment or uniformly distributed, as directed by the Consultant, and any disturbed areas shall be shaped and left in a neat and tidy condition.

When excavation of trenches for installation of conduit requires the removal of concrete, asphalt pavement, asphalt bases and/or base materials, the Contractor shall replace and reconstruct the disturbed portion of the surface with materials of equal quality. The work shall be left in a condition satisfactory to the Consultant and shall conform with the adjacent surface.

Flexible conduit shall be placed in continuous lengths with no joints between junction or pole bases.

Rigid conduits may be jointed with approved couplings cemented in accordance with the manufacturer's instructions.

2.7.4 MEASUREMENT AND PAYMENT

2.7.4.1 **Underground Electrical Conduit - Trench Excavation**

Conduit installed by the trench excavation method will be measured by the length in metres of conduit pipe complete in place.

Conduit installed by the trench excavation method will be paid for at the price bid per metre for "Underground Electrical Conduit - Supply and Install - Trench Excavation". This payment will be full compensation for excavating and preparing the base, supplying, hauling and placing select backfill material, supplying and installing all conduit materials, backfilling, compacting, site restoration, traffic accommodation, and all labour, equipment, tools and incidentals necessary to complete the work in accordance with the plans and specifications herein.

Replacement and reconstruction of disturbed portions of the subgrade will not be measured or paid for separately, but shall be considered incidental to the Work.

2.7.4.2 **Underground Electrical Conduit - Pushed Conduit**

Pushed conduit installation will be measured by the length in metres of the augered hole. Any remaining conduit extending beyond the augered hole will be measured as "Underground Electrical Conduit - Trench Excavation".

Pushed conduit installation will be paid for at the price bid per metre for "Underground Electrical Conduit - Supply and Install - Pushed Conduit". This payment will be full compensation for traffic accommodation, excavating, preparing and backfilling of the pit excavations, supplying and installing all conduit materials, compacting, site restoration, and all labour, equipment, tools and incidentals necessary to complete the work in accordance with the plans and specifications herein.

In the event that the Contractor has to cut the existing surface, removal, replacement and reconstruction of disturbed portions of concrete, asphaltic pavement, asphaltic bases and/or base material will not be measured and paid for separately, but shall be included in the price bid per metre for "Underground Electrical Conduit - Supply and Install - Pushed Conduit".

TABLE OF CONTENTS

2.8 PERFORATED PIPE SUBDRAINS

2.8.1 GENERAL

The Work shall consist of trenching, supplying and installing perforated pipe wrapped in filter fabric and backfilling with select filter material at locations and to the depth and grade as established by the Consultant.

2.8.2 MATERIALS

2.8.2.1 **Perforated Pipe**

The Contractor shall supply perforated pipe in accordance with Specification 5.23, Supply of Corrugated Metal Pipe and Pipe Arches or Specification 5.24, Supply of Polyethylene Pipe.

2.8.2.2 **Filter Fabric**

The Contractor shall supply filter sock or filter fabric material for wrapping the perforated pipe in accordance with the following:

PROPERTIES	ASTM Test	REQUIREMENTS
PHYSICAL		
Grab Tensile Strength	D4632	400 Newtons (N) Minimum
Grab Tensile Elongation	D4632	50 % Minimum
Mullen Burst	D3786	1275 kPa Minimum
Puncture	D4833	240 Newtons (N) Minimum
Trapezoid Tear	D4533	180 Newtons (N) Minimum
UV Resistance	D4355	70 % @ 150 hr.
HYDRAULIC		
Apparent Opening Size	D4751	0.212 mm Minimum
Permittivity	D4491	2.1 sec^{-1}
Flow Rate	D4491	102 $l/sec/m^2$

2.8.2.3 **Filter Material**

The Contractor shall supply filter material composed of hard, durable mineral particles free from organic matter, clay balls, soft particles and other deleterious materials and meeting the gradation requirements as specified in Specification 3.2, Aggregate Production and Stockpiling, for designation 8 class 25 material. The Contractor shall supply aggregate materials in accordance with Specification 5.2, Supply of Aggregate and haul aggregate materials in accordance with Specification 4.5, Hauling.

2.8.3 CONSTRUCTION

2.8.3.1 **Trench Excavation**

Trenches shall be excavated to depths and grades as established by the Consultant. The trench shall be kept as narrow as practicable and still permit jointing to be done. The minimum width of the trench shall be the inside diameter of the pipe plus 0.25 m. The bottom of the trench shall be stable to afford a firm and uniform bearing throughout the entire length of the culvert. Where the bottom of the trench is in an impervious layer which has become wet and puddled, gravel material shall be added to stabilize the bottom. However, the depth of gravel material shall be kept to a minimum to prevent possibilities of water flow under the subdrain pipe.

2.8.3.2 **Pipe Installation**

Perforated pipe shall be installed to the depth and grade established by the Consultant. Perforations shall be oriented in directions as indicated by the Consultant, in accordance with the requirements for either collecting or carrying of water.

2.8.3.3 **Filter Fabric Installation**

The perforated pipe shall be wrapped with filter fabric or fitted with a filter fabric sock prior to installation.

2.8.3.4 **Trench Backfill**

The subdrain trench shall be backfilled with pervious filter material conforming to Section 2.8.2.3. Filter material shall be placed in 0.15 m layers, shall be thoroughly tamped and carried to a minimum of 0.15 m above the seepage zone, or to height as directed by the Consultant. The remainder of the trench shall be backfilled with impervious material and thoroughly compacted.

2.8.4 MEASUREMENT AND PAYMENT

2.8.4.1 **Trench Excavation**

Measurement and payment for excavation for the subdrain trench will be made in accordance with Specification 2.3, Grading, for the various classes of material excavated.

2.8.4.2 **Supply and Install Perforated Pipe Subdrain**

Measurement for the supply and installation of perforated pipe subdrains will be in metres, measured along the pipe invert. Payment will be made at the unit price bid per metre for "Perforated Pipe". This payment will be full compensation for preparation of the bottom of the trench, supplying and installing the pipe and filter fabric and backfilling of the trench.

2.8.4.3 **Filter Material**

Payment for filter material for backfilling will be made at the unit bid per cubic metre for "Filter Material". This payment will be full compensation for processing, hauling and placing the material as specified.

2.8.4.4 **Supply of Aggregate**

Payment for the supply of aggregate will be made in accordance with Specification 5.2, Supply of Aggregate.

TABLE OF CONTENTS

2.9 SALVAGE OF BASE COURSE AND PAVEMENT MATERIAL

2.9.1 GENERAL

2.9.1.1 **Description**

This work shall consist of the salvaging and stockpiling of existing surface and/or base course materials, in accordance with these specifications and in conformity with the plans and locations provided, or as directed by the Consultant

2.9.2 CONSTRUCTION

2.9.2.1 **Salvaging and Stockpiling**

Where directed by the Consultant, the existing surface and/or base course material shall be carefully salvaged and stockpiled. Salvaged surface course material shall be pulverized and blended with the salvaged base course gravel.

Stockpiles shall be placed at locations designated by the Consultant, and shall be uniform in dimension and accessible for loading. Where directed by the Consultant, the salvaged material shall be loaded, hauled, spread and compacted on the finished roadbed.

2.9.2.2 **Use of Salvaged Material**

When directed by the Consultant, salvaged material shall be excavated from the stockpiles, hauled, spread and compacted on sections of completed subgrade as indicated.

2.9.2.3 **Excavation and Recompaction of Subgrade**

Where directed by the Consultant, subgrade exposed by the salvage of surface and base materials shall be excavated and/or recompacted to the depth and grade established.

2.9.3 MEASUREMENT AND PAYMENT

2.9.3.1 **Excavation of Base Course or Pavement Material**

Base course or pavement material excavated and stockpiled or used on the roadway will be measured in cubic metres in its original position. The quantity as measured will be paid for at the applicable unit price bid per cubic metre for "Salvage Base Course and Pavement Materials (Haul by Trucks)" or "Salvage Base Course and Pavement Materials (Haul Using Grading Equipment)". These payments will be compensation in full for excavating, pulverizing, blending, stockpiling where required, or spreading and compacting directly on the finished roadway, and all labour, equipment, tools and incidentals necessary to complete the work. When hauling is by trucks, the payment includes the costs of loading and truck hauling. When the material is hauled using grading equipment, separate payment will normally be made for overhaul. If the Contract does not contain a bid item for overhaul, haul will be considered incidental to the Work.

2.9.3.2 **Use of Salvaged Material from Stockpile Using Trucks**

Stockpiled material truck-hauled and used as shown in the Contract or determined by the Consultant will be measured by the cubic metre as determined in the original stockpile position.

Payment will be made at the price bid per cubic metre for "Salvage Base Course and Pavement Materials (Haul by Trucks)". This payment will be full compensation for the excavation or loading from stockpile, hauling to the road, spreading and compacting on the roadway and for all labour, equipment, tools and incidentals necessary to complete the work.

2.9.3.3 **Use of Salvaged Material from Stockpile Using Grading Equipment**

Stockpiled material used as shown in the Contract or determined by the Consultant and hauled using grading equipment will be measured by the cubic metre as determined in the original stockpile position.

Payment will be made at the price bid per cubic metre for "Salvage Base Course and Pavement Materials (Haul Using Grading Equipment)". This payment will be full compensation for the excavation or loading from stockpile, spreading and compacting on the roadway and for all labour, equipment, tools and incidentals necessary to complete the work.

2.9.3.4 **Overhaul**

When salvaged material is hauled, using grading equipment, a distance of more than 300 m from a source (road or stockpile) to a stockpile or to the completed subgrade, overhaul will be calculated and paid for on the cubic metre kilometre basis, as specified in Specification 2.3, Grading.

2.9.3.5 **Excavation and/or Reworking Subgrade**

(i) Where subgrade preparation is required on subgrade exposed by salvage operations, it will be measured and paid for in accordance with the provisions of Specification 3.1, Subgrade Preparation.

(ii) When unit prices for excavation under Specification 2.3, Grading, are contained in the Contract, excavation and/or embankment required on subgrade exposed by salvage operations will be measured and paid for in accordance with Specification 2.3, Grading.

(iii) When no unit prices for excavation under Specification 2.3, Grading, are contained in the contract, excavation and/or embankment required on subgrade exposed by salvage operations will be measured and paid for in accordance with the applicable provisions of Specification 3.1, Subgrade Preparation.

TABLE OF CONTENTS

2.10 MANHOLES, INLETS AND CATCH BASINS

2.10.1 GENERAL

2.10.1.1 **Description**

This work shall consist of supplying materials and constructing manholes, inlets and catch basins of concrete, with or without steel reinforcement as specified, and of precast reinforced concrete units, complete with necessary frames, castings and fittings in accordance with these specifications and in conformity with the dimensions, lines, elevations and design shown on the plans herein, at locations as indicated.

All references to "Standards" or "Specifications" refer to the latest edition at the time of tender.

2.10.2 MATERIALS

The Contractor shall supply all materials required in accordance with the applicable specifications.

2.10.2.1 **Aggregate**

The Contractor shall produce aggregate materials for backfill in accordance with Specification 3.2, Aggregate Production and Stockpiling. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate and haul aggregate in accordance with Specification 4.5, Hauling.

2.10.2.2 **Concrete**

All materials for the manufacture of concrete shall be supplied by the Contractor and shall comply with requirements specified in Specification 5.5, Supply of Portland Cement Concrete. Class "B" air-entrained Portland Cement Concrete shall be used, unless otherwise specified or shown on the plans.

2.10.2.3 **Reinforcing Bars and Wires**

Steel reinforcing bars shall be deformed bars in accordance with the most recent edition of CSA G30.12 - M "Billet Steel Bars for Concrete Reinforcement".

Cold drawn wire or welded wire fabric for concrete reinforcement shall conform to the requirements of the latest edition of CSA G30.5.

2.10.2.4 **Precast Reinforced Concrete**

Precast reinforced concrete units shall be as specified in the Contract and shall be supplied by the Contractor.

2.10.2.5 **Concrete Block Units**

Concrete block for the construction of concrete block units shall be supplied by the Contractor. Concrete masonry blocks used for construction of manholes, inlets, and catch basins shall conform to the requirements of A.S.T.M. Designation C139.

2.10.2.6 **Mortar**

Mortar shall be composed of one part Portland cement and two parts fine aggregate by volume. Materials for the manufacture of mortar shall be supplied by the Contractor.

2.10.2.7 **Frames, Castings and Fittings**

All required metal frames, castings and fittings shall be supplied by the Contractor.

2.10.3 SAMPLING AND TESTING

Sampling and Testing of cast-in-place Concrete shall meet the requirements of Specification 5.5, Portland Cement Concrete.

2.10.4 CONSTRUCTION

2.10.4.1 **Preparation of Base**

Foundation pits for manholes, inlets and catch basins shall be excavated to elevations established by the Consultant, and shall be of sufficient size to accommodate the entire dimensions of the structure and foundation slab. All soft and yielding, or other unsuitable material, when encountered at foundation elevation, shall be removed to depth as required and replaced with acceptable gravel backfill. The backfill shall be placed in uniform layers not exceeding 0.15 m in depth and thoroughly compacted. The base shall be finished to provide a smooth and firm surface.

2.10.4.2 **Forms**

Forms for poured-in-place structures shall be of wood or metal, straight and free from distortion and of sufficient strength to resist springing during the process of depositing and tamping the concrete. All forms shall be thoroughly cleaned and oiled before the concrete is placed therein.

2.10.4.3 **Reinforcing Steel**

Reinforcing steel shall be accurately placed, and during placing of concrete firmly held in the position shown on the plans by means of stays, blocks, ties, hangers or other approved devices.

2.10.4.4 **Mixing and Placing Concrete**

Concrete for poured-in-place manholes, inlets, catch basins and foundation slabs shall be proportioned and mixed in accordance with requirements specified in Specification 5.5, Supply of Portland Cement Concrete.

Concrete shall be placed in such manner as to avoid segregation, spread in horizontal layers when practicable and consolidated sufficiently to eliminate all voids.

Exposed surfaces shall be thoroughly floated with a moist wooden float to produce a uniform even surface, and edges rounded with an approved finishing tool having a radius of 5 mm.

2.10.4.5 **Precast Reinforced Concrete Units**

Precast reinforced concrete units shall be constructed on poured-in-place foundations, in accordance with the details shown on the plans. All structures shall have the lower section from the foundation to the top

of the inlet and outlet pipes built up with poured-in-place concrete. Precast units shall be used for the structure above the top of the pipe inlets or outlets. All joints of the precast unit shall be sealed with mortar.

Inlet or outlet pipe entering precast units of the structure shall be accommodated in precast holes, having a diameter 75 mm larger than the outside diameter of the pipe. No holes for inlet or outlet pipes shall be made in precast units at the site of the work, unless otherwise directed by the Consultant.

Pipes placed in foundation slabs or precast units shall extend through the walls and beyond the outside surface a sufficient distance to allow for connections. Joints around pipes entering precast units shall be carefully sealed with mortar to prevent leakage.

2.10.4.6 **Concrete Block Units**

Concrete block units shall be constructed on poured-in-place foundations in accordance with the details shown on the plans. All joints of the concrete block units shall be sealed with mortar.

Pipes placed in foundation slabs or concrete block units shall extend through the walls and beyond the outside surface a sufficient distance to allow for connections. Joints around pipes entering precast units shall be carefully sealed with mortar to prevent leakage.

2.10.4.7 **Ladder Rungs**

Galvanized metal ladder rungs shall be installed in all poured-in-place structures having a depth greater than 1 m. When ladder rungs are required in structures constructed of precast units, the units shall be supplied with ladder rungs installed.

2.10.4.8 **Frames, Castings and Fittings**

Metal frames and fittings shall be set in the concrete true to line and elevation, as established and as required to fit the adjacent surfaces.

Castings shall be set in full mortar beds, or otherwise secured, as shown on the plans.

2.10.4.9 **Cleaning**

Upon completion, each manhole, inlet, and catch basin shall be thoroughly cleaned of any accumulations of silt, debris, or other foreign matter, and shall be maintained free of such accumulations until final acceptance of the work.

2.10.4.10 **Backfill**

After the concrete or mortar has set sufficiently, approved granular backfill material shall be placed and thoroughly compacted in layers not exceeding 0.15 m in depth. The backfill shall be neatly graded off flush with the top of the structure, or to depth as directed by the Consultant, and the complete work left in a neat and tidy condition.

2.10.4.11 **Adjusting Existing Manholes, Catch Basins and Water Valves**

Where specified, the height of existing manhole, catch basin and water valve frames and covers shall be adjusted to match the elevation of a new surface by means of bricks and mortar or precast risers and mortar

or cast iron extension rings as directed by the Consultant. The maximum amount of adjustment allowed using bricks, risers or extension rings is 300 mm. Adjustments in excess of 300 mm will require alterations of the manhole, catch basin or water valve barrel in conjunction with adjustment of the frame and cover as described above.

2.10.5 MEASUREMENT AND PAYMENT

2.10.5.1 **Preparation of Base**

Excavation of foundation pits and preparation of the base will not be measured and paid for separately, but shall be included in the prices bid for manholes, inlets and catch basins.

2.10.5.2 **Manholes, Inlets and Catch Basins**

Manholes, inlets and catch basins, of dimensions and standard depths as shown on the plans, will be measured by the unit complete in place. Structures which exceed the standard depth shown on the plans will be measured by the unit of standard depth complete in place, plus the vertical length in excess of the standard depth as measured by the metre.

The depth of the structures will be measured from the top of the foundation slab to the top of the manhole cover, or to the flow line of the inlet grating of catch basin or inlets.

Payment will be made at the unit price bid each for "Manholes, Inlets and Catch Basins", of standard depth and type as specified and at the unit price bid per metre for corresponding vertical length in excess of standard depths. These payments will be full compensation for excavating and preparing the base; supplying all required materials for manufacture of concrete and mortar; supplying all specified precast units, placing all materials; placing backfill; and all labour, equipment, tools and incidentals necessary to complete the work in accordance with the plans and specifications.

2.10.5.3 **Placing Reinforcing Steel**

Reinforcing steel incorporated into the work will be either on a lump sum basis or will be measured by the kilogram as identified in the Contract. When measurement is by the kilogram the total weight will be determined using the theoretical weight of bars as shown in the following table:

BAR NUMBER	10	15	20	25	30	35	45	55
WEIGHT kg/m	0.785	1.570	2.355	3.925	5.495	7.850	11.775	19.625

Payment for placing reinforcing steel will be made either at the lump sum price bid or the unit price bid per kilogram for "Reinforcing Steel", as applicable.

2.10.5.4 **Backfill**

Backfilling will not be measured or paid for separately, but shall be included in the price bid for manholes, inlets and catch basins.

2.10.5.5 **Adjusting Existing Manholes, Catch Basins and Water Valves**

Payment for adjusting the elevation of manholes, catch basins and water valves will be made at the unit price bid per unit for "Adjust Manhole", "Adjust Catch Basin" and "Adjust Water Valve" and will be considered full compensation for all materials, equipment, labour, tools and incidentals necessary to complete the work to the satisfaction of the Consultant. Payment for adjustment of manhole, catch basin and water valve barrels will be made as Extra Work in accordance with Specification 1.2, General.

TABLE OF CONTENTS

2.12 FENCING

2.12.1 GENERAL

2.12.1.1 **Description**

Fencing shall consist of supplying and erecting wire fence, gates and related appurtenances of the class or classes specified, in accordance with these specifications and in conformance with the dimensions, details and requirements shown on the plans or as directed by the Consultant.

Where specified, existing fences shall be taken down and removed or re-erected to standards approved by the Consultant.

2.12.1.2 **Classification of Fence**

Fencing will be classified according to type as follows:

Class A: 3 barbed wires with wooden posts at 5 m maximum spacing (Dwg. CB6-2.12M1)

Class B: 4 barbed wires with wooden posts at 3.75 m maximum spacing (Dwg. CB6-2.12M2)

Class C: 2 barbed wires and 813 mm paige wire with wooden posts (Dwg. CB6-2.12M3)

Class D: 2 barbed wires and 914 mm paige wire with wooden posts (Dwg. CB6-2.12M4)

Class E: 2 barbed wires and 1067 mm paige wire with wooden posts (Dwg. CB6-2.12M5)

Class F: 2134 mm paige wire with wooden posts (Dwg. CB6-2.12M7)

Class G: 4 barbed wires with wooden posts at 5 m maximum spacing (Dwg. CB6-2.12M8)

Details of each classification are shown on the drawings. The use of alternative Class B fencing as shown on Drawings CB6-2.12M2A and CB6-2.12M11 will be allowed only when specified or approved by the Consultant.

2.12.2 MATERIALS

The Contractor shall supply all materials for new fencing, including posts, wire, staples, and gates.

2.12.3 CONSTRUCTION

2.12.3.1 **General**

Fencing shall be constructed in accordance with the plans, at the locations as designated on the plans and Drawing CB6-2.12.M6 or as directed by the Consultant.

All trees, brush, or other obstacles which interfere with the construction of the fence shall be removed prior to commencing fence construction.

Openings for gates shall be provided at locations designated by the Consultant.

The whole work of fencing shall be carried out in a substantial and workmanlike manner.

2.12.3.2 **Posts**

The posts shall be set in holes to the required depth, and tamped in a plumb and firm position to the line and spacing shown on the plans or as directed by the Consultant. Post holes shall be large enough to allow for proper tamping. Posts shall be set with the large end down. Backfill shall be placed in layers not exceeding 0.15 m, and compacted by hand tampers, machine tampers, or other suitable equipment. Completed backfill shall be crowned slightly to permit drainage away from the posts.

Driving of posts, including methods employing drilled pilot holes, will only be permitted if the results of these methods produces a satisfactory, uniform, undamaged product, with the post firmly implanted into the soil to the depth as indicated on the plans. If, in the opinion of the Consultant, the results obtained from the driving of posts, as described, are not satisfactory, then this method shall be discontinued.

Sharpening of posts will not be permitted.

Intermediate brace posts shall be erected in conformance with the maximum spacing requirements as shown on the plans, or at such additional locations as directed by the Consultant.

2.12.3.3 **Metal Stays and Reflective Tubing**

Where applicable, metal stays shall be installed to the line and spacing as shown on the plans or as directed by the Consultant. Fence wire shall be placed into the pre-punched slots of the metal stay and locked in place with a keeper wire inserted into the back of the metal stay. Reflective tubing shall be installed between the top wire and the second wire at each metal stay as indicated on the drawings.

2.12.3.4 **Wire**

All fence wire shall be pulled tight with hand stretchers, or tensioning apparatus capable of adjustment. The use of tractors or trucks for tightening the fence wire will not be permitted, unless the pull is controlled by adjustable tensioning apparatus.

2.12.3.5 **Gates**

Gates shall be constructed and located as shown on the plans or as directed by the Consultant. All gates shall be constructed and/or installed in a workmanlike manner.

2.12.3.6 **Taking Down and Re-Erecting of Existing Fence**

Where specified, existing fences shall be taken down, the materials carefully salvaged, and the fence re-erected in accordance with the class specified, to the satisfaction of the Consultant. Fencing materials damaged through the carelessness of the Contractor shall be replaced at his expense.

2.12.3.7 **Remove and Salvage of Existing Fences**

Where removal and salvage of existing fences is specified, the Contractor shall carefully take down the fence, roll the wire, and pile and place the material at locations as directed by the Consultant. Materials that are not suitable for salvage shall be disposed of at locations as directed or acceptable to the Consultant.

2.12.3.8 **Remove and Dispose of Existing Fences**

Where removal and disposal of existing fences is specified, the Contractor shall completely remove the fence and dispose of all materials at locations acceptable to the Consultant.

2.12.4 MEASUREMENT AND PAYMENT

2.12.4.1 **General**

The construction of fences of all classifications and the taking down and re-erecting of existing fences will be measured by the kilometre, or fraction thereof, complete in place, including the length across constructed, installed or re-erected gates.

Where fences are removed only, the existing fence will be measured by the kilometre, or fraction thereof.

Length measurement will be calculated on the basis of through highway centreline chainage for fencing parallel to the highway, and on the basis of measured length in all other cases.

2.12.4.2 **Supply and Install New Fence**

Payment will be made at the unit price bid per kilometre for "New Fence - Supply and Install", of the class specified, complete in place, and including the installation of gates. This payment will be full compensation for supplying all materials, constructing the fence and for all equipment, tools, labour and incidentals necessary to complete the Work.

2.12.4.3 **Taking Down and Re-Erecting Existing Fence**

Payment will be made at the unit price bid per kilometre for "Taking Down and Re-erecting Existing Fence", of the class specified. This payment will be full compensation for taking down, salvaging and re-erecting the fence, and for all equipment, tools, labour and incidentals necessary to complete the Work.

2.12.4.4 **Remove and Salvage of Existing Fences**

Payment will be made at the unit price bid per kilometre for "Remove and Salvage of Existing Fence". This payment will be full compensation for removing and stockpiling salvaged materials and/or disposing of unsalvageable materials; and for all equipment, tools, labour and incidentals necessary to complete the Work.

2.12.4.5 **Remove and Dispose of Existing Fences**

Payment will be made at the unit price bid per kilometre for "Remove and Dispose of Existing Fence". This payment will be full compensation for removing and disposing of the fence and for all equipment, tools, labour and incidentals necessary to complete the Work.

2.12.4.6 **Clearing Fence Line**

The removal of trees, brush, or other obstacles will be measured and paid for in accordance with Specification 2.1, Clearing.

TABLE OF CONTENTS

2.13 LIVESTOCK GUARDS

2.13.1 GENERAL

2.13.1.1 **Description**

This work shall consist of the installation of livestock guards of the type and to the dimensions, lines, elevations and design shown on the plans and in accordance with these specifications, at locations as shown on the plans or as directed by the Consultant.

2.13.2 MATERIALS

2.13.2.1 **Concrete**

All materials for the manufacture of concrete shall be supplied by the Contractor and shall comply with the requirements of Specification 5.5, Supply of Portland Cement Concrete. Class "B" air-entrained Portland Cement Concrete shall be used unless otherwise specified or shown on the plans.

2.13.2.2 **Livestock Guards**

Livestock guards shall be fabricated and supplied by the Contractor in accordance with Specification 5.21, Supply of Livestock Guards. All materials including anchor bolts, U-bolts, protection angles, rail type or drill stem decking, treated timber and all nuts, washers and incidental hardware shall be supplied by the Contractor.

2.13.3 SAMPLING AND TESTING

Sampling and Testing of cast-in-place Concrete shall meet the requirements of Specification 5.5, Portland Cement Concrete.

2.13.4 CONSTRUCTION

2.13.4.1 **Preparation of Base**

Foundation pits for livestock guards shall be excavated to elevations established by the Consultant, and shall be of sufficient size to accommodate the entire dimensions of the structure and footing slabs. All soft and yielding or other unsuitable materials, when encountered at foundation elevation, shall be removed to depth as required and replaced with acceptable granular backfill. The backfill shall be placed in layers not exceeding 0.15 m in depth and thoroughly compacted. The base shall be finished to provide a smooth and firm surface.

2.13.4.2 **Forms**

Forms shall be of wood or metal, straight and free from distortion, and of sufficient strength to resist springing during the process of placing and tamping the concrete. All forms shall be thoroughly cleaned and oiled before placing concrete therein.

2.13.4.3 **Reinforcing Steel**

Reinforcing steel shall be accurately placed, and during placing of the concrete firmly held in the position shown on the plans by means of stays, blocks, ties, hangers, or other approved devices.

2.13.4.4 **Mixing and Placing Concrete**

Concrete for livestock guards shall be proportioned and mixed in accordance with the requirements of Specification 5.5, Supply of Portland Cement Concrete.

Concrete shall be placed in such a manner as to avoid segregation, shall be spread in horizontal layers when practicable, and shall be consolidated sufficiently to eliminate all voids.

Exposed surfaces shall be thoroughly floated and finished to produce a uniform, even surface, and edges rounded with an approved finishing tool having a radius of 5 mm.

2.13.4.5 **Connections**

All bolt connections shall be securely tightened.

2.13.4.6 **Backfill**

After the concrete has attained sufficient strength, forms shall be removed and approved backfill material shall be placed as required, and thoroughly compacted in layers not exceeding 0.15 m in depth. The backfill shall be graded flush with the top of the structure, or to elevation as directed by the Consultant, and the work left in a neat and tidy condition.

2.13.4.7 **Cleaning and Maintenance**

Upon completion, livestock guards shall be free draining, cleaned of any accumulation of soil, debris, or other foreign matter, and maintained in this condition until final acceptance of the work.

2.13.4.8 **Remove and Dispose of Livestock Guards**

Livestock guards, as shown on the plans and/or as directed by the Consultant, shall be removed and disposed of in a manner satisfactory to the Consultant. All materials shall become the property of the Contractor and the site shall be left in a neat and tidy condition.

2.13.4.9 **Remove and Reinstall Livestock Guards**

Where specified, existing livestock guards shall be removed, the materials carefully salvaged, and the livestock guards reinstalled in accordance with the plans and specifications, and at a location as directed by the Consultant. Materials damaged through the negligence of the Contractor shall be replaced at his expense.

2.13.4.10 **Install and Remove Temporary Livestock Guards**

Prior to the commencement of operations in areas as shown on the plans or defined in the special provisions, the Contractor shall supply, install and maintain temporary livestock guards in accordance with the applicable drawings. Upon completion of operations in these areas the Contractor shall remove the livestock guards and restore the areas to the satisfaction of the Consultant.

2.13.5 MEASUREMENT AND PAYMENT

2.13.5.1 **Supply and Installation of Livestock Guards**

Measurement for the supply and installation of livestock guards will be made by the unit, complete in place, for the type and width specified.

Payment will be made at the applicable price bid per unit for "Standard Livestock Guard - Supply and Install", “Range Type Livestock Guard - Supply and Install” and “Off-Highway Type Livestock Guard - Supply and Install”. This payment will be full compensation for supplying the livestock guard; excavating and preparing the base; driving piles and constructing plank sheathing where applicable; backfill; and installing the livestock guard.

2.13.5.2 **Remove and Dispose of Livestock Guards**

Payment for the removal and disposal of livestock guards will be made at the price bid per unit for "Remove and Dispose of Livestock Guards". This payment will be full compensation for removing, hauling, and disposing of the material at a location suitable to the Consultant and restoring the site.

2.13.5.3 **Remove and Reinstall Livestock Guards**

Payment for the removal and reinstallation of livestock guards will be made at the price bid per unit for "Remove and Reinstall Livestock Guards". This payment will be full compensation for removing the existing guards, and for loading, hauling, unloading and reinstalling the livestock guards in accordance with the plans and specifications at the location as directed by the Consultant.

2.13.5.4 **Install and Remove Temporary Livestock Guards**

Payment for this work will be made at the price bid per unit for "Install and Remove Temporary Livestock Guard". This payment will be full compensation for supplying the temporary livestock guard, installing, maintaining and removing the unit, and restoring the site to the satisfaction of the Consultant.

TABLE OF CONTENTS

2.15 METAL BIN-TYPE RETAINING WALL

2.15.1 GENERAL

2.15.1.1 **Description**

This work shall consist of the construction of metal bin-type retaining walls in accordance with these specifications and in conformity with the dimensions and designs shown on the plans, at locations as indicated and to lines and grades as established by the Consultant.

2.15.2 MATERIALS

2.15.2.1 **Metal**

The Contractor shall supply all materials required for the construction of the retaining wall in accordance with Specification 5.30, Supply of Metal Bin Retaining Wall.

2.15.2.2 **Gravel Backfill Material**

The Contractor shall produce aggregate for the gravel material for backfill in accordance with Specification 3.2, Aggregate Production and Stockpiling for the Designation and Class of materials specified or as approved by the Consultant. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate and haul aggregate in accordance with Specification 4.5, Hauling.

2.15.3 CONSTRUCTION

2.15.3.1 **Preparation of Base**

Rough excavation for the site of the retaining wall shall be made to the elevation of the finished ground line at the face of the wall. Below this point, trenches 0.45 m in width shall be excavated for the four sides of the bins to depths established by the Consultant. All soft and yielding or other unsuitable material, when encountered at the base elevation, shall be removed and replaced with acceptable backfill. The base shall be thoroughly compacted and finished to a smooth, firm surface, in conformance with the lines and grades shown on the plans or as established by the Consultant.

2.15.3.2 **Assembly**

The base plates of the columns shall be accurately established to the line and grade necessary to provide a 1:6 batter. The retaining wall shall be erected by connecting the members with bolts, to form bins conforming with the dimensions shown on the plans. The columns shall be checked for batter during the placing of the members and before the assembly bolts are tightened.

Members shall be carefully handled during erection, and any which are damaged shall be removed and replaced with new members at the Contractor's expense.

2.15.3.3 **Backfill**

The backfill for the interior of the bins shall be approved gravel material, free from large boulders, placed in layers not exceeding 0.15 m in depth, and compacted by means of mechanical tampers of a type satisfactory to the Consultant.

The backfill behind the wall shall be material common to the site where the structure is being erected, and shall progress with the filling of the bins at all times.

2.15.4 MEASUREMENT AND PAYMENT

2.15.4.1 **Excavation of Site**

Excavation for the site of the retaining wall and backfill behind the wall will be measured and paid for as provided in Specification 2.3, Grading.

2.15.4.2 **Metal Bin Retaining Wall**

Metal bin-type retaining walls will be measured by the square metre of face area for each design depth of wall complete in place.

When more than one design of retaining wall is specified, the designs will be shown by letter suffixes following the pay item.

Payment will be made at the unit price bid per square metre for "Metal Retaining Wall" of design as specified. This payment will be full compensation for preparation of the base; supply and construction of the retaining wall; placement of backfill material; and all labour, equipment, tools, and incidentals necessary to complete the Work.

2.15.4.3 **Supply of Aggregate**

Payment for the supply of aggregate will be made in accordance with Specification 5.2, Supply of Aggregate.

TABLE OF CONTENTS

2.17 REMOVAL OF MISCELLANEOUS STRUCTURES

2.17.1 GENERAL

2.17.1.1 **Description**

This work shall consist of removing concrete curbs, concrete curbs and gutters, concrete surfaces such as sidewalks, pavement and medians, manholes, inlets, catch basins, concrete or masonry walls and other structures; salvaging and disposing of the resulting material as directed, and backfilling the resulting trenches, holes and pits in accordance with these specifications.

2.17.2 MATERIALS

2.17.2.1 **Salvage**

All materials having salvage value shall be carefully removed to avoid damage, and shall be stored outside the limits of construction at locations and in a manner satisfactory to the Consultant.

Approved salvage material shall be used in the new work when directed by the Consultant.

2.17.3 CONSTRUCTION

2.17.3.1 **Breaking Down and Removing Structures**

The structures designated for removal, complete with all attached parts and connections, shall be removed in their entirety to the limits as shown on the plans or as directed by the Consultant.

In removing concrete curbs, concrete curbs and gutters, and concrete surfaces where portions of the existing structures are to be left in the surface of the finished work, the old structures shall be removed to an existing joint or cut to a true vertical face on a line established by the Consultant.

During the removal of manholes, inlets and catch basins, any live sewers connected with them shall be properly reconnected, and a satisfactory bypass shall be maintained during the construction operations.

Concrete or masonry walls, piers, foundations and similar masonry structures shall be removed entirely, or broken down to an elevation of at least 0.60 m below the finished subgrade surface when the structure falls within the area of the roadbed, and to an elevation of at least 0.30 m below the finished ground surface when the structure exists elsewhere.

When a portion of the existing structure is to be retained, care shall be taken not to damage the retained portion during the removal operations.

All operations necessary for the removal of any structures which might endanger the new construction shall be completed prior to the construction of the new work.

2.17.3.2 **Disposing of Materials**

As far as practicable, all concrete, stone and brick having no salvage value shall be broken into pieces, such that the largest face is not greater than 0.1 m^2 in area, and placed in embankments in parallel layers. All voids shall be completely filled with suitable common embankment material and thoroughly compacted. No rubble material shall be placed within the top 0.30 m of the subgrade surface.

Material that cannot be used in embankment construction shall be buried in pits outside the limits of the roadway, in a manner satisfactory to the Consultant.

All poles, posts, timbers, stumps and similar debris shall be disposed of by burning.

2.17.3.3 **Backfilling**

All trenches, holes and pits resulting from the removal of miscellaneous structures shall be filled with approved material, placed in layers not exceeding 0.15 m in depth. Each layer shall be thoroughly compacted, by mechanical tamping or rolling, to one hundred percent proctor density on areas falling within the limits of the subgrade, and to a density of not less than the density of the undisturbed adjacent soil on areas outside the limits of the subgrade.

2.17.4 MEASUREMENT AND PAYMENT

2.17.4.1 **General**

If the tender does not include separate items for the removal of any of the structures listed herein, the removal of such structures shall be considered as extra work and will be paid for accordingly.

Where bid items are included for the removal of the structures, measurement will be made of the structure to be removed in its original position.

2.17.4.2 **Curb Removal**

Removing concrete curb, and concrete curb and gutter, will be measured by length in metres along the base of the curb face, or along the flow line of the gutter.

Concrete curb, and concrete curb and gutter, measured as provided, will be paid for at the price bid per metre, respectively, for "Removing Curb" and "Removing Curb and Gutter", which payment shall be compensation in full for excavating, breaking down, removing, hauling, salvaging or disposal of material, backfilling, and all labour, tools, and incidentals necessary to complete the work in accordance with the specifications.

2.17.4.3 **Removing Concrete Surfaces**

Removing concrete surfaces will be measured by area in square metres. Where removal of an integral curb and gutter is required in conjunction with the removal of concrete surfaces, these structures will be classed as removing concrete surface and will be measured by area in square metres.

Removing concrete surfaces will be paid for at the price bid per square metre for "Removing Concrete Surface", which payment shall be compensation in full for excavating, breaking down, removing, hauling, salvaging or disposing of material, backfilling, and all labour, tools, and incidentals necessary to complete the work in accordance with the specifications.

2.17.4.4 **Removing Miscellaneous Structures**

Removing manholes, inlets, catch basins, and similar structures will be measured as units, including all attached parts and connections.

Payment for removal of miscellaneous structures will be made at the price bid each for "Removing Manhole" and/or "Removing Inlet" and/or "Removing Catch Basin", which payment shall be compensation in full for excavating, breaking down, removing, hauling, salvaging or disposing of material, backfilling, and all labour, tools, and incidentals necessary to complete the work in accordance with the specifications.

2.17.4.5 **Removing Concrete or Masonry Walls**

Removing concrete or masonry walls and similar structures will be measured by volume in cubic metres, and will be paid for at the price bid per cubic metre for "Removing Concrete and Masonry", which prices and payments will be compensation in full for excavating, breaking down, removing and hauling the structures complete, salvaging or disposing of the material, backfilling the resulting trenches, holes and pits, and all labour, equipment, tools, and incidentals necessary to complete the work in accordance with the specifications.

TABLE OF CONTENTS

2.18 CONCRETE AND/OR CORRUGATED STEEL STORM SEWER

2.18.1 GENERAL

The Work shall consist of trenching, preparation of base, laying of sewer pipe, backfilling, and constructing related items such as manholes, storm drain inlets, catch basins, special fittings, and special inlet and outlet structures.

2.18.2 MATERIALS

2.18.2.1 **Storm Sewer Pipe**

The Contractor shall supply pipe material in accordance with Specification 5.23, Supply of Corrugated Metal Pipe and Pipe Arches or Specification 5.16, Supply of Concrete Pipe and Related Junctions, Fittings and Materials, as applicable.

Storm sewer material supplied shall include couplings, bands, bolts, hoops, gaskets, tie bars, and any other applicable hardware.

Corrugated steel pipe material may, where specified, be of the asbestos bonded and/or bituminous coated type.

2.18.2.2 **Cement Mortar**

If concrete pipe is specified, the supply of cement mortar shall be the responsibility of the Contractor. This cement mortar mixture shall be composed of one part Portland Cement and two parts sand by volume. The quantity of water in the mixture shall be sufficient to produce a stiff, workable mortar. The sand shall conform to the requirements of A.A.S.H.T.O. Specification M45-42 and latest revisions thereof, or shall be an equivalent subject to approval by the Consultant. The cement shall conform to the requirements of A.A.S.H.T.O. Specification M85-63, or latest revisions thereof.

2.18.2.3 **Granular Materials**

The Contractor shall produce aggregate in accordance with Specification 3.2, Aggregate Production and Stockpiling for the designation and class of materials specified or as shown below. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate and haul of aggregate shall be in accordance with Specification 4.5, Hauling.

The Contractor shall produce uniformly graded material, containing sufficient fines to act as a binder, which shall be composed of sound, hard, durable particles free from injurious quantities of flaky particles, soft shale, organic matter, frozen lumps and other foreign material. If, due to foundation conditions, pit-run gravel is required for the bedding material, the Contractor shall supply gravel capable of passing a 50 mm screen, and shall be so graded as to provide a stable foundation.

2.18.3 CONSTRUCTION

2.18.3.1 **Excavation and Preparation of Base**

In general, the storm sewer shall be placed in a trench, the dimensions of which shall be in accordance with the drawings contained in this contract. The trench shall be excavated to a depth of not less than 100 mm below the base of the storm sewer.

All soft, yielding, or otherwise unsuitable material encountered at the bottom of the trench shall be removed to a depth as indicated by the Consultant, and replaced with gravel or other acceptable material to afford a firm foundation of uniform density throughout the entire length of the storm sewer. The exposed surface of the excavation shall then be thoroughly compacted, and the excavation backfilled with pit-run gravel material to within the 100 mm grade elevation established for the storm sewer installation.

Where ledge rock, boulders, rocky or gravelly soil, hardpan, or other unyielding material is encountered, the material shall be removed to provide for a minimum bedding thickness of 100 mm. The excavation shall then be backfilled with sand to the elevation established for the storm sewer installation.

The bedding shall be carefully and accurately shaped by means of a template to fit the lower 15 percent of the overall storm sewer height, so as to provide a uniform and firm contact for the bottom of the storm sewer. If concrete pipe is specified, particular care must be taken during shaping of the bedding to ensure that it is shaped to conform to the bell joint for uniform support. There shall be no rocks or other protuberances projecting into the template-formed bed section.

Unless otherwise directed by the Consultant, excavated trench material may be stockpiled alongside the trench, provided the working space is adequate for this purpose, and provided the material does not spill onto private property. All excavated material, other than that required and suitable for backfill, shall be removed to a suitable disposal area as shown on the plans, or as directed by the Consultant.

Excavated material piled along the trench shall not be allowed to unduly restrict cross traffic at road intersections. Material shall be cleared from road intersections and provisions made for use of the cross road by traffic, as soon as possible after excavation has taken place. Pedestrian traffic to individual properties shall be maintained at all times, and where required, temporary timber bridges shall be provided where it is necessary to cross open trenches.

Roadways, driveways, and drainage facilities shall not be blocked unnecessarily. Hindrance to local traffic must be kept to a minimum. In order that excavated material may be piled along the trench, roads may be temporarily closed to traffic if so approved by the Consultant, provided adequate detours are available.

Where excavated material cannot be piled along the trench in compliance with the above provisions, it shall be trucked to locations where backfilling is taking place, or to a temporary stockpile for return to the trench at the time of backfilling, as directed by the Consultant. Temporary stockpile sites or disposal areas will be located as shown on the plans, or as directed by the Consultant.

During construction operations, all necessary precautions are to be taken to protect the workers, the public, and both public and private installations and property. All Workers' Compensation Board regulations regarding trench shoring and safety are to be adhered to. The amount of open trench at any one time is to be limited to 100 m, or as otherwise directed by the Consultant.

2.18.3.2 **Assembly**

2.18.3.2.1 General

Placing and assembling the pipe may proceed only after the excavation, foundation and bedding for the pipe have been approved by the Consultant. Where ground or surface water is encountered, the trench is to be de-watered before pipe laying commences.

A system of batter boards, or other such method, shall be used to control the grade of the installation to the elevations as staked by the Consultant.

When the work is left for any time, the open end of the sewer must be securely closed. When the sewer is completed, it shall be thoroughly cleaned of all earth, stones and any other debris.

2.18.3.2.2 Concrete Storm Sewer

Storm sewer pipe materials shall be handled and lifted by means of the lifting holes or slings. Assembly of the pipe shall start with the placing of the downstream end section, laid with its bell or grooved end facing upstream. Each successive section shall be placed to the true alignment, and shall bear firmly on the shaped bedding throughout its full length. After preparation of each joint, as described following, successive sections shall be drawn tightly together using a cable and winch method, or such other method as may be approved by the Consultant, to provide a positive, uniform and tight fitting joint. The mechanical tightening device shall be anchored a sufficient distance beyond the joint being tightened to avoid disturbance of previously tightened joints. Assembly tightening and joint construction shall be completed to the satisfaction of the Consultant before backfilling may commence.

Field cast wye connections shall be free of any cracks, and shall be fabricated to provide a field strength equivalent to the adjoining pipes.

Unless otherwise specified on the plans, a minimum of three end sections shall be anchored to adjacent sections by means of approved anchoring devices. All lift holes shall be filled with an approved mortar, finished off flush with the surface of the pipe.

2.18.3.2.2.1 Mortar Joints

Unless otherwise specified, all joints shall be filled with mortar. The mortar used shall conform to the mixture as outlined in Section 2.18.2.2 of these specifications.

The pipe ends shall be thoroughly cleaned and wetted with water immediately before the joint is made. Stiff mortar shall then be applied to the lower half of the groove section of the pipe already laid and, simultaneously, to the upper half of the tongue of the sections being placed, and the joint shall then be drawn up tightly. Sufficient mortar shall be used to fill the joint completely and form a bead on the outside of the pipe. The inside of the pipe shall have the joint pointed all the way around. The outside of the pipe shall have the joint mudded all the way around.

The mortar shall be protected from the elements with a proper covering until satisfactorily cured. No water shall be allowed to drain through the newly laid pipe until the joints have satisfactorily cured. No backfilling around the joint shall be undertaken until the joints have been approved by the Consultant.

2.18.3.2.2.2 Rubber Gasket Joints

Where specified, rubber gaskets shall be fitted between the bevelled surfaces of the tongue and groove ends of the connecting concrete pipe sections, to form a flexible, watertight seal.

Gaskets and jointing materials shall be placed in accordance with the recommendation of the particular manufacturer in regard to the use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements and adhesives shall be dry and thoroughly cleaned of all foreign matter. The rubber gasket shall be placed on the tongue end of the pipe section being laid, and the gasket checked for proper positioning. Gaskets and jointing shall be inspected before installation of the pipe, and loose or improperly affixed gaskets and jointing materials shall be removed and replaced to the satisfaction of the Consultant. Both joint surfaces shall be thoroughly coated with the lubricant supplied, and the tongue of the pipe section being laid shall be lined up true with the groove of the

preceding section, and the two sections united together to the tightest position by means of cable and winch, or other approved methods. If, while making the joint, the gasket becomes loose and can be seen through the exterior joint recess when the joint is pulled up to within 25 mm of closure, the pipe shall be removed and the joint remade to the satisfaction of the Consultant.

2.18.3.2.2.3 Corrugated Steel Storm Sewer

Corrugated steel pipe shall be laid on the prepared base, with the separate sections securely joined together by means of the coupling bands provided. Corrugated steel pipe of the round or elongated type, and pipe arch culvert constructed from individual steel plates, shall have the outside laps of circumferencial joints in each pipe section on the upstream end, and the longitudinal lap seams at the sides of the pipe.

The pipe shall be laid true to the lines and grades as established by the Consultant. When designated, elbows shall be installed at locations as established by the sharp changes in gradient or direction of the pipe.

All pipe shall be carefully handled to prevent damage to the protective coating. Unavoidable damage to coatings shall be repaired by the Contractor by painting with two coats of zinc oxide or asphaltic type cement paint prior to backfilling.

2.18.3.3 **Backfill**

2.18.3.3.1 General

After assembly of the pipe has been approved, the backfill shall commence, utilizing sand material to be compacted by means of pneumatic or other mechanical tamping equipment. As the backfill between the sides of the pipe and the sides of the trench must carry a part of the total vertical load on the horizontal plane at the top of the pipe, it is essential that it be good material, carefully placed and compacted.

2.18.3.3.2 Sand Backfill

Backfill under the haunches and up to the quarter points shall be carefully compacted and rammed into place in thin layers, to fill all voids and ensure firm contact with the entire bottom surface. Backfill alongside and above the pipe for a minimum of 0.30 m, unless otherwise shown on drawings contained in this contract, shall also be sand material. Backfilling shall be laid down and compacted in layers not exceeding 0.15 m, and shall proceed simultaneously to the same level on each side of the pipe. Sand backfill shall be compacted to 100 percent of Standard Proctor density at the optimum moisture content. Puddling of the backfill will not be permitted.

In all backfilling operations, care shall be exercised, and it shall be the Contractor's responsibility to ensure that the pipe is not damaged by vertical or lateral forces imposed during installation and by compaction of the backfill. Circular pipe with elliptical reinforcement, and elliptical pipe with circular reinforcement, are particularly vulnerable to damage by careless compaction of backfill, and it may be necessary to install horizontal or vertical strutting until the fill over the pipe has been completed. Strutting, so required, shall be undertaken in an approved manner and at the Contractor's expense.

Sand backfill will be considered as Class B Bedding, as shown on the plans contained in this contract.

2.18.3.3.3 Earth Backfill

Unless otherwise directed by the Consultant, native earth backfill as excavated from the trench shall be used where shown on the plans, provided it is an approved, frost-free, fine grained soil. Such soil backfill shall be compacted to a density as specified in the plans.

2.18.3.3.4 Extra Sand Backfill

Where, in the opinion of the Consultant, the excavated trench material is unsuitable to be used as backfill, the area shown in the plans as earth backfill shall be constructed with sand. The extra sand backfill material shall be placed and compacted to the density specified in the plans.

2.18.3.3.5 Pit-Run Gravel Bedding

In areas where the Consultant directs excavation to be done below the normal 100 mm beneath the pipe grade as shown in the plans, pit-run gravel shall be used as bedding material for that portion of the pipe bed below the 100 mm grade line. The pit-run gravel shall be placed and compacted to 100 percent of Standard Proctor Density.

2.18.3.4 **Workmanship and Final Acceptance**

In addition to compliance with the details of construction, the completed structure shall show careful finished workmanship in all particulars.

If, in the opinion of the Consultant, any of the following defects are present in the structure, they shall be considered sufficient cause for rejection:

(a) variation from the designed centerline or grade;

(b) concrete pipe tongue or grooved edge which has been chipped such that 10 percent of the bevelled surface area is destroyed, or chipped at any point to such a degree that in the opinion of the Consultant a proper joint will not be achieved;

(c) concrete pipe joined by the construction of improperly formed or cracked joints;

(d) concrete pipe which shows as a result of negligent handling the exposure of reinforcing steel, or any permanent cracks in the concrete of 0.25 mm or greater width, or deformation induced through improper bedding, backfilling or construction procedures; or

(e) steel pipe connected with improperly installed couplers and/or gaskets.

Structures exhibiting defects will be rejected, and the Contractor shall be held responsible for replacing and reinstalling the unacceptable section(s). Any material damaged or destroyed by the Contractor shall be replaced at the Contractor's expense.

Conditions requisite to the final acceptance of the work shall include, in addition to the terms and conditions as set forth in this contract, a sewer thoroughly cleaned of any accumulations of silt, debris, or other foreign matter, any loose material or waste resulting from the operations disposed of, and the working areas restored to the satisfaction of the Consultant.

2.18.4 MEASUREMENT AND PAYMENT

2.18.4.1 **Excavation for Sewer Installation**

Excavation to the required depth and width as detailed in the plans will not be paid for directly, but shall be included in the applicable unit price bid for "Concrete Storm Sewer - Supply and Install", and/or "Corrugated Steel Storm Sewer - Supply and Install", and/or "Leads", which price shall include the necessary haul and disposition of the material.

There will be no separate payment for any shoring, dewatering, or any safety precautions necessary. Such payment will be considered to be included in the unit price bid for "Concrete Storm Sewer - Supply and Install", and/or "Corrugated Steel Storm Sewer - Supply and Install", and/or "Leads".

Payment for any necessary trucking to another area of the project, or to and from temporary stockpile or disposal areas, will not be made directly, but shall be included in the unit prices bid for "Concrete Storm Sewer - Supply and Install", and/or "Corrugated Steel Storm Sewer - Supply and Install", and/or "Leads".

2.18.4.2 **Supply and Install Storm Sewer**

Measurement for the supply and installation of storm sewers will be in metres along the invert centreline length of the sewer. The measurement will be continuous through manholes.

The measurement of laterals and leads shall be taken along the invert centreline of the branch line to the invert centreline of the main sewer. The measurement will be continuous through manholes or storm drains. In cases where the branch line originates at a manhole or storm drain, the measurement will be taken from the mid point of the facility.

Payment will be made at the applicable unit price bid per metre for the various sizes of "Concrete Storm Sewer - Supply and Install", and/or "Corrugated Steel Storm Sewer - Supply and Install", and/or "Leads". This payment will be full compensation for supplying and installing the sewer pipe, precast elbow connections, and all other precast appurtenances; excavation and preparation of the trench to the required depth; supplying and placing sand bedding; shoring; tunnelling under existing utilities; construction of concrete cradles; field casting of wye branches, supplying and backfilling with either native or imported material; compacting where necessary; and the use of all equipment, tools, labour and incidentals necessary to complete the work.

2.18.4.3 **Bedding and Backfill**

2.18.4.3.1 Placing

Payment for supplying and placing of bedding and backfill for storm sewer trenches up to the original ground level will not be made directly, but shall be included in the unit price bid for "Concrete Storm Sewer - Supply and Install", and/or "Corrugated Steel Storm Sewer - Supply and Install", and/or "Leads".

For the purposes of this Specification, the original ground line shall be the surface elevation existing at the time of commencement of excavation of the storm sewer trench.

In order to provide reduced load on the storm sewer pipe, it may be specified in the plans that embankment shall be constructed over a storm sewer alignment prior to the excavation of the trench. In these cases, the original ground line will be the surface of the constructed embankment.

2.18.4.3.2 Supply of Sand Material

Payment for supplying and placing Class B Bedding Material as shown on the plans will not be made directly, but shall be included in the unit price bid for "Concrete Storm Sewer - Supply and Install", and/or "Corrugated Steel Storm Sewer - Supply and Install", and/or "Leads".

2.18.4.3.3 Extra Sand Backfill

Payment for "Extra Sand Backfill" will be made by the cubic metre in place. This payment will be full compensation for processing and hauling sand material to the point of the installation. Payment for placing this material shall be included in the applicable unit price for "Concrete Storm Sewer - Supply and Install", and/or "Corrugated Steel Storm Sewer - Supply and Install", and/or "Leads".

2.18.4.3.4 Pit-Run Gravel Bedding

Payment for "Pit-Run Gravel Bedding" will be made by the cubic metre in place. This payment will be full compensation for excavation in excess of the 100 mm below pipe grade shown in the plans, loading, hauling and disposing of unsuitable material, processing, hauling and placing the pit-run material.

2.18.4.3.5 Supply of Aggregate

Payment for the supply of aggregate for extra sand backfill and\or pit-run gravel bedding will be made in accordance with Specification 5.2, Supply of Aggregate.

TABLE OF CONTENTS

2.19 GUARDRAIL AND GUIDE POSTS

2.19.1 GENERAL

The Work consists of the erection, removal, salvage and reinstallation or disposal of guardrail and guide posts.

2.19.2 MATERIALS

The Contractor shall supply all new materials required for the construction of guardrail, barrier and guide posts in accordance with:

Specification 5.25, Supply of W-Beam Guardrail and Posts;
Specification 5.26, Supply of Box Beam Guardrail and Posts;
Specification 5.27, Supply of Cable Barrier and Metal Posts; and
Specification 5.28, Supply of Flexible Guide Post Traffic Delineators.

When the Contract specifies the removal, salvage and reinstallation of guardrail, only materials from the existing installations shall be used. Contractor stockpiles of used material from other sources will not be considered acceptable.

2.19.3 CONSTRUCTION

2.19.3.1 **General**

Guardrail and guide posts shall be accurately set to the required depth and alignment, in a manner resulting in a smooth continuous installation, as shown on the drawings or as directed by the Consultant. Permissible tolerance for plumb and grade of posts shall be 6 mm maximum.

Holes shall be excavated by auger. The diameter of the holes augered for guardrail shall be of sufficient size to allow for pneumatic tamping. Prior to digging any holes, the Contractor shall contact all applicable utility companies to arrange for utility location and marking.

Unsuitable material at the bottom of the holes excavated for guardrail shall be replaced with granular material at the Contractor's expense, as directed by the Consultant. The Contractor shall thoroughly compact the bottom of the hole. The guardrail posts shall rest directly and solidly on the bottom of the hole at the time of installation.

Excavated material which is unsuitable for use as backfill shall be substituted with granular material by the Contractor at his expense. Backfill shall be throughly compacted, using pneumatic tampers, in layers not exceeding 150 mm, for the full depth of the excavation.

Guardrail laps shall be in the direction of traffic flow. Bolts shall be tightened to a torque of 100 N·m. Metal reflectors (Scotchlite or equivalent) shall be attached to the top of every third guardrail post with two 50 mm nails.

The Contractor shall take all necessary precautions to eliminate damage to galvanizing. Minor abrasions shall be repaired by painting with two coats of zinc rich paint. Major abrasions shall be repaired by re-galvanizing. The method to be used for repair of any damage shall be approved by the Consultant before such work is commenced. The Contractor, at his own cost, shall carry out the repair or replace components to the satisfaction of the Consultant.

The guardrail shall be connected to new or existing bridge walls or parapets as shown on the drawings. Surplus excavated material and debris shall be removed from the site by the Contractor at his expense.

Upon completion of the installation, the work area shall be restored to its original condition.

At the end of the one year warranty period, the permissible tolerance for plumb and grade of all posts shall be 13 mm.

Construction of guardrail and guide posts will include several types of installations in accordance with the plans and specifications and as directed by the Consultant. Drawings referenced as TEB drawings are found in the latest edition of the Department's manual entitled "Typical Barrier Drawings". Installations will include but not be limited to:

2.19.3.1.1 W-Beam Guardrail

Standard w-beam installations shall be in accordance with drawing TEB 3.12. Installations at bridge approaches shall be in accordance with drawing TEB 3.48, and construction shall always be started at the bridge. A Strong Post System of installation as shown in drawing TEB 3.09, shall be used when directed by the Consultant.

2.19.3.1.2 Box Beam Guardrail

Standard box beam installations shall be in accordance with drawings TEB 3.27, TEB 3.28, TEB 3.33, TEB 3.34, TEB 3.35, TEB 3.36, TEB 3.37, TEB 3.38, TEB 3.39, TEB 3.40, TEB 3.41, TEB 3.46, and TEB 3.47. Installations at bridge approaches shall be in accordance with drawings TEB 3.41 and TEB 3.47 and construction shall always be started at the bridge.

Median box beam installations shall be in accordance with drawings TEB 3.22, TEB 3.23, TEB 3.24, TEB 3.25, TEB 3.26, TEB 3.27A, TEB 3.28A, TEB 3.29 and TEB 3.30. Installations at bridge approaches shall be in accordance with drawing TEB 3.29 and construction shall always be started at the bridge.

2.19.3.1.3 Cable Barrier

Cable barrier installations shall be in accordance with drawings TEB 3.42, TEB 3.43, TEB 3.44 and TEB 3.45.

2.19.3.1.4 Installation on Base Course Projects

When installing guardrail on base course projects, installation of guardrail and construction of base course shall be performed in accordance with drawing TEB 3.56 as directed by the Consultant.

2.19.3.1.5 Guide Posts

The Contractor shall remove and dispose of existing guide posts and/or install new guide posts at locations identified by the Consultant.

Guide posts shall be installed straight and plumbed vertical to a uniform depth in accordance with the applicable drawings found in the latest edition of the Department's manual entitled "Alberta Highway Pavement Marking Guide". All replaced soil around the delineator shall be firmly compacted. The Contractor shall supply any additional material required to ensure that the delineator has a suitable foundation.

2.19.3.2 **Removal and Salvage or Disposal of Existing Guardrail**

2.19.3.2.1 General

The Contractor shall remove the designated sections of guardrail including posts and shall fill and compact all holes left from post removal before nightfall.

The Consultant will designate the material to be reused and the material for disposal. Material damaged by the Contractor during removal shall be replaced with new material by the Contractor at his own expense.

2.19.3.2.2 Remove and Salvage

When salvaged material is being reinstalled, the Contractor shall haul it when necessary, and neatly pile the salvaged material near the site of the proposed installation as directed by the Consultant.

At sites where existing guardrail is to be removed and new or salvaged guardrail is to be installed at the same location, the Contractor shall complete the installation within 5 working days of the site becoming available for re-erection of the guardrail.

Until guardrail is erected, the Contractor shall erect barricades as shown on drawing TCS-B-4.2. Other safety protection shall be provided as directed by the Consultant.

2.19.3.2.3 Remove and Dispose

All materials designed for removal and disposal, those damaged during removal and any materials not required for reinstallation as determined by the Consultant, shall become the property of the Contractor and shall be disposed of in a manner and location satisfactory to the Consultant.

2.19.4 MEASUREMENT AND PAYMENT

2.19.4.1 **Supply and Install Guardrail or Barrier**

Measurement for supplying and installing barrier or guardrail sections, including end terminals and bridge connections and posts, will be in metres of the length of each type of barrier or guardrail installed.

Payment will be made at the applicable unit price bid per metre for "W-Beam Guardrail - Supply and Install", "Strong Post W-Beam Guardrail - Supply and Install, "Box Beam Guardrail - Supply and Install" or "Cable Barrier - Supply and Install". These payments will be full compensation for supplying and installing all guardrail and cable barrier materials including end terminals and bridge connections and posts.

2.19.4.2 **Removal, Salvage and Reinstallation of Existing Guardrail or Barrier**

Measurement for removal, salvage and reinstallation of barrier or guardrail sections, including end terminals and bridge connections and posts, will be in metres of the length of each type of guardrail or barrier removed and reinstalled.

Payment will be made at the unit price bid per metre for "Remove, Salvage and Reinstall Existing Guardrail" for the type of guardrail removed. This payment will be full compensation for removing, salvaging, and reinstalling the guardrail including end terminals and bridge connections and posts.

2.19.4.3 **Removal and Disposal of Existing Guardrail or Barrier**

Measurement for removal and disposal of barrier or guardrail sections, including end terminals and bridge connections and posts, will be in metres of the length of each type of barrier or guardrail removed.

Payment will be made at the unit price bid per metre for "Remove and Dispose of Existing Guardrail" for the type of guardrail removed. This payment will be full compensation for removing and disposing of the guardrail material as directed by the Consultant.

2.19.4.4 **Haul of Guardrail Materials**

No separate payment will be made for hauling existing guardrail designated for salvage or disposal. Haul will be considered incidental to the Work.

2.19.4.5 **Supply and Install Guide Posts**

Measurement will be made of the number of each type of guide post installed.

Payment will be made at the applicable unit price bid per guide post for "Flexible Guide Post/Delineators - Round - Supply and Install" or "Flexible Guide Post/Delineators -Semi Flat - Supply and Install". This payment will be full compensation for supplying and installing the new posts.

No separate payment will be made for guide post removal. The removal and disposal of existing guide posts is considered incidental to the work.

TABLE OF CONTENTS

2.20 SEEDING

2.20.1 GENERAL

This specification covers preparing the area to be seeded, supplying and applying the seed and fertilizer and harrowing of the seeded area or protecting seeded areas by means of a mulch cover.

2.20.2 MATERIALS

2.20.2.1 **Supply of Materials**

Materials for seeding, including grass seed mix, fertilizer, mulch and water shall be supplied by the Contractor.

2.20.2.2 **Grass Seed**

Grass seed shall meet the requirements of the Seeds Act for Common No. 1 Seed and shall be of the composition specified in the Special Provisions. The seed shall be mixed and tested by a recognized seed house and shall be clearly marked with the name of the supplier and the certified mixture composition. The Contractor shall provide the Consultant with the Certificate(s) of Analysis of all the lots of seed used.

2.20.2.3 **Fertilizer**

Fertilizer shall be of the composition specified in the Special Provisions. Fertilizer shall be stored in standard containers clearly marked with the name of the manufacturer, weight and specified composition.

2.20.2.4 **Mulch**

Mulch material shall be cellulose fibre unless otherwise approved by the Consultant. Mulch shall be clean and free of weeds and other foreign matter.

2.20.3 CONSTRUCTION

2.20.3.1 **Traffic Safety**

When required by the Consultant, the Contractor shall, at his own expense, provide a truck mounted arrowboard in accordance with Specification 1.2, General, to assist in the accommodation of traffic during hydro-seeding operations. The arrowboard truck shall be equipped with an overhead revolving beacon with an amber lens a minimum of 180 mm high and 180 mm wide. The beacon shall be mounted on the top of the vehicle fully visible to traffic approaching from both front and rear.

The arrowboard shall be controlled from a console located in the vehicle cab.

When required by the Consultant, the hydro-seeding vehicle and the arrowboard truck shall each be equipped with a two-way radio for voice communication.

A "Slow Moving Vehicle" sign shall be mounted at the rear of the vehicle and be visible to the public only when hydro-seeding is being performed.

The Contractor shall ensure that the operation of the hydro-seeder and the arrowboard truck is with the traffic flow at all times.

The Contractor shall minimize any loading or unloading of materials or fueling of equipment on the highway surface. Field entrances or areas other than the highway surface shall be used as sites for these operations if possible.

2.20.3.2 **Notification of Commencement of Work**

The Contractor shall notify the Consultant not less than 48 hours prior to any seeding operation and shall not begin seeding until all areas prepared or designated for seeding have been approved by the Consultant.

2.20.3.3 **Weather Conditions**

The Contractor shall not proceed with the work when, in the opinion of the Consultant, weather conditions are unsuitable. The Consultant will not allow work to proceed when wind conditions are such that material is being carried beyond the designated work areas or that the material is not being uniformly applied. No work shall take place on frozen or unusually wet surface areas.

Generally, work shall not commence in the spring until the ground has completely thawed and soil temperatures have reached 10EC. Work shall be suspended in the fall when soil temperatures consistently fall below 5EC.

2.20.3.4 **Area to be Seeded**

Areas to be seeded will include disturbed areas and exposed earth surfaces within the right-of-way and borrow and waste areas, as designated by the Consultant.

Areas to be seeded will be divided into two categories, one requiring seeding, fertilizing and harrowing, and the other requiring seeding, fertilizing and mulching. Generally, those areas which in the opinion of the Consultant are impractical to harrow due to the terrain characteristics or access problems will be designated for seeding, fertilizing and mulching.

2.20.3.5 **Surface Preparation**

Any grading or topsoil placement forming part of the Contract shall be completed to the satisfaction of the Consultant prior to any surface preparation.

All eroded areas shall be corrected prior to surface preparation, as directed by the Consultant, using imported material or material adjacent to the area being filled.

When the Contract contains bid items for grading work or "Topsoil Placement", the correcting of eroded areas which were graded or topsoiled under this Contract will be considered incidental to the work and no separate payment will be made.

When the Contract does not contain bid items for grading work or "Topsoil Placement", payment for the correcting of eroded areas will be made as "Extra Work" in accordance with Specification 1.2, General.

Areas to be seeded shall be fine graded to a smooth and uniform surface and be loose to a depth of not less than 25 mm at the time of seeding. Where necessary, the surface shall be scarified and the Contractor shall dispose of stones and other debris as directed by the Consultant. Where mulch is to be applied, the surface must be sufficiently smooth to allow a uniform cover by seed and mulch material. No area shall be seeded or mulched until the surface preparation has been approved by the Consultant.

2.20.3.6 **Application Rates**

The following application rates are the minimum required:

Grass Seed Mix	25 kg/hectare
Fertilizer	75 kg/hectare
Wheat or Wheat/Wheatgrass hybrid	5 kg/hectare
Mulch	1150 kg/hectare(where applicable)

2.20.3.7 **Seeding, Fertilizing and Harrowing**

2.20.3.7.1 Seeding and Fertilizing

Grass seed, Wheat or Wheat/Wheatgrass hybrid and fertilizer shall be uniformly mixed and distributed over the area designated for seeding by one of the following methods:

- use of an approved type of hydraulic seeder which utilizes water as the carrying medium and maintains a continuous agitator which will keep seed and fertilizer mixed in uniform distribution until pumped from the tank. The pump pressure must maintain a continuous non-fluctuating stream of solution; or

- use of an approved type of drill seeder which is capable of being calibrated to distribute seed and fertilizer into the soil at not less than specified minimum rates of application; or

- areas designated as or resulting from "sideslope improvement work" or areas inaccessible to the above methods may be seeded and fertilized by an approved cyclone seeder or hand methods.

Distribution of the seed and fertilizer is to be at a uniform rate and at not less than the minimum specified rate of application.

The Contractor shall measure the quantities of all material to be charged into the seeder either by weight or by a system of volume measurement as approved by the Consultant and shall provide all equipment required for this purpose.

2.20.3.7.2 Harrowing

The Contractor shall harrow areas designated for harrowing immediately after seed and fertilizer is applied.

2.20.3.8 **Seeding, Fertilizing and Mulching**

The seed, fertilizer and mulch shall be uniformly mixed and applied over the designated areas. The Contractor shall use approved type of hydraulic seeder which uses water as the carrying medium, and maintains a continuous agitator action which will keep the seed, fertilizer and mulch mixed in uniform distribution until pumped from the tank. The pump pressure must maintain a continuous non-fluctuating stream of solution.

In order to apply the required amount of mulch to the designated area, the Contractor may have to apply a second or third cover of material. Extension hoses may be required to propel mulch slurry to areas which are otherwise inaccessible.

2.20.3.9 **Protection**

The Contractor shall take reasonable care to prevent the contamination of structures, signs, guardrails, fences, utilities and other installations by his operations. Where such contamination occurs, he shall remove the offending material by approved methods to the satisfaction of the Consultant.

The Contractor shall be responsible for the protection of the work and shall, at his own expense, repair all areas damaged by any cause, until the work has been accepted by the Consultant.

2.20.3.10 **Reseeding**

The Contractor shall, at locations designated by the Consultant or the Department, reseed, refertilize and remulch or reharrow all areas which fail for any reason to show a uniform stand of grass during the calendar year following the year of initial seeding. The seeding work will be inspected during the month of May in the calendar year following the year of initial seeding and the Contractor shall complete any required reseeding work prior to June 15 of that year. This date will be extended if, in the opinion of the Consultant, the weather conditions prior to June 15 are not suitable for reseeding Work. A uniform stand of grass will be considered growth which shows no deterioration or bare spots greater than 1 square metre in size and provides a minimum of 80 percent ground cover as determined by the Consultant.

The requirement to reseed is considered to be a warranty requirement in accordance with Specification 1.2, General. Reseeding shall meet all the requirements for initial seeding, including fertilizing and harrowing or mulching as applicable. The Contractor will not be required to reseed any area more than once during the warranty period.

The Contractor shall supply all materials necessary for reseeding work and complete all reseeding work entirely at his own expense.

2.20.4 MEASUREMENT AND PAYMENT

2.20.4.1 **General**

Measurement will be made in hectares to the nearest 0.01 hectare based on horizontal measurements as determined by the Consultant. No allowance will be made for uneven or sloping ground.

2.20.4.2 **Seeding, Fertilizing and Harrowing**

Payment for seeding, fertilizing and harrowing will be made at the unit price bid per hectare for "Seeding, Fertilizing and Harrowing". This payment will be full compensation for supplying seed and fertilizer; preparing the surface; and seeding, fertilizing and harrowing the designated areas.

2.20.4.3 **Seeding, Fertilizing and Mulching**

Payment for seeding, fertilizing and mulching will be made at the unit price bid per hectare for "Seeding, Fertilizing and Mulching". This payment will be full compensation for supplying seed, fertilizer and mulch; preparing the surface; and applying the seed, fertilizer and mulch to the designated areas.

TABLE OF CONTENTS

2.21 CABLE DUCTS

2.21.1 GENERAL

2.21.1.1 **Description**

The scope of work shall include the construction of 100 mm cable ducts in accordance with these specifications and in conformity with the plans herein, at locations as provided or as directed by the Consultant.

2.21.2 MATERIALS

2.21.2.1 **Ducts**

Duct shall be 100 mm nominal inside diameter and of rigid non-metallic P.V.C. pipe. Couplings are to suit the pipe.

2.21.2.2 **Spacers**

Spacers shall be cast concrete or interlocking plastic designed for 100 mm standard duct on 200 mm by 200 mm centres. Wooden or metal spacers shall not be used.

2.21.2.3 **Concrete**

All materials for the manufacture of concrete shall be supplied by the Contractor and shall comply with requirements specified in Specification 5.5, Supply of Portland Cement Concrete. Concrete shall have a minimum compressive strength of 20 MPa at 28 days. Aggregate shall have a maximum size of 19 mm. Cement shall be Type 50 (Sulphate Resistant) Portland Cement. Slump shall not exceed 80 mm. An air-entrainment agent shall be added to result in an air content between 5 and 7 percent.

2.21.2.4 **Rope**

Pull rope shall be 7 mm diameter nylon cord. The rope shall be continuous through each duct with 3 metres spare at each end.

2.21.2.5 **Sealant**

Duct seal shall be a non-thermoplastic compound used for electrical applications. Acceptable compounds are shown on the Alberta Transportation Products List.

2.21.3 SAMPLING AND TESTING

Sampling and Testing shall meet the requirements of Specification 5.5, Portland Cement Concrete.

2.21.4 CONSTRUCTION

2.21.4.1 **Trenching**

The trench shall be carefully excavated to the required depth to allow the duct run to be set on undisturbed soil. Where soft spots or unsuitable material are encountered the Contractor shall, at no extra cost, undercut a minimum of 150 mm, or as directed by the Consultant, replace with acceptable material and compact to 95% Standard Proctor Maximum Dry Density.

2.21.4.2 **Duct Installation**

The duct shall not be placed until the trench has been checked for line and grade by the Consultant. All ducts shall be placed a minimum of 600 mm below subgrade. Duct runs shall be graded uniformly to their ends.

Duct installation shall be by the tier method using the specified spacers. The duct group shall be securely banded together using metal strapping.

Duct couplings shall be staggered by at least 150 mm along the duct run. The cutting and tapering of duct joints shall be made with tools as specified by the duct manufacturer. All duct joints shall be made water tight. Where ducts are to be connected to existing conduits a suitable conduit to duct coupling shall be used. All ducts shall terminate with a duct coupling that is set flush with the end of the concrete envelope.

Split duct shall be wrapped with a waterproof, impregnated paper or plastic sheeting and securely taped to prevent entry of any concrete.

The duct assembly shall be securely anchored to the trench bottom to prevent ducts from shifting or floating when concrete is poured.

The concrete shall be carefully placed by chute down on the sides of the duct bank so that the concrete flows under the ducts and rises up around the ducts to fill all spaces. The concrete shall be carefully rodded with a flat bar.

Pull ropes shall be installed in each duct and shall be checked to ensure they are free of kinks, bends or joints. The surplus shall be coiled 3 metres at each end on the duct.

Duct locations shall be marked by the Consultant in the field prior to backfilling. A 50 mm by 100 mm marker (painted red) shall extend from the duct entrance to 450 mm above grade.

A spike shall be driven flush in the edge of the pavement over the duct run.

2.21.4.3 **Backfilling and Compaction**

Backfilling shall not be undertaken until the concrete and ducts have been checked by the Consultant. The backfill of trenching shall be with material similar to that removed except that organic material or stones larger than 150 mm in diameter shall be removed.

The degree of compacting shall be similar to existing or to the degree required for various pavement layers under other sections of these specifications. The ends of each duct system shall be backfilled using an envelope of sand, or other suitable backfill, extending 1 metre from the duct for a width of 600 mm and from the bottom of the duct system to 500 mm above the top duct.

2.21.5 MEASUREMENT AND PAYMENT

2.21.5.1 **Cable Duct**

Payment will be made at the unit price bid per metre of encasement (including 2-100 mm standard ducts). This price shall include all labour, materials, and equipment necessary to complete the work to the satisfaction of the Consultant.

2.21.6 FINAL ACCEPTANCE

2.21.6.1 **Acceptance**

After each section of duct run is completed and the concrete thoroughly set, a test mandrel that is 65mm smaller in diameter than the nominal duct size shall be drawn through each individual duct. This test shall be done in the presence of the Consultant.

The Contractor shall be responsible to clear or replace any ducts that do not pass the mandrel test.

Acceptance of the Work will be given upon certification that all ducts have been tested and proven clear of any obstructions.

2.21.6.2 **Sealing**

At the completion of the acceptance the Contractor shall seal in a tight manner the ends of all ducts by using duct seal.

TABLE OF CONTENTS

2.22 PLASTIC CULVERT EXTENSIONS AND CULVERT LINERS

2.22.1 GENERAL

This specification covers the installation of plastic pipes as liners inside existing culverts, and extensions of these plastic pipes beyond the ends of the existing culverts.

2.22.2 MATERIALS

2.22.2.1 **Plastic Pipe**

The Contractor shall supply plastic pipe complete with all necessary material required to join the plastic pipe sections in accordance with Specification 5.17, Supply of Polyvinyl Chloride Pipe and Specification 5.24, Supply of Polyethylene Pipe.

2.22.2.2 **Grout**

The Contractor shall supply grout suitable for low pressure pumping into the void between the plastic pipe used as a liner and the surrounding existing culvert and which has a minimum compressive strength of 500 kPa at 28 days.

Cement shall be sulphate resistant.

2.22.3 CONSTRUCTION

2.22.3.1 **Preparation For Installation**

The Contractor shall prepare the designated existing culverts for installation of the culvert liners by flushing and scouring the existing culverts with water under pressure, and by inspecting and correcting any minor protrusions within the existing culvert.

2.22.3.2 **Liner Installation**

The Contractor shall excavate or clear a trench for assembly of liner pipes at the upstream end of the existing culvert. He shall then push or pull the plastic pipe through the existing culvert with the spigot end first (working down grade) preventing any damage to the liner and connecting sections thereafter securely joined together. Pipes shall be joined together to form a flexible, watertight seal. Joints shall not be deflected beyond the manufacture's recommended maximum.

The Contractor will ensure that the liner remains at the existing culvert invert elevation during the grouting operation. Liners shall be installed in accordance with drawing CB6-2.29M1, Plastic Liner Installation and Grouting within Existing Culverts.

2.22.3.3 **Grouting**

The Contractor shall place grout using a low pressure pump to fill the void completely. Due care must be taken when pressure pumping so that excessive pressure will not damage the liner. When extension of the plastic culverts beyond the ends of the existing pipe is required, the Contractor shall complete grouting of the liner pipe before completing the backfill of the extension pipe and allow the Consultant to observe the grouting operation and the completion of the grouting.

2.22.3.4 **Plastic Pipe Culvert Extension Installation**

Extensions to existing plastic pipes or liners shall be made in accordance with Specification 2.4, Culverts, modified as follows:

- Plastic pipe shall be placed on the prepared base, with the separate sections securely joined with joints as specified in the applicable sections of Specifications 5.17 and 5.24.

- The pipe shall be installed true to the lines and grades as established by the Consultant. When designated, elbows shall be installed at locations as established to accommodate sharp changes in gradient or direction of the pipe.

- Backfilling and sloping the ends of plastic pipe shall be performed in accordance with Section 2.4.3.3.2, Backfilling Polyethylene Pipe.

2.22.4 MEASUREMENT AND PAYMENT

2.22.4.1 **Supply and Install Plastic Liner**

Measurement for the supply and installation of plastic culvert liners will be in metres based on the length along the centreline invert of pipe installed as a liner.

Payment will be made at the unit price bid per metre for “Culvert Liner - Supply and Install” for the applicable size of culvert as indicated in the unit price schedule. This payment will be full compensation for supplying all materials, flushing of existing culverts, correcting any protrusions in existing culverts, any excavation required for pipe assembly, installing the liner, end treatment if required, and the use of all equipment, tools, labour and incidentals necessary to complete the plastic culvert liner installation.

When, in the opinion of the Consultant, the installation of a liner must be abandoned before completion through no fault of the Contractor, payment will be made for the pipe installed at the applicable unit prices.

2.22.4.2 **Supply and Install Grout**

The Contractor shall provide a suitable means to measure the quantity of grout that has been placed into voids between the liner and the culvert to the nearest tenth of a cubic metre.

Payment for grouting will be made at the unit price bid per cubic metre for "Grouting Liners". This price will be full compensation for supplying all materials and equipment, installing the grout and all work incidental to the completed installation.

2.22.4.3 **Plastic Culvert Extensions**

Measurement and payment for the supply and installation of plastic culvert extensions will be made in accordance with Specification 2.4, Culverts.

TABLE OF CONTENTS

2.23 SMOOTH WALL STEEL PIPE CULVERT EXTENSIONS AND CULVERT LINERS

2.23.1 GENERAL

This specification covers the installation of smooth wall steel pipes as liners inside existing culverts, and extensions of these smooth wall steel pipes beyond the ends of the existing culverts.

The abbreviation S.W.S.P. will mean smooth wall steel pipe.

2.23.2 MATERIALS

2.23.2.1 **Smooth Wall Steel Pipe**

The Contractor shall supply smooth wall steel pipe in accordance with Specification 5.22, Supply and Install Smooth Wall Steel Pipes.

2.23.2.2 **Grout**

The Contractor shall supply grout suitable for low pressure pumping into the void between the steel pipe used as a liner and the surrounding existing culvert and which has a minimum compressive strength of 500 kPa at 28 days.

Cement shall be sulphate resistant.

2.23.3 CONSTRUCTION

2.23.3.1 **Preparation For Installation**

The Contractor shall prepare the designated existing culverts for installation of the culvert liners by flushing and scouring the existing culverts with water under pressure, and by inspecting and correcting any minor protrusions within the existing culvert.

2.23.3.2 **Liner Installation**

The Contractor shall excavate or clear a trench for assembly of liner pipes at the upstream end of the existing culvert. The Contractor shall then push or pull the S.W.S.P. pipe through the existing culvert with the spigot end first (working down grade) preventing any damage to the liner and connecting sections thereafter securely joined together. Joints shall be welded and the pipe shall be joined using either a wedge and block or mechanical pipe pullers to bring the pipe to the home position to form a watertight seal. Joints shall not be deflected beyond the manufacture's recommended maximum.

The Contractor shall ensure that the liner remains at the existing culvert invert elevation during the grouting operation. Liners shall be installed in accordance with drawing CB6-2.29M1, Plastic and S.W.S.P. Liner Installation and Grouting within Existing Culverts.

2.23.3.3 **Grouting**

The Contractor shall place grout using a low pressure pump to fill the void completely. When extension of the S.W.S.P. culverts beyond the ends of the existing pipe is required, the Contractor shall complete grouting of the liner pipe before completing the backfill of the extension pipe and allow the Consultant to observe the grouting operation and the completion of the grouting.

2.23.3.4 **Smooth Wall Steel Pipe Culvert Extension Installation**

Installation of S.W.S.P. extensions shall be made in accordance with Specification 2.4, Culverts and Specification 5.22, Supply and Install Smooth Wall Steel Pipes, modified as follows:

- The pipe shall be installed true to the lines and grades as established by the Consultant. When designated, elbows shall be installed at locations as established to accommodate sharp changes in gradient or direction of the pipe.

2.23.4 MEASUREMENT AND PAYMENT

2.23.4.1 **Supply and Install Smooth Wall Steel Pipe Liner**

Measurement for the supply and installation of S.W.S.P. culvert liners will be in metres based on the length along the centreline invert of pipe installed as a liner.

Payment will be made at the unit price bid per metre for “Culvert Liner - Supply and Install (S.W.S.P.)” for the applicable size as indicated in the unit price schedule. This payment will be full compensation for supplying all materials, flushing of existing culverts, correcting any protrusions in existing culverts, any excavation required for pipe assembly, installing the liner, end treatment if required, and the use of all equipment, tools, labour and incidentals necessary to complete the S.W.S.P. culvert liner installation.

When, in the opinion of the Consultant, the installation of a liner must be abandoned before completion through no fault of the Contractor, payment will be made for the pipe installed at the applicable unit prices.

2.23.4.2 **Supply and Install Grout**

The Contractor shall provide a suitable means to measure the quantity of grout that has been placed into voids between the liner and the culvert to the nearest tenth of a cubic metre.

Payment for grouting will be made at the unit price bid per cubic metre for "Grouting Liners". This price will be full compensation for supplying all materials and equipment, installing the grout and all work incidental to the completed installation.

2.23.4.3 **Smooth Wall Steel Pipe Culvert Extensions**

Measurement and payment for the supply and installation of S.W.S.P. culvert extensions will be made in accordance with Specification 5.22, Supply and Install Smooth Wall Steel Pipes.

TABLE OF CONTENTS

2.25 HIGHWAY STREET LIGHTING

2.25.1 GENERAL

This work shall consist of the supply and installation of highway lighting and all associated electrical work in accordance with these specifications, and in conformity with the dimensions, details and requirements shown on plans and drawings, at locations as indicated and as established by the Consultant. The electrical installation shall be in accordance with the current edition of the "Canadian Electrical Code", regulations of the Electrical Inspection Department having jurisdiction and as determined by the Consultant. Any work, even if not shown or specified, which is obviously necessary or reasonably implied to complete the work, shall be done as if it were both shown and specified.

All electrical installation work shall be performed by qualified tradesmen experienced in such work.

The Contractor shall obtain all permits and approvals and pay all related fees required for the work and submit a copy of all permits and associated documents to the Consultant.

2.25.2 ABBREVIATIONS AND DEFINITIONS

Wherever in these Specifications the following abbreviations are used, the intent and meaning shall be as follows:

C.S.A.: The Canadian Standards Association
CEMA: Canadian Electrical Manufacturers Association
EEMAC: Electrical and Electronic Manufacturer's Association of Canada

Reference to regulations and standards in all cases shall mean the latest amendment or revision current at the closing date of the tender.

2.25.3 MATERIALS

The Contractor shall supply all materials required for the installation of the highway lighting including associated electrical components.

All material supplied shall be new and built in accordance with EEMAC standards and shall be C.S.A. approved unless otherwise approved by the local inspection authority. The Contractor shall obtain approval of the local inspection authority and shall bear all inspection charges levied and any modification costs required for any materials not C.S.A. approved.

Material shall also comply with the plans, drawings and as required by the "Canadian Electrical Code". Where there is lack of specification in the plans and drawings, the materials shall comply with the special provisions, standard specifications, or as specified by the Consultant.

When the work necessitates the removal, salvage and reinstallation of lighting structures, only materials from existing installations shall be used. Contractor stockpiles of used material from other sources will not be acceptable.

2.25.3.1 **PVC Conduit**

The Contractor shall supply, in accordance with the applicable C.S.A. standards and as shown on the drawings, 50 or 100 mm DB2 PVC conduit with all necessary bends, caps, couplings and cement.

2.25.3.2 **Wiring**

All wiring within the poles to the luminaires shall be #12 Cu. RW90 X-Link. All conductors shall be copper.

The Contractor shall supply secondary electrical cable as shown on the drawings. All teck cables shall be copper and have 1000 V cross link insulation. Teck cable shall be HL rated.

2.25.3.3 **Luminaires and Standards(Poles)**

The Contractor shall supply new luminaires complete with lamps, davit or high mast standards, and bases as shown on the plans and drawings. All standards shall be hot dip galvanized in accordance with C.S.A. standard G164-M. Double dipping will not be permitted.

2.25.3.4 **Sand Bedding and Backfill**

All bedding sand shall be supplied by the Contractor and shall be free of clay, rocks and organic materials. The sand shall be a Designation 5 Class 10A in accordance with Specification 3.2, Aggregate Production and Stockpiling or as approved by the Consultant.

When native material excavated from a ditch or trench is unacceptable as backfill, the Contractor shall supply sand or other approved backfill material. At no time shall backfill material containing ice, snow, organic or frozen material be used. All backfill material will be subject to the approval of the Consultant.

2.25.3.5 **Concrete Bases**

The Contractor shall supply all materials for the construction of pole and cabinet bases and the bases shall be constructed of concrete in accordance with CAN3-A23.1-M90. Concrete shall be Type 50, Class C in accordance with Specification 5.5, Portland Cement Concrete. Reinforcing shall be Grade 400, deformed bars in accordance with CSA G30.12-M77 complete with 10M ties as shown on the plans.

Anchor bolts shall be supplied in accordance with the requirements of the pole or base manufacturer. Generally the top 300 mm of the anchor bolts shall be hot dipped galvanized unless otherwise specified.

2.25.3.6 **Frangible Bases (Breakaway Couplings)**

The Contractor shall supply all required frangible bases for light standards as shown on the drawings or in the Special Provisions.

2.25.3.7 **Site Lighting Distribution Enclosure and Components**

The Contractor shall supply the required distribution enclosure in accordance with the drawings and as determined by the Consultant.

The enclosure shall be a weatherproof CEMA4 design complete with padlockable door, hinged on one side. The enclosure shall be of sufficient size to house panel boards, disconnects, breakers, lighting contactors, control transformers, splitters and controls. Refer to details on drawings. The enclosure shall be C.S.A. approved with components installed. The entire system in the enclosure shall be concealed in conduit or other acceptable means. Exposed wiring will not be accepted. The Contractor shall provide all wiring schematics for future reference.

Panel boards shall be commercial or industrial grade complete with breaker. Rating of panel boards and number and type of breakers shall be as indicated on drawings. Breakers shall be bolt in style only to match panels. Acceptable manufacturers are Westinghouse, Square D, FPE or approved equal.

Main disconnect shall be commercial or industrial grade CEMA 1 breaker enclosure suitable for service entrance. Rating and phases shall be as indicated on drawings. Acceptable manufacturers shall be Westinghouse, Square D, FPE or approved equal.

Lighting contactors shall have a minimum of 600 volt rated contacts and 120 volt operating coil. The contactor shall be mounted in a CEMA 1 enclosure and have a rating and number of phases as indicated on drawings. Acceptable manufacturers shall be Westinghouse, Allen Bradley, Square D or approved equal.

Control transformer (if required) shall be 2000 VA rated and mounted in CEMA 1 enclosure. The transformer shall have voltage ratings and phases as indicated on drawings.

Control circuit disconnect (if required) shall be rated at 15 amp and shall be mounted in a CEMA 1 enclosure. Voltage ratings and phases shall be as indicated on drawings. Acceptable manufacturers shall be Westinghouse, Square D, FPE or approved equal.

Hand-Off-Auto switch shall be a 3-position selector switch with capabilities to override photocell and shall be mounted in a CEMA 1 enclosure.

Photocell shall be rated 1500 watt, 120 volt, drift free minimum “turn on level” of 1.5-foot candles. It shall be integrally wired into distribution enclosure and shall be of vandal proof design.

2.25.4 DRAWINGS

The Contractor shall submit shop drawings of electrical work, which includes poles, luminaires, distribution enclosures and frangible bases to the Consultant for review, a minimum of 14 days before the scheduled start of the work. Shop drawings shall be stamped and signed by a Professional Engineer. Work shall not commence until all shop drawings have been reviewed by the Consultant.

The Contractor shall maintain a set of drawings on the site at all times and record any changes required by the Consultant that may occur and on the set mark “AS BUILT”. These drawings shall be submitted to the Consultant upon completion of the project.

2.25.5 SAMPLING AND TESTING

Sampling and Testing of the cast-in-place Concrete shall meet the requirements of Specification 5.5, Portland Cement Concrete.

2.25.6 CONSTRUCTION

2.25.6.1 **Existing Underground Utilities**

The Contractor shall hand expose all underground utilities in all areas of excavation. Hand exposure shall be as specified by the utility owner. The exposure and backfilling of the utilities shall be undertaken by the Contractor under the direct supervision of the company's representative.

2.25.6.2 **Removal and Salvage of Existing Standards**

Where required as shown on the drawings, the Contractor shall remove, salvage and store existing light standards. Existing pre-cast bases and all other components shall be removed and disposed of in an acceptable manner. The Contractor shall backfill and compact holes left from pole removal before nightfall. Material damaged by the Contractor during the removal shall be replaced with new material by the Contractor at his own expense.

When standards are salvaged for reuse, the existing galvanizing shall be repaired to the satisfaction of the Consultant prior to installation.

When painted standards are designated to be salvaged and reinstalled, they shall be hauled to a plant equipped to do the work, stripped of all paint and rust and hot dip galvanized in accordance with CSA Standard G164-M.

2.25.6.3 **Removal and Disposal of Existing Lighting Fixtures**

Where required as shown on the plans, the Contractor shall remove and dispose of existing light fixtures including standards, bases and luminaires in a manner and location as approved by the Consultant. All materials shall become the property of the Contractor.

The Contractor shall backfill and compact the disturbed areas prior to nightfall.

2.25.6.4 **Saw Cutting**

Wherever specified, saw cutting shall be to a sufficient depth so the pavement structure including any concrete and soil cement layers can be excavated leaving a clean straight vertical butting edge against which new material can be effectively placed and compacted. Rough, jagged edges will not be acceptable.

All cut away material shall be disposed of by the Contractor at his expense.

2.25.6.5 **Excavation and Backfill**

No trenching or excavation work will be permitted over existing power, communication cable, pipeline or other underground utilities without the supervision of the appropriate authority. The Contractor shall call Alberta First Call and the respective utilities to locate and mark existing underground utilities. Damage to any utilities is the responsibility of the Contractor.

Trench digging machinery will be permitted except where its operation will cause damage to trees, buildings, or existing structures above or below ground. At such locations, alternative methods shall be used subject to the approval of the Consultant.

Excavation and backfill shall be executed where required for electrical installation unless otherwise stated on plans and drawings. Trenches shall be a minimum of 150 mm wide along alignments. Trenches shall be a minimum of 0.9 metres to a maximum of 1.1 metres below finished grade level. The trench bottom shall be free of stones, loose material and sharp objects. In backfilled areas, the trench bottom shall be kept level to facilitate laying-in of the cable. The excavation shall be performed in such a manner as to cause the least possible damage to the adjacent embankment surface and other improvements.

No deviation shall be made from the required line or grade except with written approval of the Consultant.

Trenches shall not be left open unattended or unprotected without written permission from the Consultant. In such cases, the open trench shall be properly marked and barricaded with flashers. In locations where flooding may occur or public hazard is created by open trench, the Consultant at his discretion may require that the excavation be appropriately covered.

Temporary support, adequate protection, and maintenance of all underground and surface utilities structures, drains, sewers, and other obstructions encountered in the progress of the work shall be provided by the Contractor at his own expense.

Backfill material shall be mechanically compacted in maximum lifts of 150 mm to a minimum of 95% of Standard Proctor Density for the full depth of the excavation. Compaction tests shall be on a minimum of one density test per 150 metres of trench for compacted vertical backfill. Additional tests may be required at the discretion of the Consultant. The cost of all testing shall be the responsibility of the Contractor.

All disturbed areas shall be restored to the conditions existing prior to the disturbance or a condition satisfactory to the Consultant.

Disposal of all excess material shall be the responsibility of the Contractor.

2.25.6.6 **Sand Bedding**

Sand used as bedding or backfill in excavated areas beneath roadway, driveways, and sidewalks shall be compacted to a minimum of 100% of Standard Proctor Density and provide a minimum of 50 mm covering on all sides of the conduit. In all other cases, unless otherwise specified by the Consultant, sand shall be compacted to a minimum of 95% of Standard Proctor Density.

2.25.6.7 **Street Light Bases**

Street light bases shall be cast in place as detailed on the drawings. Bases shall be constructed a minimum of 21 days prior to installing the poles, unless adequate and approved braces are provided.

The Contractor is advised to assess the nature of the existing soil types and conditions prior to tender. The Contractor shall have no claim against the Department for difficulties in the constructability of the bases and footings due to soil types and conditions.

2.25.6.8 **Luminaires and Standards (Poles)**

The Contractor shall install all davit and high mast standards (to the height specified), luminaires, lamps and frangible bases according to the plans and drawings and as determined by the Consultant.

Standards shall be installed plumb and level. Shims may be used for levelling, however any gaps between standards and bases shall be appropriately filled with grout.

Each luminaire shall be aligned and aimed correctly as indicated on the plans or as determined by the Consultant.

The Contractor shall complete all associated wiring, fusing and galvanizing in accordance with C.S.A. standard G164-M for the installation of the unit.

Terminations in the pole base shall be completed using insulated crimping connectors, not wire nuts (amp type or approved equal). All aluminum to aluminum or aluminum to copper connections shall be made using PENETROX, or an approved equivalent, in an approved manner.

2.25.6.9 **Underground Electrical Conduit**

PVC conduit shall be installed beneath all roadway, walkways, driveway crossings and other locations as indicated on the drawings. The installation shall be for the entire length of the crossing plus an additional metre on each side. Installation shall be in accordance with the plans and drawing and as determined by the Consultant.

Pushed or trenched underground electrical conduit shall be installed in accordance with Specification 2.7, "Underground Electrical Conduits" and the applicable drawings.

2.25.6.10 **Site Lighting Distribution Enclosure**

The Contractor shall install the required distribution enclosure in accordance with the drawings and as determined by the Consultant. The sand bedding for the enclosure shall be compacted to a minimum of 100% of Standard Proctor Density.

A concrete base shall be constructed to the dimensions shown on the plans. All connections to the enclosure shall run through the concrete base.

The Contractor shall situate the base and cabinet to ensure that the photocell operation is not effected by outside light sources.

2.25.6.11 **Secondary Electrical Cable**

Secondary electrical cable shall be placed in trenches in random separation with great care to ensure no kinking or damage to the sheath (splices are unacceptable). Cables crossing all roadways shall be placed in a 50 or 100 mm PVC conduit as specified, one duct for each cable.

Secondary electrical cable shall be installed as shown on the drawings or determined by the Consultant.

2.25.7 TESTING

The electrical installation shall be completely tested, including but not limited to megger and ground testing, and certified by a qualified licensed electrician demonstrating to the satisfaction of the Consultant that the equipment and system installed perform in the manner intended. The Consultant shall be notified 24 hours in advance of the certification testing.

2.25.8 MEASUREMENT AND PAYMENT

Payment for the following items will be compensation in full for all equipment, labour, tools and incidentals necessary to complete the work.

2.25.8.1 **Trench and Backfilling**

Trenching and backfilling for wiring installation will be measured by the lineal metre along the centreline of the trench.

Payment will be made at the unit price bid per lineal metre for "Trenching and Backfilling". This payment will be full compensation for trenching, supply, placement and compaction of any required sand bedding, backfilling, disposal of the spoil as required and replacing original sod with topsoil and grass seed.

2.25.8.2 **Hand Expose Existing Underground Utilities**

There will be no separate or additional payment for hand exposing and backfilling existing underground utilities. Costs will be considered incidental to the work.

2.25.8.3 **Underground Electrical Conduit**

Measurement and payment for PVC pipe installation will be in accordance with Specification 2.7.4, "Underground Electrical Conduit - Trench Excavation" or "Underground Electrical Conduit - Pushed Conduit" as applicable.

2.25.8.4 **Secondary Cable**

The quantity of secondary cable considered for payment will be based on the length in metres of trench excavated for the installation of underground wiring as measured along the centreline of the trench. No additional allowance or payment will be made for the requirement for extra connecting cable at run terminations or for cable wiring installed at variance with a straight line.

Payment will be made at the unit price bid per metre for "Secondary Cable - Supply & Install" for the type specified. This payment will be full compensation for the supply and installation of the cable.

2.25.8.5 **Electrical Wiring and Materials**

Except for the secondary electrical cable, no separate or additional payment will be made for the supply and installation of electrical materials required for the proper installation of the luminaires and electrical operating systems. All wiring, fusing, connectors, insulators and any other materials necessary for the proper operation of the system will be considered incidental to the Work.

2.25.8.6 **Removal and Salvage of Existing Standards**

Payment for the removal and salvage of existing standards will be made at the applicable price bid per unit for "Removal and Salvage of Existing Standards" for the type and size indicated. This payment will be full compensation for the supply of all tools, equipment and labour required to remove, salvage and store the standards; remove and dispose of the remainder of the installation; and backfill, compact and restore the excavated areas to the satisfaction of the Consultant.

2.25.8.7 **Removal and Disposal of Existing Light Fixtures**

Payment for the removal and disposal of existing light fixtures will be made at the price bid per unit for "Removal and Disposal of Existing Light Fixtures". This payment will be full compensation for the supply of all tools, equipment and labour required to remove and dispose of standards, luminaires, concrete bases and electrical components and backfilling, compacting and restoring the excavated areas to the satisfaction of the Consultant.

2.25.8.8 **Concrete Base**

Payment for concrete bases for pole installations will be made at the price bid per unit for "Cast In Place Concrete Base - Supply & Install". This payment will be full compensation for all excavation for the installation, disposal of spoil, supply, placement and compaction of the sand bedding, supply and placement of concrete, rebar and anchor bolts, supply of saunatube (if necessary), tamping and levelling.

2.25.8.9 **Davit and High Mast Standards**

Payment for the installation of davit or high mast standards will be made at the applicable price bid per unit for "Street Light Standard - Supply & Install" for the type and height specified. This payment will be full compensation for supplying and installing the pole, luminaire, lamp, frangible base, wiring, fusing and all other materials necessary to complete the installation.

When frangible bases are not required, payment for the installation of davit or high mast standards will be made at the applicable price bid per unit for "Street Light Standard (without frangible bases) - Supply & Install" for the type and height specified. This payment will be full compensation for supplying and installing the pole, luminaire, lamp, wiring, fusing and all other materials necessary to complete the installation.

2.25.8.10 **Reinstallation of Salvaged Standards (Poles)**

Payment for reinstalling poles will be made at the applicable unit price bid per pole for "Salvaged Street Light Standard - Install" for the type and height specified. This payment will be full compensation for hauling the poles from the storage location, repairing the galvanizing when necessary, installing the salvaged pole, supplying and installing new luminaire, lamp, frangible base, wiring, fusing and all other materials necessary to complete the installation.

When reinstalling salvaged standards without frangible bases, payment for reinstalling poles will be made at the applicable unit price bid per pole for "Salvaged Street Light Standard (without frangible bases) - Install" for the type and height specified. This payment will be full compensation for hauling the poles from the storage location, repairing the galvanizing when necessary, installing the salvaged pole, supplying and installing new luminaire, lamp, wiring, fusing and all other materials necessary to complete the installation.

2.25.8.11 **Site Lighting Distribution Enclosure**

Payment for the distribution enclosure will be made at the price bid per unit for "Distribution Enclosure - Supply & Install". This payment will be full compensation for supplying and installing all materials necessary to provide the distribution and control of the street lighting system according to the plans and drawings. This shall also include supply and installation of the concrete pad and sand bedding, supply and installation of specified grounding system and the complete system testing and certification.

2.25.8.12 **Galvanizing of Existing Standards**

Measurement will be made of the number of salvaged standards, properly galvanized and reinstalled on the project.

Payment will be made at the applicable unit price bid per pole for "Galvanizing Salvaged Standards" for the type and size indicated. This payment will be full compensation for hauling the standards to the galvanizing plant, removing all paint and rust, galvanizing and returning the standards to the Work site.

2.25.8.13 **Saw Cutting**

Measurement will be made in metres of the length of structure required to be saw cut as specified.

Payment for saw cutting will be made at the unit price bid per metre for "Saw Cutting". This payment will be full compensation for all equipment, tools and incidentals necessary to complete the work including disposal of debris.

2.25.8.14 **Restoring Site Conditions**

No separate payment will be made for any materials, equipment, tools or labour required to restore excavated or disturbed areas to the condition existing prior to construction or as approved by the Consultant, including any required topsoil and seed. All costs will be considered incidental to the Work.

TABLE OF CONTENTS

3.1 SUBGRADE PREPARATION

3.1.1 GENERAL

3.1.1.1 **Description**

Subgrade shall be considered as the soil surface on which a subsequent layer or layers of base course, gravel surfacing, surface treatment, pavement or other material is to be placed. Prior to the deposition of any material on the subgrade, it shall be prepared to the satisfaction of the Consultant in accordance with the provisions hereinafter specified.

3.1.1.2 **Test Methods**

Unless otherwise specified, the test methods used shall be the same as specified in Section 2.3.4.7.5.2, Test Methods of Specification 2.3, Grading.

3.1.2 CONSTRUCTION

3.1.2.1 **Subgrade Excavation**

Subgrade soil or previously existing, failed surfacing materials designated as undesirable by the Consultant shall be excavated, removed and disposed of at a time and place as directed by the Consultant. The disposal sites shall be levelled and trimmed to leave a neat and tidy appearance. The excavated areas shall be immediately backfilled with material as designated by the Consultant.

3.1.2.2 **Granular Fill**

Where designated by the Consultant, the Contractor shall place and compact granular fill on the prepared subgrade or within the subgrade excavated areas. This work shall be done in accordance with the provisions of Specification 3.8, Granular Fill .

3.1.2.3 **Preparing Subgrade Surface**

The subgrade shall be scarified to a depth of 150 mm, unless otherwise specified. The loosened material shall be windrowed to the side, and the exposed surface shall be thoroughly compacted. The windrowed material shall then be uniformly mixed, shaped to conform to the dimensions, lines, grades and cross-section as established by the Consultant, and compacted to obtain an average of one hundred percent, and with no test results being less than ninety-seven percent of the maximum dry density at optimum moisture content established by the Moisture-Density Relation tests using Standard Compaction. Approved material shall be added or removed to restore true grade and cross-section as directed by the Consultant.

When material varies from optimum moisture content, it shall be treated in the following manner. When a deficiency in moisture content exists, the material shall be watered and thoroughly mixed until optimum moisture content is attained. When an excess in moisture content exists, the material shall be worked and aerated until optimum moisture content is attained. The use of lime or any other material to assist in drying material shall be entirely at the Contractor's discretion.

Any large rocks encountered during the subgrade preparation process which constitute a hazard to traffic, due to size or protrusion from the finished subgrade, shall be removed and disposed of as directed by the Consultant.

The finished subgrade surface shall be firm and uniform, true to grade and cross-section, and shall be approved by the Consultant before placing subsequent material thereon. Subgrade that does not conform to the requirements as to grade, cross-section, moisture content or density shall be reworked until such requirements are met.

Where required, the subgrade shall be prepared to a depth exceeding 150 mm on sections of the roadway as designated by the Consultant. When such work has been ordered, it shall be carried out in layers, each of which do not exceed 150 mm in depth, and requirements for density and optimum moisture as specified above shall apply for each layer.

Subgrade ramps of whatever nature at approaches to railway crossings, bridge structures, or adjacent to fixed obstructions, shall be removed to the lines and grades as directed by the Consultant. When the surplus material has been removed, the subgrade shall then be prepared in accordance with these specifications.

The Contractor shall, at his own expense, repair any damages to a prepared subgrade surface as well as repair damages done to culverts by his equipment, and shall remove any obstructions he may have placed which will interfere with the normal function of a drainage system.

3.1.2.4 **Preparing Subgrade Surface on Combined Grading and Surfacing Projects**

Where the Contract specifies grading and subsequent base course and/or paving work on the same project area, subgrade preparation shall be performed as required between the separate phases as determined and directed by the Consultant. Subgrade preparation work, when so ordered by the Consultant, will be performed according to the specified requirements of Section 3.1.2.3, Preparing Subgrade Surface.

Subgrade preparation bid units included in the tender for combined projects shall not relieve the Contractor of completing the initial grading construction totally to the specified profile, cross-section, moisture content and compaction standards.

3.1.3 MEASUREMENT AND PAYMENT

3.1.3.1 **Subgrade Excavation**

Subgrade excavation will be measured in cubic metres based on the actual number of cubic metres excavated, as measured in its original position. Payment will be made at the unit price bid for "Subgrade Excavation". This payment will be full compensation for excavating, hauling and disposing of the material at a location suitable to the Consultant.

Removal of ramps of whatever nature at approaches to railway crossings, bridges, or adjacent to fixed obstructions, will be paid for at the unit price bid for "Subgrade Excavation".

3.1.3.2 **Granular Fill**

Granular fill, placed were required, will be paid for in accordance with the provisions of Specification 3.8, Granular Fill .

3.1.3.3 **Preparing Subgrade Surface**

Preparing subgrade surface will be paid for at the price or prices bid per square metre for "Preparing Subgrade Surface", for the top surface area and the top surface area of successive layers of 150 mm in depth, prepared in accordance with these specifications, which payment shall be compensation in full for all equipment, labour and tools necessary to complete the work and shall include scarifying the subgrade, blading, mixing, watering or drying, shaping and compacting.

When the Consultant directs the Contractor to prepare subgrade surface for a layer or successive layers of 150 mm depth below the layer or layers specified in the Contract, preparation of such layers will be paid for at the unit price bid per square metre for "Preparing Subgrade Surface" of the nearest upper layer and shall be compensation in full for all equipment, labour and tools necessary to complete the work as specified.

In the event the Contractor chooses to use lime or some other material to assist in drying wet material, the supply and use of lime or other such material shall be entirely at the Contractor's expense.

3.1.3.4 **Preparing Subgrade Surface on Combined Grading and Surfacing Projects**

On combined projects, the Contractor shall complete the grading construction to required profile, cross-section, moisture content and compaction standards in accordance with Specification 2.3, Grading, and payment for this will be made in accordance with Specification 2.3, Grading.

On areas where the grading has been approved as acceptable and the condition of the subgrade has subsequently deteriorated, the Consultant may direct that subgrade preparation be performed before the subsequent application of base or surfacing materials. For these areas as designated by the Consultant, the Contractor shall perform the subgrade preparation work in accordance with Section, and payment for these specified areas will be made at the unit price bid per square metre for "Preparing Subgrade Surface". Payment will be made only once for preparing subgrade on the designated areas and layers.

Payment for subgrade preparation will be made only for those areas and layers specified by the Consultant for preparing subgrade surface and where such is fully completed in accordance with Section 3.1.2.3. Separate payment will not be made for minor levelling, removing ruts or blading the subgrade surface required between the time of grading and the base or surfacing work, this being considered incidental to the grading operation.

TABLE OF CONTENTS

3.2 AGGREGATE PRODUCTION AND STOCKPILING

3.2.1 GENERAL

This specification covers the general requirements for production, gradation, stockpiling, and pit operations for specified aggregate materials.

3.2.2 MATERIALS

The Contractor shall supply aggregate materials in accordance with Specification 5.2, Supply of Aggregate.

3.2.3 PRODUCTION

3.2.3.1 **General**

Aggregate produced from all sources shall comply fully with the specifications, and the Contractor shall recognize and satisfy himself as to the type and amount of work that may be necessary to produce the material required. The aggregate shall meet the specified requirements as shown on Table 3.2.3.1 for the material specified. The Contractor shall adjust and modify aggregates as required in order to meet specification requirements.

The crushed aggregate shall be composed of sound, hard and durable particles of sand, gravel and rock, and shall be free from elongated particles, injurious quantities of flaky particles, soft shales, organic matter, clay lumps and other foreign matter.

All material up to and including 300 mm diameter in Designated Sources and Department Sources identified in the Contract shall be crushed.

When producing Designation 7 Class 40, "Cement Stabilized Base Course Aggregate" in the event that clay lumps are encountered, the maximum allowable size of material shall be 25 mm.

Acceptance of processed aggregates shall take place when they are in their final position and have met all the requirements of the Contract. The Consultant may test at any time and reject material that does not meet specifications. Final position for a crushing and stockpiling bid item will be the stockpile.

For Designation 1 aggregates used for wearing surfaces (top lift), the Contractor shall produce aggregates such that material retained on the 5 000 micron sieve shall not contain more than 3% detrimental matter based on the total mass of the combined aggregates in the final product.

Prior to the production of any aggregate for use as a wearing surface, the Contractor shall submit a proposal to the Consultant detailing the action to be taken in the event the specification requirement for detrimental matter cannot be achieved. Production of aggregates for use as a wearing surface shall not proceed until such an action plan has been approved by the Consultant.

TABLE 3.2.3.1, SPECIFICATIONS FOR AGGREGATE

DESIGNATION		1				2				3				4			5		6		7	8	9
Class (mm)		10	12.5	16	25	*16(N2)	20	25	40	12.5AW	12.5BW	12.5C	16	20	25	40	10A	10B	80	125	40	25	8
Percent Passing Metric Sieve (CGSB 8-GP-2M) μm	125 000																			100			
	80 000																		100				
	50 000																		55-100	55-100			
	40 000								100							100					100		
	25 000				100			100	70-94						100				38-100	38-100		100	
	20 000				85-95		100	82-97						100		55-90							
	16 000			100	77-87	100	84-94	70-94	55-85				100						32-85	32-85		90-100	
	12 500		100	80-92	67-80	89-100				100	100	100	72-95										
	10 000	100	83-92	70-84	59-73	78-94	63-86	52-79	44-74	35-65	55-75	70-93	53-82	35-77	30-77	25-72	100	100			85-100	45-75	
	8 000																						100
	5 000	60-75	55-70	50-65	40-58	55-70	40-67	35-64	32-62	0-15	0-15	30-60	27-54	15-55	15-55	8-55	70-90	45-70	20-65	20-65		0-15	85-100
	1250	26-45	26-45	26-45	22-38	26-45	20-43	18-43	17-43	0-3	0-3	9-28	9-28	0-30	0-30	0-30	20-45	20-45			40-100	0-5	45-75
	630	18-38	18-38	18-38	15-31	18-38	14-34	12-34	12-34														30-50
	315	12-30	12-30	12-30	10-25	12-30	9-26	8-26	8-26			0-15	0-15				9-22	9-22	6-30	6-30	17-100		18-30
	160	8-20	8-20	8-20	6-16	8-20	5-18	5-18	5-18			0-11	0-11				5-15	5-15					10-21
	80	4-10	4-10	4-10	4-10	4-10	2-10	2-10	2-10	0-0.3	0-0.3	0-8	0-8	0-12	0-12	0-12	0-10	0-10	2-10	2-15	6-30		5-15
% FRACTURE BY WEIGHT (2 FACES)	ALL +5000	*See Note (N1)				60+	60+	60+	50+	75+ (100% 1 Face)	75+ (100% 1 Face)	60+	60+	40+	40+	25+	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PLASTICITY INDEX (PI)		NP	NP	NP	NP	NP	NP-6	NP-6	NP-6	N/A	N/A	NP-4	NP-4	NP-8	NP-8	NP-8	NP-6	NP-6	NP-8	NP-8	NP-5	NP-5	NP
L.A. ABRASION LOSS PERCENT MAX.		40	40	40	40	50	50	50	50	35	35	35	35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	35
FLAKINESS INDEX		N/A								MAX 15		N/A											
COEFFICIENT OF UNIFORMITY (Cu)		N/A																			3+	N/A	

Designations:

Designation 1 - Asphalt Concrete Pavement

Designation 2 - Base Course Aggregate

Designation 3 - Seal Coat Aggregate

Designation 4 - Gravel Surfacing Aggregate

Designation 5 - Sanding Material

Designation 6 - Pit- Run Gravel Fill

Designation 7 - Cement Stabilized Base Course Aggregate

Designation 8 - Granular Filter Aggregate

Designation 9 - Slurry Seal Aggregate

* Notes:

N1. According to Specification 3.50, Asphalt Concrete Pavement - EPS or 3.53, Asphalt Concrete Pavement - Superpave and Mix Type Specified.

N2. Designation 2 Class 16 Material is for ASBC

N3. For crushed aggregates other than all Designation 5 and Designation 9 materials, a tolerance of three percent in the amount passing the maximum size sieve will be permitted provided all oversize material passes the next larger standard sieve size.

3.2.3.2 **Quality Control**

3.2.3.2.1 General

In all sources, quality control testing is the responsibility of the Contractor. Tests performed by the Consultant will not be considered to be quality control tests.

The Contractor shall use professional Engineering services and a qualified testing laboratory licensed to practise in the Province of Alberta to assess and where necessary, modify the aggregate materials being produced to ensure their end use meets all specification requirements.

3.2.3.2.2 Test Methods

The terms "ATT" and "TLT" refer to Alberta Transportation Test methods.

Unless otherwise specified, the latest edition of the test methods shown in Table 3.2.3.2(A) will be used to determine material characteristics.

TABLE 3.2.3.2(A)
TEST METHODS USED TO DETERMINE MATERIAL CHARACTERISTICS

TESTS	STANDARD
Sampling, Gravel and Sand	ATT-38
Sieve Analysis	ATT-25 or 26
Sieve Analysis, 80 000 Fm Minus, Part II - Pit-Run Contamination, - 5 000 Fm Sieve Analysis	ATT-25, Part II
Determining the Liquid Limit of Soils	AASHTO T 89
Dry Strength, Non-Plastic Aggregates	ATT-54
Determining the Plastic Limit and Plasticity Index of Soils	AASHTO T 90
Percent Fracture	ATT-50
Classification of Soils for Engineering Purposes (for definition of Coefficient of Uniformity, Cu)	ASTM D2487
L.A. Abrasion	AASHTO T 96
Flakiness Index	ATT-49
Detrimental Matter in Coarse Aggregate	TLT-107

Note:

(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 Table 3.2.3.2 (B).

TABLE 3.2.3.2(B)

SIEVES IN ACCORDANCE WITH: AASHTO DESIGNATION: M 92 ASTM DESIGNATION: E 11 (U.S. STANDARD SERIES) (OPENING AND DESIGNATION)			METRIC SIEVES IN ACCORDANCE WITH: CGSB SPEC. 8-GP-2M
125.0	mm	5"	125 000
75.0	mm	3"	80 000
63.0	mm	2-1/2"	63 000
50.0	mm	2"	50 000
37.5	mm	1-1/2"	40 000
25.0	mm	1"	25 000
19.0	mm	3/4"	20 000
16.0	mm	5/8"	16 000
12.5	mm	1/2"	12 500
9.5	mm	3/8"	10 000
4.75	mm	#4	5 000
2.36	mm	#8	2 500
2.00	mm	#10	2 000
1.70	mm	#12	1 600
1.18	mm	#16	1 250
0.850	mm	#20	800
0.600	mm	#30	630
0.425	mm	#40	400
0.300	mm	#50	315
0.150	mm	#100	160
0.075	mm	#200	80
0.045	mm	#325	45

3.2.3.2.3 Quality Control Testing

The Contractor shall provide and maintain equipment and qualified personnel to perform all field testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the work.

The Contractor shall provide safe and convenient means for accurately and representatively sampling each aggregate stream being produced during all screening, splitting and crushing processes.

The minimum frequencies of quality control testing are described in Table 3.2.3.2(C) of this specification. Copies of all quality control tests shall be submitted to the Consultant within one working day of the completion of each test.

TABLE 3.2.3.2(C)
QUALITY CONTROL TESTING OF AGGREGATES

TESTS	STANDARD	MINIMUM FREQUENCY
SIEVE ANALYSIS		
1 Crushed Aggregate	ATT-25 or ATT-26	Minimum Frequency not Specified
2 Determining Pit-Run Contamination of Des. 1 (coarse fraction of Mix Types H1 & H2) and Extra Manufactured Fines aggregates.	ATT-25, Part II	One per 12 hours of plant production.
3 Blend Sand	ATT-26	Minimum Frequency not Specified
4 Extra Manufactured Fines	ATT-26	Minimum Frequency not Specified
5 Chips (Des. 3 Class 12.5AW & 12.5BW), Slurry Seal (Des. 9)	ATT-26	One per four hours of plant production
DRY STRENGTH	ATT-54	Des. 2-one per 20 000 tonnes
PLASTICITY INDEX	AASHTO T 90	Des. 1-minimum frequency not specified Des. 2-one per Source and one per 20 000 tonnes when ATT-54 indicates a non-plastic high result. Other Des.-when requested by the Consultant
PERCENT FRACTURE	ATT-50	One per 5 000 tonnes.
L.A. ABRASION	AASHTO T 96	When requested by the Consultant
FLAKINESS INDEX (DES. 3 CLASS 12.5AW & 12.5BW)	ATT-49	One per source
DETRIMENTAL MATTER IN COARSE AGGREGATE (Paving Aggregates, Coarse Fraction, +5000 Fm material)	TLT-107	Minimum of one for first 10 000 tonnes. (Note 1)
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.		

NOTE 1: Additional tests at rate of one per 10 000 t: if first test indicates deleterious material is $4%. (Reported on line E of Form MAT 5-730/94)

The Consultant may inspect the aggregate production process and test and monitor the quality of the material being produced by the Contractor at any time and as often as he deems necessary. Such inspection or testing shall not in any way relieve the Contractor of the responsibility for producing aggregates that meet the specifications in all respects.

The Consultant is under no obligation to provide the Contractor with test results.

3.2.3.3 **Stockpiling**

When aggregate stockpiles are specified or used as part of construction operations, the following shall apply:

(i) When stockpiling is specified in the Contract, the stockpile sites shall be located as shown on the plans or as directed by the Consultant.

(ii) If, in order to expedite his construction operation, the Contractor constructs temporary stockpiles at sites of his own choosing, he shall arrange for such sites and be responsible for them in all respects, including all costs for clearing, removal and salvage of overburden and other site preparation and reclamation. The Contractor shall also obtain approvals and clearances from Alberta Environmental Protection and the Archaeological Survey of Alberta for these sites prior to commencement of the Work.

(iii) Stockpiles shall not be constructed at locations or by methods that will interfere with or damage any utilities such as power lines, telephone lines, pipelines, and underground utilities.

(iv) Sites shall be cleared to the required dimensions. Topsoil and subsoil shall be separately excavated to the full depth or 300 mm, whichever is greater, and stockpiled separately. Stockpile sites shall be shaped to a uniform smooth surface and graded to ensure positive drainage.

(v) Stockpiles shall be constructed by first distributing material uniformly over the entire base, and building upwards in successive layers not exceeding a thickness of 2 m.

(vi) Construction operations shall be controlled to prevent segregation of the various particle sizes.

(vii) Crushed aggregate or pit-run shall not be pushed or dumped over the edges or down the faces of stockpiles.

(viii) Stacking conveyors will not be permitted for stockpiling Designation 2, all classes, and Designation 3 Classes 12.5C and 16 crushed aggregate.

Stacking conveyors may be used for Designation 1 material upon approval of the Consultant.

Stacking conveyors may be used for stockpiling all other designations and classes of aggregate.

(ix) For blend sand, newly processed material shall be blended into the stockpile.

(x) Completed stockpiles shall be neat and regular in form and shall be constructed to occupy the smallest feasible area taking into consideration the bearing capacity of the foundation soils and the requirements of the Occupational Health and Safety Act.

(xi) If different types of material are to be stockpiled, the piles shall be located and constructed so that no intermixing of material will occur.

3.2.3.4 **Aggregate Production**

3.2.3.4.1 General

The Contractor shall produce aggregates conforming to the specifications for the Designations and Classes called for in the Contract.

Prior to any aggregate production, the Contractor shall submit a written proposal to the Consultant, detailing aggregate processing procedures intended to be used. These proposed procedures will require the approval of the Consultant. Aggregates produced prior to this approval will not be accepted.

The Contractor shall notify the Consultant a minimum of two days in advance of the start of aggregate production to allow the visual inspection of the process and testing of the production as deemed necessary by the Consultant.

Any recombining of aggregates or addition of blend materials shall be performed so that a uniform mix of the various sizes is achieved.

Unless otherwise specified, the Contractor shall ensure that manufactured fines are retained in the crushed aggregate stockpile.

There will be no separate payment made for any additional work associated with the Contractor's proposal in achieving the specification requirements for detrimental matter and all related costs shall be included in the unit price bid for "Asphalt Concrete Pavement" for the class of material used.

3.2.3.4.2 Production of Designation 1 Aggregates

The Contractor shall split aggregates for Designation 1 material into coarse and fine fractions prior to crushing of the coarse fraction. The crushed coarse and the fine fractions shall be stockpiled separately.

The Contractor shall select a screen size at which splitting will take place. Splitting of aggregates shall be controlled such that the coarse aggregate fraction, before crushing, shall contain no more than 5% passing the 5000 sieve for all mix types.

In Department sources, the fine fraction shall contain no more than 20% of material retained on the 5000 sieve size.

Further splitting of the crushed coarse aggregate into separate stockpiles may be performed at the Contractor's option. No additional payment will be made for this work.

3.2.3.4.3 Production and Addition of Blend Sand

When the aggregate being produced is destined for further processing through a mixing plant, the addition of any required blend sand shall take place at the mixing plant.

Prior to the mix production, blend sand shall be separately stockpiled so that a representative sample can be obtained in order to establish a mix design.

All blend sand shall be screened before being incorporated into the mix, to remove clay lumps, roots and other deleterious materials. All blend sand so screened shall pass the 5 000 sieve.

Blend sand shall be dried if necessary to ensure a uniform feed.

All other aggregates requiring an addition of blend sand to meet the gradation requirements shall be adjusted at the crushing stage by means of a separate conveyor or other approved device capable of metering the blend sand at a specified uniform rate. The blend sand shall be added prior to or onto the crusher screen deck.

3.2.3.4.4 Production of Extra Manufactured Fines

Manufactured fines are defined as that portion of the material passing the 5 000 sieve size which is produced by the crushing process.

In the event the manufactured fines in the total combined aggregate do not meet the requirement for the specified Asphalt Concrete Mix Type, extra manufactured fines shall be produced by screening the pit-run material so that the screened material contains no more than 5% material passing a 5 000 sieve. This material shall be crushed and all material produced by this crushing process shall be placed in a separate stockpile and designated as Extra Manufactured Fines.

3.2.3.5 Interim Payment for Producing and Stockpiling Crushed Aggregates

3.2.3.5.1 General

Interim payments for producing and stockpiling certain designations and classes of crushed aggregates will be made under the following conditions:

(i) The Contractor submits a written request for interim payment to the Consultant.

(ii) The producing and stockpiling has been completed in accordance with the specifications.

(iii) There are no separate payments specified for crushing and stockpiling aggregates.

(iv) The Contractor provides the Consultant with written consent of Surety to the interim payment, or with security in the form of an Irrevocable Letter of Credit in the amount of the total interim payment.

Interim payment will not imply acceptance of the crushed aggregate by the Consultant. Interim payment will not be made for reject or surplus material.

3.2.3.6 Surplus Crushed Aggregates

3.2.3.6.1 Definitions

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

3.2.3.6.1.1 Surplus Crushed Aggregates

Aggregates which have been produced from Designated Sources or Department Sources identified in the Contract for use on this Contract, and which remain in stockpile after completion of the Work. These aggregates are the property of the Department.

3.2.3.6.1.2 Quantity Placed

The quantity of any particular material incorporated into the Work and accepted by the Consultant.

3.2.3.6.1.3 Tender Quantity

The quantity shown in the Unit Price Schedule for the particular material.

3.2.3.6.1.4 Modified Tender Quantity

For any particular material, the Modified Tender Quantity will be either:

(i) the greater of

(a) the Tender Quantity, or
(b) the increased amount of material to be crushed as ordered by the Consultant, or
(c) the Quantity Placed, or

(ii) in the case where the Consultant orders a reduction in the Quantity to be placed, before the crushing of the material in question was completed, the Modified Tender Quantity will be the greater of

(a) the reduced Quantity as ordered, or
(b) the Quantity Placed.

3.2.4 MEASUREMENT AND PAYMENT

3.2.4.1 **General**

In all sources, the production of aggregates including the processing, hauling and addition of blend sand, the production and addition of extra manufactured fines, and any other aggregate gradation adjustments and modifications will not be paid for separately. The cost of this work will be considered included in the unit price of the Contract item for which the aggregates are being produced.

Payment for the supply of aggregate materials incorporated into the Work will be made in accordance with Specification 5.2, Supply of Aggregate.

If the Contract calls only for crushing and stockpiling aggregates or stockpiling of pit-run aggregates, then measurement will be made in tonnes or cubic metres measured in the vehicle. Payment will be made at the applicable unit price bid for the quantity produced.

The cost of erecting and removal of temporary fences associated with Sources Controlled by the Department will be paid for as Extra Work in accordance with Specification 1.2, General.

The Contractor shall be responsible for the cost of quality control. The Contractor shall be responsible for the cost of all consulting services retained by him.

When stockpiling is specified in the Contract, haul to stockpile will be measured and paid for if applicable, in accordance with the requirements in Specification 4.5, Hauling.

When required, a conversion factor of 1 m^3 = 1.632 tonne will be used.

3.2.4.2 **Interim Crushing and Stockpiling**

Measurement for interim payments will be based on the quantity of crushed aggregate in stockpile, the tender quantity for the bid item incorporating the crushed aggregate, or the amount of material to be crushed as ordered by the Consultant, whichever is least.

Interim payments for producing and stockpiling crushed aggregates will be made monthly and in accordance with the following:

(i) Interim payment is considered a portion of the unit price bid for the material placed on the roadway which incorporates the crushed aggregate. The interim payment will be deducted when payment is made under the applicable bid item or when all Work covered by applicable bid item has been completed.

(ii) Interim payment will be made at the following rates or at the unit price bid for the Work incorporating the crushed aggregate, whichever is least, for the Designation and Class specified:

Designation	**Mix Type Or Class**	**Rate**
1	H1, H2, S1, S2	$ 5.00 per tonne
1	M1, L1, S3	$ 3.50 per tonne
Superpave	All Mix Types	$ 5.00 per tonne
2	All Classes	$ 2.50 per tonne
3	12.5AW and BW	$10.00 per tonne
3	12.5C	$ 5.00 per tonne
4	All Classes	$ 2.00 per tonne

Extra manufactured fines will be classified as Designation 1 material for interim payment.

Interim payment will be made for the portion of natural fines which will be incorporated into the Work.

Interim payment for premixing asphalt stabilized base course to stockpile will be made at the rate of 35% of the unit price bid for Asphalt Stabilized Base Course.

For Chip Seal Coat work with payment made on a square metre basis, the rate of interim payment shall also be on a square metre basis using a conversion factor of 20 kilograms per square metre.

3.2.4.3 **Surplus Crushed Aggregates**

Surplus Crushed Aggregates for which payment will be made are shown in Table 3.2.4.3. These aggregates will be measured in cubic metres by the Consultant by cross-sectioning the piles.

Payment for Surplus Crushed Aggregates will be made at the applicable rates shown in Table 3.2.4.3 or at the bid price for crushing and placing, whichever is lower, in accordance with the following:

(i) at Rate No. 1, for the quantity of Surplus Crushed Aggregate which when added to the Quantity Placed will be up to but will not exceed the Modified Tender Quantity; and

(ii) at Rate No. 2, for the quantity which equals the total measured Surplus Quantity minus the amount determined in (i) above, up to a maximum of 10% of the Modified Tender Quantity.

No payment will be made for the following:

(i) Quantities of surplus crushed aggregate in excess of those calculated in (i) and (ii) above.

(ii) Material which was rejected by the Consultant or which does not meet the applicable specifications.

(iii) The natural fines portion of a split aggregate.

(iv) Rejected fines.

(v) Material produced under a "Crush to Stockpile" bid item.

(vi) Reject over size aggregate.

TABLE 3.2.4.3
SURPLUS CRUSHED AGGREGATE

Designation	Class	Rate No. 1	Rate No. 2
1	All Classes **	$ 3.50/t	$ 2.75/t
Superpave	All Mix Types **	$4.00/t	$3.00/t
2	16, 20 and 25	$ 2.00/t	$ 1.35/t
2	40 and 50	$ 1.50/t	$ 1.00/t
* 2	16 (mixed with asphalt)	$ 15.00/t	$ 12.00/t
4	20 and 25	$ 1.75/t	$ 1.25/t
4	40	$ 1.50/t	$ 1.00/t
8	25	$ 2.75/t	$ 2.00/t

* These rates are for Surplus Crushed Aggregate which was mixed with asphalt and intended for Asphalt Stabilized Base Course.

** Includes only the coarse fraction and extra manufactured fines.

TABLE OF CONTENTS

3.3 GRAVEL SURFACING

3.3.1 GENERAL

Gravel surfacing shall consist of the shaping of the road surface as required, and the placing of crushed gravel thereon as designated by the Consultant.

3.3.2 MATERIALS

The Contractor shall produce crushed aggregate in accordance with Specification 3.2, Aggregate Production and Stockpiling. The Contractor shall supply aggregate materials in accordance with Specification 5.2, Supply of Aggregate and haul aggregate materials in accordance with Specification 4.5, Hauling.

3.3.3 CONSTRUCTION

3.3.3.1 **General**

Equipment used for shaping or for spreading gravel shall operate in the direction of normal traffic flow at all times.

3.3.3.2 **Placing of Gravel Material**

The road surface shall be shaped to the proper grade, crown and superelevation as shown on the plans or as directed by the Consultant.

The Contractor shall advise the Consultant at least 24 hours prior to commencement of gravel surfacing operations to allow inspection of the prepared road surface. Gravel surfacing may proceed only on sections of road which have been approved by the Consultant.

The gravel shall be placed in one or more layers as designated by the Consultant, and the amount of gravel surfacing material to be placed in each layer will be as shown on the plans or as designated by the Consultant.

Gravel shall be promptly and uniformly spread, and in all cases shall be spread before darkness each day. Every precaution shall be taken by the Contractor to provide for the safety of traffic in the area of operations.

After gravel surfacing is complete, the Contractor shall repair all damage to the shoulders or ditches resulting from his operations, leaving the road neatly trimmed and true to cross-section and grade.

The Contractor shall maintain the gravelled surface until it is accepted by the Consultant. Maintenance shall be at the Contractor's own expense and shall be carried out daily or at frequent intervals, depending upon the effects of traffic and weather upon the gravelled sections of roadway.

The Consultant may accept contiguous one kilometre long sections of gravelled roadway or the whole project.

3.3.4 MEASUREMENT AND PAYMENT

3.3.4.1 **Gravel Surfacing**

Measurement of gravel surfacing will be in cubic metres or tonnes, whichever is specified.

Volume measurements will be based on truck box measurement. The capacity of the gravel hauling vehicles will be measured by the Consultant. The measurements will be to the nearest 0.1 m^3 capacity, and the capacity of the vehicle once measured shall not be changed without the consent of the Consultant.

The gravel shall be levelled, using a strike-off method, by the Contractor before measurement. No heaping or rounding of the load above the top of box level will be allowed. Truck boxes used in the haul of gravel shall be thoroughly cleaned upon unloading.

Payment of gravel surfacing will be made at the unit price bid per tonne or per cubic metre, whichever is specified for "Gravel Surfacing". This payment will be full compensation for shaping the road surface, processing, hauling and placing the gravel material.

There will be no separate or additional payment for placement of gravel surfacing in more than one layer.

Payment for the supply of aggregate will be made in accordance with Specification 5.2, Supply of Aggregate.

TABLE OF CONTENTS

3.5 ASPHALT STABILIZED BASE COURSE

3.5.1 GENERAL

Asphalt Stabilized Base Course shall consist of an intimate mixture of crushed aggregate and cutback or emulsified asphalt, produced by plant-mixing at elevated temperatures and placed in layers upon a previously prepared surface, compacted and finished as specified herein.

3.5.1.1 **Alberta Transportation Test Procedures**

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

3.5.2 MATERIALS

3.5.2.1 **Aggregate**

The Contractor shall produce crushed aggregate in accordance with Specification 3.2, Aggregate Production and Stockpiling for the Designation and Class of materials specified. The Contractor shall supply aggregate materials in accordance with Specification 5.2, Supply of Aggregate and haul aggregate materials in accordance with Specification 4.5, Hauling. Aggregate shall not contain lime.

3.5.2.2 **Asphalt**

The Contractor shall supply asphalt material in accordance with Specification 5.7, Supply of Asphalt by Contractor.

Unless otherwise specified in the Special Provisions, asphalt binder for Asphalt Stabilized Base Course shall be MC-250 or MC-800. The Contractor shall make the choice between these two.

3.5.3 MIX DESIGNS AND JOB MIX FORMULA

3.5.3.1 **Responsibility for Mix Designs**

Preparation and submission of Asphalt Stabilized Base Course mix designs for Consultant approval are the responsibility of the Contractor. All costs incurred in mix design formulation are the responsibility of the Contractor. Shipping costs for samples sent to the Consultant for 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 on the Work and to carry out the design of the Asphalt Stabilized Base Course mixture.

3.5.3.2 **Requirements for Mix Design**

The Asphalt Stabilized Base Course mix design shall follow the Marshall Method of Mix Design as outlined in the latest edition of procedure TLT-302 or TLT-303, as appropriate. A minimum of four specimens shall be prepared at each asphalt content and the grade of asphalt used in the design shall conform to Specification 5.7, Supply of Asphalt, shall be identical to that being supplied to the project and shall be obtained from the same supplier.

Mix designs shall meet the following characteristic requirements at the design asphalt content:

TABLE 3.5.3.2
MIX DESIGN CHARACTERISTICS

	HF-500M	**MC-250 OR MC-800**
Marshall Stability (N)	3000+	6700+
Air Voids	3% to 6%	3% to 6%

3.5.3.3 **Approval of Mix Designs**

The Contractor shall submit the mix design to the Consultant for approval. The Contractor's submission shall include the following information:

(a) The gradation of each aggregate to be used in the mixture;

(b) The percentage by mass of each aggregate to be used in the mixture;

(c) The mix design gradation of the combined aggregate;

(d) Other characteristics of the combined aggregate specified in Specification 3.2, Aggregate Production and Stockpiling;

(e) All Marshall mix design characteristics, including graphs used in arriving at the final mix design, the bulk specific gravity of the combined aggregates, and the asphalt absorption of the combined aggregate; and

(f) The recommended design asphalt content expressed as a percentage of dry weight of the aggregate.

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

The Consultant may, at any time, require the Contractor to provide representative samples of the individual aggregates in sufficient quantity that, when combined at the design proportions, a 100 kg sample is achieved. The Consultant will require up to five working days from the time of receipt of such samples to verify the mix design. The cost of such mix design verification will be borne by the Department.

Where required by the Consultant because of a change in the nature or source of the aggregates, 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 will not accept any asphalt mix produced prior to the Contractor receiving written approval of the mix design from the Consultant.

The aggregate proportioning and asphalt content for the approved mix design will then be the Job Mix Formula for the production of the Asphalt Stabilized Base Course mixture.

The Contractor shall be totally responsible for the production of mixes in conformance with the Contract.

3.5.3.4 **Variation from the Approved Job Mix Formula**

After the Job Mix Formula gradation and proportioning of the various aggregate sizes have been established and approved, no alteration to the Job Mix Formula will be permitted. The maximum permissible variation between an individual Cold Feed sample gradation and the Job Mix Formula gradation shall be as shown in the following table:

TABLE 3.5.3.4
GRADATION VARIATION

MAXIMUM PERMISSIBLE VARIATION * PERCENT BY WEIGHT PASSING	
Sieve Designation	**Individual Cold Feed Sample**
5000	±6
1250	±4
630	±3
315	±3
160	±2
80	±2
* In any case, the Gradation must meet the gradation requirements of Specification 3.2, Aggregate Production and Stockpiling.	

If any deviation from the approved Job Mix Formula beyond the variations given above, or any alteration of aggregate proportioning, is requested by the Contractor in writing, the Consultant will evaluate the request and determine if a new mix design is required.

Any deviation whatsoever from the approved Job Mix Formula shall require the prior written approval of the Consultant, and the Consultant will not accept any asphalt mix produced prior to this approval.

The Estimated Original Binder content of any individual sample shall not vary by more than 0.5% from the Job Mix Formula and the daily average by more than 0.3% from the Job Mix Formula.

3.5.4 SAMPLING AND TESTING

3.5.4.1 **Test Methods**

Unless otherwise specified, the latest edition of the following Test Methods shown in Table 3.5.4.1 will be used to determine material characteristics.

TABLE 3.5.4.1
TEST METHODS

TEST	STANDARD
Moisture or Volatile Distillates in Bituminous Paving Mixtures	AASHTO T 110
Extraction	ATT-12
Correction Factor, Extracted Asphalt Content	ATT-12, Part III
Sieve Analysis, 20 000 Fm Minus	ATT-26
Density, ASBC Control Strip Method	ATT-66
Sampling, Mixes	ATT-37
Sampling, Asphalt	ATT-42
Sampling, Gravel and Sand	ATT-38
Moisture Content, Oven Method, Part II, Emulsified Asphalt Mixes	ATT-15, Part II
Moisture Content, Oven Method, Part III, Cutback Asphalt Mixes, Calcium Oxide Method	ATT-15, Part III

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.

3.5.4.2 **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 be quality assurance tests and will not be considered as quality control tests. The Contractor shall provide and maintain equipment and qualified personnel to perform all field testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the Work.

The minimum frequencies of quality control testing are described in Table 3.5.4.2. The Consultant may require an increase in the frequency of any quality control test. The Contractor shall arrange and pay for any additional tests required by the Consultant. Copies of all quality control tests shall be submitted to the Consultant within one working day of the completion of each test.

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

TABLE 3.5.4.2
ASPHALT STABILIZED BASE COURSE
QUALITY CONTROL TESTING

TEST	STANDARD	MINIMUM TEST FREQUENCY	
Plant Calibration	ATT-17	Once per project or as required by the Consultant	
Moisture or Volatile Distillates in Bituminous Paving Mixtures	AASHTO T110	PLANT PRODUCTION One per day(1)	FINAL PLACEMENT One per day(2)
Asphalt Extraction	ATT-12	Two per day	
Sieve Analysis	ATT-26	Each Extraction	
Asphalt Correction Factor	ATT-12, Part III	One per design	
Moisture Content of: Emulsified Asphalt Mixes Cutback Asphalt Mixes	ATT-15, Part II ATT-15, Part III	PLANT PRODUCTION Two per day	DURING LAYDOWN After a rain, as required by the Consultant
Aggregate Sieve Analysis (Cold Feed)	ATT-26	One per day	
Mix Temperature	ATT-30	Four per day	
Plant Inspection	ATT-16	Four per day	
Sampling Cutback Asphalts and Emulsions	ATT-42	One sample per day	
Sampling Tack, Prime and Fog Materials	ATT-42	One per load	
Emulsion Breaking Point	ATT-65	During laydown as required	

NOTE:

(1) One test per day for the first 3 days of production if all mix specification criteria are met.
(2) Not required if Plant Production test results for % of the original cutback weight are between 40-70% for MC 250, and more than 75% for MC 800.

3.5.4.3 **Acceptance Sampling and Testing**

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 measured and accepted based on the Consultant's quality assurance test results.

3.5.5 CONSTRUCTION

3.5.5.1 **General**

The Contractor shall mix the Asphalt Stabilized Base Course through a central mixing plant at elevated temperatures.

The mix shall be produced, placed and compacted in a manner which results in a uniform and non-segregated product. The Contractor shall eliminate the causes of any aggregate segregation or non-uniform asphalt distribution which may occur and shall correct any areas which are segregated or excessively rich, lean or wet.

3.5.5.2 **Asphalt Mixing Plant Requirements**

3.5.5.2.1 All Plants

The Contractor shall calibrate the plant at each production location and shall provide the Consultant with a calibration certificate and data attesting to the calibration.

The Consultant may, when he deems necessary, verify the calibration of the plant at any time. The Contractor shall provide all equipment, facilities and operating staff required to verify the calibration safely and accurately.

The cold aggregate feed shall contain separate bins for each aggregate to be introduced into the mix. Each cold feed bin shall have an adjustable gate and a variable speed feed belt. The cold feed bins shall be calibrated by diverting and weighing the aggregate flow at various speeds of the feed belt. The Contractor shall provide vibrators or other devices to ensure a uniform flow of material.

Each cold feed unit shall be equipped with a sampling device which will allow a representative sample of the aggregate material being delivered to the mixing plant to be obtained safely and without disrupting the continuous operation of the plant.

3.5.5.2.2 Batch Plants

Batch plants shall be equipped with weigh scales on both the asphalt and the aggregate hoppers.

The asphalt scale accuracy shall be checked with enough test weights to simulate the size of the anticipated asphalt batch.

The aggregate scale accuracy shall be checked with test weights or by diverting a number of pre-weighed batches into a truck and verifying the weight on the platform scale.

Each scale shall be accurate to 1.0%.

3.5.5.2.3 Continuous Mix Plants (Pug-Mill Type)

The hot aggregate hopper shall be equipped with an adjustable gate and may also have a variable speed apron feeder. The hot bin shall be calibrated by diverting and weighing the hot aggregate flow into a truck at various gate settings or apron feeder speeds or both. The asphalt pump shall be of the positive displacement type and shall be mechanically or electronically interlocked with the aggregate flow. The asphalt pump shall be calibrated by diverting asphalt into a suitable container for a time at various settings

and weighing the pumped asphalt on the platform scale. The container shall have a volume of at least 3 000 litres.

3.5.5.2.4 Drum Mix Plants

Drum mix plants shall be equipped with electronic controls that automatically and continuously measure the amounts of aggregate and asphalt that are being delivered to the mixing drum. The flow of aggregate shall be weighed by an electronic belt scale.

The calibration shall be performed by diverting the aggregate flow into a truck and the asphalt flow into a container of at least 3 000 litres capacity. The materials shall be weighed on a platform scale and the weight compared to the plant readings.

During the calibration, the asphalt percent delivered shall not vary by more than 0.1% from a particular setting.

The rates of flow of aggregate and asphalt shall be displayed on the control panel.

The belt scale shall be accurate to within 1.0% of the truck weight at the anticipated production rate and also at the lesser of the following rates:

100 t/h less than the anticipated production rate, or

25% lower than the anticipated production rate.

3.5.5.3 **Production**

Asphalt binder, of the designated type and grade, shall be uniformly applied to the combined crushed aggregate at the rate approved in the Job Mix Formula. The temperature of any ingredient of the mix shall not exceed 100ºC at the time of plant mixing. Mixing shall continue until all the asphalt is uniformly dispersed throughout the mix and all aggregate particles are coated with asphalt. The drying and mixing process shall not reduce the cutback level to such a degree that the mix cannot be properly placed. Up to the time of spreading and placing material that is to be blade laid, the amount of cutback in the mix shall be maintained as shown below for each binder grade:

MC-250 Between 40% and 70% of the original cutback weight;

MC-800 More than 75% of the original cutback weight

Mixes containing emulsified asphalt shall not be placed and compacted until the Emulsion Breaking Point Test (ATT-65) indicates the emulsion breaking point has been reached.

The moisture content at the plant discharge of mixes containing cutback asphalt shall be 1.0% or less as measured by any individual test.

3.5.5.4 **Stockpiling**

When Asphalt Stabilized Base Course stockpiles are used as part of construction operations, the general provisions for stockpiling contained in Specification 3.2, Aggregate Production and Stockpiling shall apply, modified and supplemented as follows:

(a) Stacking conveyors only shall be used in the construction of the stockpiles.

(b) The free fall distance from the conveyor to the base of the stockpile at the commencement of stockpiling operations at a given site shall not exceed 3.5 m, and the conveyor shall not be raised until the free fall is less than 2 m. Thereafter, the free fall shall not exceed 2 m.

(c) No equipment shall be allowed on the stockpile at any time.

(d) Stockpiles shall be constructed so as to minimize segregation and the taking on of moisture. The height of stockpiles shall not exceed 8 m.

(e) The Contractor shall not plant-mix or stockpile Asphalt Stabilized Base Course mix during periods of rain. Work may resume when the rain ceases.

3.5.5.5 **Spreading and Compaction**

For blade laid material, up to the time of spreading and placing, the amount of cutback in the mix shall be maintained as shown below for each binder grade:

MC-250 Between 40% and 70% of the original cutback weight;

MC-800 More than 75% of the original cutback weight.

Mixes containing emulsified asphalt shall not be placed until the Emulsion Breaking Point Test (ATT-65) indicates the emulsion breaking point has been reached.

The mix shall be uniformly placed on the prepared and approved surface at the rate of application required to yield the nominal compacted thicknesses specified or designated by the Consultant.

The mix shall be spread and compacted only when the ambient temperature is 5ºC or greater and its moisture content is 1.0% or less as measured by any individual test.

Vibratory compaction equipment shall not be used over Cement Stabilized Base Course unless specifically approved by the Consultant in writing.

The mix shall be spread and compacted to specified grade and cross-section, be stable, uniform in depth, gradation, density and asphalt content at the values specified or designated, and the finished surface shall be smooth, waterproof and free of roller and tire marks.

The Contractor shall, at his own expense and to the satisfaction of the Consultant, repair or restore to specified condition any Asphalt Stabilized Base Course which fails, loses specified density or becomes too wet or too dry, or becomes unstable, rutted, distorted, loose or rough prior to placing subsequent layers of material and prior to final acceptance of the Work.

3.5.5.6 **Density Control**

3.5.5.6.1 General

Control over the density to which Asphalt Stabilized Base Course is compacted will be exercised by the construction of a Control Strip.

A Control Strip is a layer of Asphalt Stabilized Base Course of specified depth constructed on a section of prepared surface. The length of the control strip section shall be 200 m long or as directed by the Consultant.

The Control Minimum Number of Passes is the number of passes with the minimum compaction equipment to attain a Control Maximum Wet Density for a Control Strip.

To determine the Control Minimum Number of Passes, the Consultant will take density measurements by means of nuclear equipment during the compaction operation until a maximum wet density is achieved. The wet density so achieved is the Control Maximum Wet Density.

A new Control Strip with its corresponding Control Maximum Wet Density may be required at any time throughout the project as determined by the Consultant.

3.5.5.6.2 Minimum Compaction Equipment

A Control Strip over Granular Base Course shall be compacted using the following equipment as a minimum:

(i) Two vibratory steel-wheeled rollers, weighing not less than 6 t each and having vibratory capacities of at least 1 500 vibrations per minute with a minimum dynamic or centrifugal force of 8 000 kg, operated in the vibratory mode at a speed not to exceed 8 km/h; or

(ii) One vibratory steel-wheeled roller, weighing not less than 6 t and having a vibratory capacity of at least 1 500 vibrations per minute with a minimum dynamic or centrifugal force of 8 000 kg, operated in the vibratory mode at a speed not to exceed 8 km/h; and one of the following:

  (a) Six wobbly-wheel pneumatic-tired rollers with tires inflated to a pressure of from 165 kPa to 235 kPa, ballasted with at least a level load and towed at a speed not to exceed 8 km/h; or

  (b) Two self-propelled pneumatic-tired rollers, each ballasted to its maximum capacity, weighing not less than 10 t, having a minimum tire pressure of from 365 kPa to 435 kPa, and travelling at a speed not to exceed 8 km/h; or

  (c) A combination of 4 wobbly-wheel pneumatic-tired rollers and one self-propelled pneumatic-tired roller, all of which meet the appropriate criteria described above.

A Control Strip over Cement Stabilized Base Course shall be compacted using the equipment options as described in Section 3.5.5.6.2 (ii) above as a minimum, except that the vibratory steel roller is to be operated in static mode.

3.5.5.6.3 Method of Compaction for the Control Strip

A "pass" is one complete coverage of the Control Strip area with at least the minimum compaction equipment specified in Section 3.5.5.6.2 of this Specification.

As portions of the mix are being spread, the Contractor shall initially compact the mix either with one of the vibratory steel-wheel rollers specified in Section 3.5.5.6.2(i) or (ii), or with the equipment specified in Section 3.5.5.6.2(ii) (a), (b) or (c), as the case may be, so that when the entire lift has been spread he shall have covered the Control Strip area completely at least twice with this compaction equipment.

Once the Contractor has completely spread the Asphalt Stabilized Base Course for the Control Strip, the Consultant will commence measurements of wet density using nuclear equipment. Compaction using all the minimum equipment specified in Section 3.5.5.6.2(i) or (ii) shall then proceed, and shall continue until the Control Maximum Wet Density is attained and the Control Minimum Number of Passes is established.

When pneumatic-tired rollers are used for compaction, they shall precede the vibratory steel-wheeled roller.

3.5.5.6.4 General Construction Using the Control Strip

Once the Control Minimum Number of Passes and the Control Maximum Wet Density have been established using a given combination of equipment, the Contractor shall use the same equipment, spreading technique and minimum number of passes for the general construction operation unless otherwise approved by the Consultant.

The Consultant may at any time take measurements using nuclear equipment to determine if the Control Maximum Wet Density has been attained. If the results at ten randomly selected test sites do not average at least 98.0% of the Control Maximum Wet Density, then the Contractor shall carry out more passes until such an average is attained, or he shall construct a new Control Strip to establish a new Control Maximum Wet Density and a new Control Minimum Number of Passes, as directed by the Consultant.

The Contractor shall compact areas such as entrances, where all of the specified equipment cannot work practically, using a vibratory steel-wheeled roller as specified in Section 3.5.5.6.2 until 95.0% of the Control Maximum Wet Density has been achieved.

3.5.5.7 **Asphalt Fog Coat**

The Contractor shall apply an asphalt fog coat to the finished Asphalt Stabilized Base Course surface as soon as is practical, as the Work progresses, and at locations and to dimensions designated by the Consultant, according to Specification 3.19, Prime, Tack and Fog Coats. Areas of Asphalt Stabilized Base Course which have been repaired or restored shall be refogged to the satisfaction of the Consultant.

3.5.5.8 **Interim Lane Markings**

The Contractor shall provide interim lane markings on all newly constructed asphalt stabilized base course surfaces, or on tacked surfaces that are to be exposed to traffic overnight. 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, shall employ the same paint colour as the permanent marking to come and shall be completely covered with glass beads at the time of painting.

3.5.5.9 **Slopes and Ditches**

Slopes shall be neatly trimmed, and loose or waste material shall be either neatly bladed against the edge of the base course or spread neatly over the sideslopes and ditches as directed by the Consultant. All rocks larger than 75 mm in diameter shall be removed from the side slopes and ditches and disposed of in a manner satisfactory to the Consultant. This is considered incidental to the Work and no separate payment will be made.

3.5.5.10 **Asphalt Stabilized Base Course for Others**

The Contractor shall make available, on request, additional asphalt stabilized base course for the use of the Department. The estimated quantity of additional material is shown in the unit price schedule as "Asphalt

Stabilized Base Course For Others". This additional material will either be picked up at the mixing plant by other forces at times that are mutually agreeable to the Contractor and the Consultant or stockpiled by the Contractor, as determined by the Consultant.

3.5.6 MEASUREMENT AND PAYMENT

3.5.6.1 **Asphalt Stabilized Base Course**

Accepted Asphalt Stabilized Base Course material will be measured in tonnes and paid for at the unit price bid per tonne for "Asphalt Stabilized Base Course". This payment will be full compensation for processing, hauling and placing the mix; stockpiling if appropriate, interim lane marking and quality control.

No payment will be made for any material used to repair failures which may occur in the base courses constructed under this Contract. Any expense incurred in the supply, processing, hauling and placing of such material shall be borne by the Contractor.

3.5.6.2 **Asphalt Stabilized Base Course For Others**

Payment will be made at the unit price bid per tonne for "Asphalt Stabilized Base Course For Others." This payment will be full compensation for processing the mix, loading to trucks or stockpiling the material and quality control.

3.5.6.3 **Supply of Aggregate**

Payment for the supply of aggregate will be made in accordance with Specification 5.2, Supply of Aggregate.

3.5.6.4 **Fog Coat**

Measurement and payment for Fog Coat will be in accordance with Specification 3.19, Prime, Tack and Fog Coats.

3.5.6.5 **Supply of Asphalt**

Payment for the supply of asphalt for Asphalt Stabilized Base Course will be made at the unit price bid per tonne for "Supply of Asphalt for Asphalt Stabilized Base Course."

TABLE OF CONTENTS

3.6 GRANULAR BASE COURSE

3.6.1 GENERAL

3.6.1.1 **Description**

Granular base course shall consist of an intimate mixture of crushed aggregate and water, which is placed in layers upon a prepared surface, compacted and finished, as specified herein.

3.6.1.2 **Definitions**

A "Control Strip" is a lift of granular base course constructed using the equipment and method of compaction as prescribed herein, normally on a 400 m section of prepared surface selected by the Consultant.

The "Control Density" is the maximum dry density attained on a "Control Strip."

A "Pass" is one complete coverage of the Control Strip area with at least the minimum compaction equipment specified herein.

A "Lot" is normally defined as the quantity of Granular Base Course placed in one day's production. For Projects with small quantities of Granular Base Course, generally less than 3 000 tonnes, the entire quantity of Granular Base Course will be considered as one Lot. 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 Granular Base Course is subject to unit price adjustment or rejection.

A "Visually Failed Area" is an area of any subgrade or base course which fails, loses specified density, becomes too wet or too dry, or becomes rutted, distorted, loose or rough.

3.6.2 MATERIALS

3.6.2.1 **Aggregate**

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

3.6.2.2 **Water**

The Contractor shall supply and haul all water required for the construction and maintenance of this work.

The water shall be free from substances which render it unfit for use.

3.6.2.3 **Asphalt**

The Contractor shall supply asphalt material for prime coat in accordance with Specification 5.7, Supply of Asphalt.

3.6.2.4 **Interim Lane Markings**

The Contractor shall supply interim lane marking paint and glass beads from the list of approved products shown in the special provisions or specification amendments.

As an alternative to paint and glass beads, the Contractor has the option of supplying reflectorized temporary pavement markers or self-adhesive reflectorized pavement marking tape. Acceptable temporary pavement markers are shown on the Alberta Transportation Products List.

3.6.3 ACCEPTANCE SAMPLING AND TESTING

All testing will be carried out by an approved laboratory.

The Consultant may at any time take samples, carry out testing and inspection of materials incorporated or being incorporated into the work. The Contractor shall cooperate with the Consultant or his representative for such sampling, testing and inspection. Such inspection shall not relieve the Contractor from any obligation to perform all the work strictly in accordance with the requirements of the contract.

Sample locations for routine quality testing will be randomly selected as far as it is practical to do so. This will not limit the Consultant from testing at any additional locations deemed necessary.

Results of the tests are available to the Contractor for his information. It is the responsibility of the Contractor to interpret test results and alter his operation if necessary, so that the product meets all required specifications.

3.6.3.1 **Test Methods**

Unless otherwise specified, the following standard Alberta Transportation test methods (ATT) shown in Table 3.6.3.1 will be used to determine the material characteristics.

TABLE 3.6.3.1
QUALITY ASSURANCE TEST METHODS

TEST	STANDARD	FREQUENCY (Minimum)
SAMPLING, Gravel and Sand	ATT- 38	As Required
[(1)]SIEVE ANALYSIS	ATT-25 or 26	As required in ATT-38
PERCENT FRACTURE	ATT-50	As required in ATT-38
DENSITY, Control Strip Method	ATT-58	[(2)]Control and Test Sections
RANDOM TEST SITE LOCATIONS	ATT-56	Each Test Sections
MOISTURE CONTENT, Oven Method, Soil and Gravel	ATT-15	As required

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)]Control Strips are established as specified herein. Density Test Sections are randomly established every 1000 m on all lifts.

3.6.4 CONSTRUCTION

3.6.4.1 **Control Strip Construction**

The nominal lift thickness of a granular base course shall be determined by the Contractor but shall not exceed 200 mm compacted. The total design granular base course thickness may require that more than one lift be constructed, in which case, a new Control Strip is required for each lift; for a change in designation, class or source of aggregate; or when called for by the Consultant.

Control Strips shall not be constructed during freezing ambient temperatures, with frozen aggregate, or on frozen subgrades.

Aggregate for construction of a Control Strip shall be spread by means of a motor grader or paver.

The Control Strip moisture content shall be adjusted as directed by the Consultant during spreading of the aggregate. The surface of the granular base course shall be kept moist until testing is completed.

Once the aggregate for the Control Strip lift has been completely spread, the moisture and density measurements for determining the Control Density will commence, and will continue during repeated passes of the specified compaction equipment until the maximum dry density is attained. These measurements will be taken by the Consultant using nuclear testing equipment.

3.6.4.1.1 Control Strip Minimum Compaction Equipment

The Control Strip lift shall be compacted using at least the following equipment:

Two vibratory steel rollers weighing not less than 10 t each and having a vibratory capacity of at least 1500 VPM with a minimum dynamic or centrifugal force of 8000 kg, operated in the vibratory mode, and at a speed not exceeding 8 km/h; plus one of the following:

(i) Six wobbly tired rollers with tires inflated to a pressure of 200 kPa plus or minus 35 kPa, ballasted with at least a level load of gravel, and towed at a speed not exceeding 8 km/h; or

(ii) Two self-propelled pneumatic rollers, each ballasted to its maximum capacity, weighing not less than 10 t each, having a minimum tire pressure of 400 kPa plus or minus 35 kPa, and travelling at a speed not exceeding 8 km/h; or

(iii) A combination of 4 wobbly tired rollers and 1 self-propelled pneumatic roller each of which meets the appropriate criteria described above.

On projects where Control Strips are being established on small areas such as acceleration and deceleration lanes, and culvert backfills, other minimum equipment proposed by the Contractor may be approved by the Consultant.

3.6.4.1.2 Control Strip Compaction

If portions of the lift are being spread using a motor grader, the aggregate shall be compacted so that when the entire lift has been spread, a minimum of 4 complete passes with the specified compaction equipment shall have been completed over all the Control Strip area.

If the aggregate has been spread by means of a motor grader and vibratory compaction causes a loss of density during base course construction, vibratory compactors shall operate in the static mode supplemented with the specified pneumatic rollers. Whenever a granular base course lift is spread by a paver, a vibratory compactor operating in the vibratory mode shall be utilized.

When pneumatic self-propelled rollers or wobbly type rollers are used for compaction the pneumatic self-propelled rollers or wobbly type rollers shall lead the steel vibratory compactor.

3.6.4.2 General Construction of Granular Base Course Using the Control Density

Once the Control Density has been established, the Contractor may choose his own combination of compaction equipment.

The base course shall be uniformly placed at the same lift thickness as the corresponding Control Strip lift thickness.

Each lift of base course shall be constructed true to grade and cross-section and the finished surface shall be smooth and free of loose material.

The Contractor shall compact areas such as entrances, using a vibratory steel-wheeled roller as specified in Section 3.6.4.1.1 to the satisfaction of the Consultant or until 95.0% of the Control Density has been achieved.

The Consultant may direct the Contractor not to use the vibratory compaction mode within certain areas located near utilities or other restricted areas as determined by the Consultant.

Water shall not be added in such quantities that it seeps into the underlying subgrade.

Materials shall be handled so that segregation of the coarser and finer fractions does not occur and the Contractor shall take all necessary precautions to prevent aggregate segregation. Any segregation shall be corrected by reblending as necessary.

Base course shall not be spread on frozen subgrade and compaction shall be completed before freezing.

3.6.4.3 Finishing Work

Subgrade slopes shall be neatly trimmed, and loose or waste material from the side slopes shall be either neatly bladed against the edge of the base course or spread neatly over the side slope and ditches to the satisfaction of the Consultant.

In addition, the finished base course surfaces shall be in compliance with the tolerances specified in the specification amendment referenced in the Contract.

All rocks larger than 75 mm in diameter shall be removed from the side slopes and ditches and disposed of in a manner satisfactory to the Consultant.

Prime coat shall be placed on the finished final lift of granular base course in accordance with Specification 3.19, Prime, Tack and Fog Coats.

3.6.4.4 **Interim Lane Markings**

The Contractor shall provide interim lane markings on all newly primed surfaces that are to be exposed to traffic overnight. The Contractor has the option of using paint and glass beads or reflectorized temporary pavement markers.

When paint is used, 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, shall employ the same paint colour as the permanent marking to come and shall be completely covered with glass beads at the time of painting.

When reflectorized temporary pavement markers are used, they shall be placed at 25 m intervals on tangent sections and at 15 m intervals on curves and shall be removed immediately prior to being overlaid.

3.6.5 COMPLIANCE TESTING

The Contractor shall, at his own expense, repair and/or restore to specified condition any Visually Failed Areas.

Each lift shall be compacted to an average of 98.0% of the applicable Control Density with no single test less than 95% of the applicable Control Density. Frequency of testing is outlined in ATT 58.

As specified for Control Strip construction, the surface of the granular base course shall be kept moist until testing is completed.

3.6.6 END PRODUCT ACCEPTANCE OR REJECTION

The following requirements apply to granular base course aggregate material placed in all lifts.

Price Adjustments for aggregate gradation for each sieve size will be based on the variation of the Lot Mean Gradation from the limits of the Designation and Class outlined in Table 3.2.3.1. The corresponding adjustment points are shown in Table 3.6A.

When the Lot Mean Gradation is outside the gradation limits of Table 3.2.3.1, the penalty assessment will be $0.02 per tonne for each Mean Adjustment Point outside those limits. If the maximum deviation shown in Table 3.6 A is exceeded, the lot is rejected.

Price Adjustments for Fractures will be based on the Mean Fracture deviation below the specification minimum shown in Table 3.2.3.1, one adjustment point for each one percent below the specification minimum will occur up to a maximum of ten percent. If the maximum deviation is exceeded, the lot is rejected.

Price Adjustments for Lot Mean Gradation and Fractures will be based on a minimum of three tests each per Lot sampled under a Full Testing Program in accordance with ATT 38, Sampling, Gravel and Sand.

At the discretion of the Consultant a Partial Testing Program in accordance with ATT 38 may be used in determining End Product acceptance subject to other compliance testing. Price adjustments will not apply in cases where the Partial Testing Program is used.

3.6.6.1 **Methods of Repair of Rejected Areas**

All rejected areas shall be repaired by the Contractor to the satisfaction of the Consultant. The following methods of repair are generally acceptable but are subject to the approval of the Department:

- Remove and replace entire depth of rejected lift in failed area.

- Place a remedial lift equal to 30 percent of the depth of the rejected lift thickness or 50 mm, whichever is greater. When remedial lifts are used as a repair method, the surrounding areas/lanes also require additional material to create smooth transitions and acceptable elevation changes between the repaired and approved areas. When a lower lift is repaired using a remedial lift, the repair material will not be considered to take the place of any portion of subsequent lifts.(i.e. the completed structure will be the design depth plus the depth of repair lift)

- Correct aggregate requirements by adding, blending and reworking appropriate materials.

All repairs shall be regular in shape and finished using good workmanship practises to provide an appearance suitable to the Consultant.

All repairs shall be carried out by the Contractor at his expense.

3.6.6.1.1 Payment for Work that had been Rejected, but was Made Acceptable

All repaired areas will be retested and the results of the retest will be used for determining pay adjustments.

When the method of repair is a remedial lift, the remedial lift will be tested and any pay adjustment as determined will be applied to the rejected underlying lift and the additional material will not be paid for.

When the method of repair is adding, blending and reworking materials, the added materials will not be paid for. Only the quantity of material originally constructed will be paid for.

Payment for the additional testing will be charged to the Contractor in accordance with the rates as shown in Section 3.6.7.2, Payment of Appeal Testing Costs.

3.6.7 APPEAL OF ACCEPTANCE TEST RESULTS AND APPEAL TESTING

3.6.7.1 **Gradation and Fractures**

Appeal testing will be done using appeal sampling method described in ATT 38. The Contractor may appeal the results of acceptance testing of gradation or fractures for any rejected or penalized Lot only once. The Consultant may request that cause be shown for the appeal. The appeal shall be for all tests within the Lot, and there will be no appeal allowed for single tests within a Lot. Priming or placing of additional lifts on the appealed Lot will void any appeal.

The following procedures will apply for an appeal:

(i) The Contractor shall serve notice of the appeal for Gradation, Fractures or both to the , in writing, within 24 hours of receipt of the test results;

(ii) The Department 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 sample the compacted base and provide the samples to the independent testing laboratory. The Contractor may observe the sampling process. The number of the new tests for the appeal shall be the same as the number used to determine the Lot Mean; and

(iv) All test results from the old Lot will be retained and averaged with the new appeal tests. A new mean for all tests will be determined and used for acceptance and unit price adjustment.

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

3.6.7.2 **Payment of Appeal Testing Costs**

If the new results show that a penalty no longer applies, then sampling and testing costs incurred during the appeal procedures for that Lot will be borne by the Department.

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 sampling and testing costs for the appeal procedures, at the following rates:

Gradation:	$500
Fracture Count:	$300

3.6.8 MEASUREMENT AND PAYMENT

3.6.8.1 **Granular Base Course**

Measurement of granular base course will be in tonnes.

Payment will be made at the applicable unit price bid per tonne for "Granular Base Course" subject to the unit price adjustments specified herein. This payment will be full compensation for processing, hauling and placing the material on the roadway, intersections, entrances and approaches, supplying water and adjusting the moisture content, preparing the surface, applying asphalt material for Prime Coat, supplying and applying blotting sand when required, maintaining the treated surface, interim lane marking and quality control.

Separate payment will not be made for any material required to repair failures which occur in the granular base course. All costs associated with the repair of failed areas will be the responsibility of the Contractor.

Payment for the supply of asphalt for Prime Coat will be in accordance with Specification 3.19, Prime, Tack and Fog Coats.

3.6.8.2 **Pay for Acceptable Work**

Total Lot Adjustment points will be calculated for each Lot. A Lot Gradation and Fracture Price Adjustment per tonne will be applied based on the following formula, providing the Lot Mean does not exceed the requirements in Table 3.6 A or the maximum deviation for fractures is not exceeded.

PAgf = (PAg + PAf) x $ 0.02

Where:

Pagf	=	Unit Price Adjustment for Gradation and Fractures
Pag	=	Adjustment Points for Gradation
Paf	=	Adjustment Points for Fractures

The Lot Unit Price Bid per tonne will be calculated as follows:

Lot Unit Price Per tonne	=	Contract Unit Price Bid Per tonne	-	PAgf

TABLE 3.6 A
MEAN ADJUSTMENT POINTS FOR DEVIATIONS FROM GRADATION LIMITS AND MAXIMUM DEVIATIONS ALLOWABLE

LOT MEAN REQUIREMENTS	SIEVE SIZE Fm			
	(1)25000 20000 16000 10000	5000 1250 630 315	160	80
Mean Adjustment Points for Deviations from limits of Table 3.2.3.1	2 for each 1% Deviation	5 for each 1% Deviation	0.5 for each 0.1% Deviation	5 for each 0.1% Deviation
Maximum Allowable Deviation from limits of Table 3.2.3.1	2	3	3	1.5

(1) Note: Include all applicable sieves up to one size smaller than top size.

TABLE OF CONTENTS

3.8 GRANULAR FILL

3.8.1 GENERAL

Granular fill shall consist of pit-run gravel, sand or crushed gravel placed upon the prepared areas and in excavations, at locations and to thicknesses specified.

3.8.2 MATERIALS

3.8.2.1 **Aggregate**

The Contractor shall produce processed 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 aggregate materials in accordance with Specification 4.5, Hauling.

3.8.2.2 **Water**

When required, the Contractor shall supply suitable water.

3.8.3 SAMPLING AND TESTING

3.8.3.1 **Test Methods**

Unless otherwise specified, the latest edition of the test methods shown in Table 3.8.3.1 will be used to determine material characteristics.

TABLE 3.8.3.1
TEST METHODS USED TO DETERMINE MATERIAL CHARACTERISTICS

Test Description	Method No.
Sampling, Gravel and Sand	ATT-38
Sieve Analysis	ATT-25 or 26
Determining the Liquid Limit of Soils	AASHTO T 89
Dry Strength, Non-Plastic Aggregates	ATT-54
Determining the Plastic Limit and Plasticity Index of Soils	AASHTO T 90
Density, Control Strip Method	ATT-58
Moisture Content, Open Pan Method	ATT-14

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.

3.8.4 CONSTRUCTION

3.8.4.1 **Granular Fill**

The granular fill shall be deposited on the prepared area or in an excavation in a uniform manner and quantity, which will produce the required compacted thickness and width designated by the Consultant. Any coarse material segregated during dumping operations shall be blended with fines and shaped to the required depth, grade and cross-section.

The granular fill shall be watered or dried and compacted. Compaction shall continue in conjunction with light blading and water spraying where necessary to maintain cross-section and designated moisture content until the required density is reached.

3.8.4.2 **Fine Grading Gravel Course**

When required, a light application of crushed gravel material of the designation and class specified, shall be placed in a single layer on the granular fill course for fine grading purposes.

The crushed gravel shall be windrowed uniformly upon the designated area and spread to the required cross-section and depth. The surface shall be compacted to the required density as directed by the Consultant. If necessary, water shall be added to the material during compaction to maintain the required uniform moisture content.

The moisture content of any layer shall not exceed the designated moisture content prior to any subsequent operations.

3.8.5 MEASUREMENT AND PAYMENT

Granular fill and fine graded gravel course will be measured in tonnes or cubic metres as specified and paid for at the applicable unit price bid for "Granular Fill" for the Designation and Class of material specified. This payment will be full compensation for supplying and adding water; and processing, hauling and placing the granular fill material.

TABLE OF CONTENTS

3.9 CEMENT STABILIZED BASE COURSE

3.9.1 GENERAL

3.9.1.1 **Description**

Cement stabilized base course shall consist of a uniform mixture of sand or crushed aggregate, Portland Cement and water, combined as hereinafter specified, placed, compacted, and finished on the prepared surfaces.

Cement stabilized base course material as defined herein shall be mixed through a central mixing plant in accordance with the requirements of the specifications.

3.9.2 MATERIALS

3.9.2.1 **Portland Cement**

The Contractor shall supply Portland Cement in accordance with Specification 5.11, Supply of Portland Cement. Unless otherwise directed or approved by the Consultant Normal Type 10 Portland Cement shall be used.

3.9.2.2 **Aggregates**

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

3.9.2.3 **Water**

The Contractor shall supply all water required in the construction of cement stabilized base course.

Water shall conform to the requirements of the latest version of CSA Standard CAN 3-A23.1, Concrete Materials and Methods of Concrete Construction. Water used in Portland Cement Concrete construction shall be subject to the prior approval of the Consultant.

3.9.2.4 **Asphalt**

The Contractor shall supply all required asphalt materials in accordance with Specification 5.7, Supply of Asphalt.

3.9.2.5 **Test Methods**

Unless otherwise specified, the following standard test methods will be used to determine material characteristics.

When requested by the Contractor, the most recent edition of the following test methods will be used for verification purposes, the results of which shall govern:

	Test Description	Method No.
(i)	Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials	AASHTO Designation T 2
(ii)	Sieve Analysis of Fine and Coarse Aggregates (1), and	AASHTO Designation T 27
	(a) Amount of Material Finer than 0.075 mm sieve in Aggregate (1)	AASHTO Designation T 11
(iii)	Determining the Liquid Limit of Soils (1)	AASHTO Designation T 89
(iv)	Determining the Plastic Limit and Plasticity Index of Soils	AASHTO Designation T 90
(v)	Classification of Soils for Engineering Purposes (for definition of Coefficient of Uniformity, Cu)	ASTM Designation D 2487
(vi)	Determination of Cement Content in Cement-Treated Aggregate by the Method of Titration (1)	AASHTO Designation T 211
(vii)	Cement Content of Soil-Cement Mixture (hardened)	AASHTO Designation T 144
(viii)	Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Moisture Tester	AASHTO Designation T 217
(ix)	Laboratory Determination of Moisture Content of Soil	ASTM Designation D 2216
(x)	Moisture Density Relations of Soil-Cement Mixtures (1) (hereinafter referred to in Section 3.9 as the Standard Proctor Test)	AASHTO Designation T 134
(xi)	Compressive Strength of Molded Soil-Cement Cylinders	ASTM Designation D 1633
(xii)	Making and Curing Soil-Cement Compression and Flexure Test Specimens in the Laboratory	ASTM Designation D 1632
(xiii)	Capping Cylindrical Concrete Specimens	AASHTO Designation T 231
(xiv)	Density of Soils In-Place by Block, Chunk or Core	AASHTO Designation T 233
(xv)	Density of Soil In-Place by the Rubber Balloon Method	AASHTO Designation T 205
(xvi)	Density of Soil In-Place by the Sand Cone Method	AASHTO Designation T 191
(xvii)	Density of Soil and Soil-Aggregate In-Place by Nuclear Method (shallow depth)	AASHTO Designation T 238
(xviii)	Sampling Bituminous Materials	AASHTO Designation T 40

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.

3.9.3 EQUIPMENT

3.9.3.1 **General**

The Contractor shall provide sufficient equipment to produce and place cement stabilized mixture at a rate of not less than 200 t per hour.

3.9.3.2 **Mixing Plants - General**

Mixing plants shall be of approved batch or continuous mix type, capable of producing a uniform mixture. All mixers shall be equipped with adjustable metering devices of a type which will introduce the cement and water into the mixer in the designated proportions. The cement metering devices and feeder shall be interlocked and synchronized to maintain a constant ratio of cement to the sand or gravel material, and the water metering control shall be adjustable to maintain the designated moisture content.

The mixing unit shall be capable of adjustment, either by reduction in volume of material or other means, to correct occurrence of dead areas in the mixer in which material does not move or is not sufficiently agitated to produce the necessary uniform dispersal of the ingredients of the mixture, as may be required by changes in the mixing properties of the material being mixed.

3.9.3.3 **Batch Type Mixers**

If a batch type mixer is used, the material shall be proportioned by batch weights.

3.9.3.4 **Continuous Type Mixers**

If a continuous type of mixer is used, the materials shall be proportioned by volume. The sand or gravel materials shall be drawn from the storage bin or bins by an approved continuous feeder through adjustable calibrated gates, or by an approved fixed gate continuous feeder with adjustable speed control, which will supply the correct amount of sand or gravel materials in proportion to the cement and water. The plant shall be equipped with facilities satisfactory to the Consultant for sampling materials and calibrating gate openings or rate of feed by weighing check samples.

3.9.3.5 **Spreading Equipment**

Spreading equipment shall be readily adjustable to various depths and widths, and shall be constructed and operated to produce a layer of material of uniform thickness, true to grade and cross-section and of uniform consistency.

3.9.3.6 **Compaction Equipment**

Compaction equipment shall be capable of producing the specified degree of compaction and surface finish within the time limits specified.

3.9.3.7 **Sampling and Sampling Stand**

Samples of the various components of the mixture and the mixture itself will be taken as often as considered necessary by the Consultant for the purpose of verifying quality control, adherence to specification, or other test purposes. The Contractor shall cooperate with the Consultant and/or his representatives in obtaining the samples required, including the provision by the Contractor of suitable sampling devices. The Contractor shall provide access to all parts of the plant as required by the Consultant. The Contractor shall at his own expense provide, install and maintain a suitable sampling stand for the purpose of sampling from loaded trucks. The stand shall be of solid construction, safe, firmly anchored, and of a convenient height to enable easy acquisition of samples from haul vehicles. The stand shall have a minimum platform area of 3 m in length and 1 m in width, shall be equipped with stairs, and be completely enclosed with guard and hand rails. The stand shall be placed in an approved location.

3.9.3.8 **Plant Calibration**

Prior to production of any material, the plant shall be calibrated to produce a mix containing the proper proportion of all components of the mixture. Calibration of the plant shall be performed at each new plant setting and at any other time as directed by the Consultant.

All plants shall contain devices capable of diverting each component of the mixture into separate receptacles or trucks for the purpose of weighing check samples.

3.9.4 CONSTRUCTION

3.9.4.1 **Cement Stabilized Base Course - General**

Cement stabilized base course shall not be mixed or placed when the atmospheric temperature is at or below 5ºC, or when conditions indicate that the temperature may fall below 5ºC within 24 hours, unless adequate means satisfactory to the Consultant are employed for the protection of the work. In no case shall cement stabilized base course be placed on frozen subgrade.

All cement stabilized base course shall be effectively protected from frost action, and any material which has become damaged by the frost action shall be replaced by the Contractor at his own expense.

3.9.4.2 **Cement Addition**

The measurement of cement content for addition to the sand or gravel shall be by weight, whether proportioned by batch weight or by volume.

Cement to be mixed with the sand or gravel material shall be uniformly distributed throughout the material during the mixing operation.

3.9.4.3 **Mixing Cement Stabilized Base Course**

Blending of the sand or gravel material shall be performed prior to the mixing operations to meet the requirements as specified herein.

Sand or gravel, cement and water shall be mixed such that an homogeneous mixture, uniform in gradation, cement content, moisture content and appearance is attained.

The proportions of water and cement to be added to the mixture will be designated by the Consultant, and the rates of addition shall be under strict control at all times.

Cement content of the mixture shall not vary by more than plus or minus 0.3% by weight from the designated cement content. The moisture content shall not vary by more than plus or minus 2% by weight, and shall be such that the designated moisture content is achieved at the compaction stage.

In the event the moisture content of the gravel or sand is above the optimum moisture content designated for the mixture, the material shall be dried by aerating or piling and allowing to drain, or by dewatering with pumps or other such methods prior to plant mixing, such that the optimum moisture of the cement stabilized mixture is realized.

3.9.4.4 **Placing Cement Stabilized Mixture**

Immediately prior to placing of the cement stabilized mixture, the surface of the prepared subgrade shall be moistened and kept moist until covered by the mixture. Care shall be exercised to prevent softening of the subgrade by the addition of excess amounts of water. Ponding of water will not be permitted.

Materials shall be transported by means of approved vehicles equipped with protective covers if required, and deposited and spread by approved spreading equipment. Dumping of mixture in piles or windrows upon the subgrade and subsequent spreading by motor graders or other equipment will not be permitted unless approved by the Consultant for irregular, restrictive areas.

The mix shall be spread and compacted to conform to grade and cross-section, be uniform in gradation, density, moisture and cement content, at the values designated, and the finished surface shall be smooth and tight.

The spreading operation will not be permitted in widths of less than 3 m, excepting as permitted by the Consultant for irregular, restrictive areas.

Where the final compacted thickness of the cement stabilized base is 225 mm or less, sufficient material is to be placed in one operation to obtain this thickness.

Where the thickness designated is greater than 225 mm, the spreading operation shall be carried out in two layers of equal thickness unless otherwise directed by the Consultant. Unless otherwise permitted, placing and spreading of base course materials shall be performed in contiguous sections.

Unless otherwise directed by the Consultant, the mixed materials shall be spread for part width of the subgrade under construction. Care shall be taken to prevent damage to the exposed edge, or edges, by the compacting equipment where part width construction is undertaken. Care shall also be taken to prevent damage to the exposed edge, or edges, by the compacting equipment and/or traffic and weather.

Where the Consultant directs that the mixed materials shall be spread for the full width of the subgrade under construction, either one spreader or several spreaders may be operated in a staggered position across the subgrade. Where more than one spreader is used to distribute the mixed material in adjacent spreads, or where one spreader is used alternately on two adjacent spreads, joint construction as hereinafter specified will not be required when less than thirty minutes elapses between the time of spreading the mix in adjacent spreads at any location. When more than thirty minutes elapses between the placing of adjacent or successive spreads, joint construction as hereinafter specified will be required.

After a part width section has been completed, the longitudinal joint against which additional mixed material is to be placed shall be trimmed to a neat line parallel to the roadbed alignment and with a vertical edge. Material cut away from the edge or material previously placed to protect the edge shall be spread uniformly over the adjacent subgrade, or otherwise disposed of as directed the Consultant.

Contamination of the cement stabilized mixture with subgrade materials will not be permitted.

The spreading operations shall be performed in a manner to prevent excessive drying or loss of moisture, and shall reserve sufficient time to permit complete compaction within the time limits specified or as required by the Consultant.

3.9.4.5 **Compacting the Cement Stabilized Mixture**

Immediately upon completion of the spreading of each lift, the material shall be thoroughly compacted in a manner to avoid the formation of irregularities, and the finished base shall be true to the required grade and cross-section and be of uniform thickness.

The intensity of rolling shall be such that the specified density is obtained to a uniform degree throughout the depth of the mixture and within the time limits. A minimum density of ninety-seven percent of the Standard Proctor Maximum Dry Density shall be attained throughout.

The surface of the uncompacted, partially compacted or completely compacted cement stabilized base shall be kept moist at all times until an asphaltic fog coat seal is applied. Care shall be taken to ensure that excessive water is not applied which subsequently damages the mix or subgrade. The water is to be applied

as a fine spray, such that segregation of the cement from the sand or gravel material does not occur.

During the course of compaction, care shall be taken to prevent or eliminate all compaction planes in a manner satisfactory to the Consultant.

Following compaction, before setting of the mixture, high spots on the cement stabilized base shall be removed by means of cutting blades or other equipment, in a manner to cause as little disturbance as possible to the compacted material. The excess material shall be removed to the shoulder or adjacent subgrade as directed by the Consultant. Loose material shall not be left on the cement stabilized base surface. Filling low spots with cement stabilized material following compaction will not be permitted.

The Contractor shall take all precautions necessary to protect the base course from damage by public traffic or construction equipment.

3.9.4.6 **Time Limits**

Unless otherwise specified, not more than two hours shall elapse between the time cement is added to the sand or gravel material and the time of completion of the final compaction. In no case shall the time interval exceed the initial hydration period for the cement as determined by the Consultant.

If the base course operation is being performed in two layers, the two hour time limit will be measured from the time water and cement are added to the sand or gravel of the first layer to the time of completion of final compaction of the uppermost lift. If the Contractor cannot meet this time limit, he will be required to wait the normal five days curing period before applying the next layer.

3.9.4.7 **Joint Construction**

All joints shall be vertical and uniform in alignment.

Longitudinal joints shall be formed or cut in a vertical plane to the subgrade surface, shall expose a face of thoroughly compacted material, and new material shall be spread and compacted against this face when constructing the adjacent lane or base section.

Unless otherwise directed by the Consultant, transverse construction joints shall be made by trimming the end of the compacted material to a straight line normal to the centreline of the roadbed and with a vertical edge in well compacted material. No mixture shall be placed until the construction joint has been prepared in a manner satisfactory to the Consultant.

3.9.4.8 **Curing Seal**

A curing fog coat seal of liquid asphalt shall be applied immediately following the final compaction and trimming of the cement stabilized base course. If the base is being constructed in two layers, the application of a curing seal between layers will not be necessary if the second layer is to be placed within the two hour time limit as described in Section 3.9.4.6. If the second layer is to be constructed after the five day cure period of the first layer, curing seal will be required on both layers after their respective final compaction.

This fog coat shall be constructed according to Specification 3.19, Prime, Tack and Fog Coats.

3.9.4.9 **Temporary Crossings**

Temporary crossings across the cement stabilized base shall be constructed only at locations approved by the Consultant. The material placed over the cement stabilized base shall be free from rocks or particles which may cause damage to the surface. The material shall be placed to a width of not less than 3.5 m for single lane or 7 m wide for double lane traffic. The depth of the material shall not be less than 0.3 m. The crossing fill shall extend beyond the width of the cement stabilized base by at least 1.5 m on either side.

Where such crossings are required to accommodate the general public, the Contractor shall maintain suitable signs, barricades, and the necessary flag-persons to direct traffic and to prevent damage to the adjacent cement stabilized base. Such crossings will not be permitted prior to the application of the asphaltic fog coat seal unless authorized by the Consultant.

3.9.4.10 **Opening to Traffic**

In general, completed sections of cement stabilized base course shall be allowed to cure for a minimum of five days before opening to normal traffic and provided the cement stabilized base has hardened sufficiently to prevent marring or distorting of the surface by equipment or traffic. If the temperature drops below 5ºC during the five day curing period, the curing period may be extended if so directed by the Consultant. Light local traffic and the Contractor's construction equipment only shall be permitted on the cement stabilized base during the curing period provided damage to the work is prevented and other accommodation of the local traffic is not possible. Where partial widths are constructed, traffic and the Contractor's hauling equipment shall be accommodated on the untreated portion of the subgrade. Such traffic which must travel over the cement stabilized base during the curing shall have speeds restricted sufficiently to prevent surface damage. The Contractor shall reconstruct any portion damaged by traffic at his own expense.

If required by the Consultant, the curing seal shall be protected from traffic by spreading a layer of fine sand over the completed cement stabilized base course.

3.9.4.11 **Tack Coat**

Prior to the application of the surface course, a tack coat shall be applied to the finished cement stabilized base course surface at the locations and to the dimensions designated by the Consultant and according to Specification 3.19, "Prime, Tack and Fog Coats".

3.9.4.12 **Application of Asphalt Stabilized Base Course**

The time interval between the finishing and compacting of the cement stabilized base course and the placing of the asphalt stabilized base course or asphalt concrete pavement as specified, shall be not less than ten days.

All cement stabilized base course placed during the construction season shall be covered with asphalt stabilized base course or asphalt concrete pavement as specified, prior to seasonal shutdown.

3.9.5 MEASUREMENT AND PAYMENT

3.9.5.1 **Cement Stabilized Base Course**

Measurement of cement stabilized base course will be in tonnes.

Payment will be made at the unit price bid per tonne for "Cement Stabilized Base Course". This payment will be full compensation for supplying water; moistening the subgrade surface; producing, hauling and placing the cement stabilized base course material; supply and application of curing seal and tack coats; protecting the surface; accommodation of traffic; and all other operations and incidentals necessary to complete the Work, including producing, hauling and placing of fines for protection of curing seal coat.

Payment will not be made for any material used to repair failures which may occur in the base course due to the Contractor's faulty workmanship. Any expense incurred in the production, hauling, and placement of such material shall be borne by the Contractor.

3.9.5.2 **Supply of Portland Cement**

Payment for the supply of Portland Cement will be made at the unit price bid per tonne for "Portland Cement".

3.9.5.3 **Supply of Aggregate**

Aggregate materials incorporated into the Work will be paid for in accordance with Specification 5.2, Supply of Aggregate.

3.9.5.4 **Curing and Tack Coats**

No separate payment will be made for the supply and application of asphalt materials for curing seal coat and fog coat. All costs will be considered incidental to the Work.

3.9.5.5 **Temporary Crossings**

Costs for producing, hauling, placing and subsequent removal and disposal of material for temporary crossings will not be paid for separately, but will be considered to be incidental to the Work.

TABLE OF CONTENTS

3.10 ASPHALT SURFACE TREATMENT

3.10.1 GENERAL

3.10.1.1 **Description**

Asphalt Surface Treatment shall consist of scarifying and salvaging existing asphalt bound aggregate and/or gravel surfacing, adding and blending additional crushed aggregate when required, adding liquid asphalt, mixing and compacting the asphalt bound aggregate on the roadway in accordance with the specifications and plans herein.

3.10.2 MATERIALS

3.10.2.1 **Aggregate**

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

3.10.2.2 **Asphalt**

The Contractor shall supply asphalt materials in accordance with Specification 5.7, Supply of Asphalt.

Asphalt binder shall not be fluxed or cut back with oil, or any other fluxing agent.

Asphalt used for asphalt surface treatment shall be SC-250, SC-800 and/or SC-70, unless otherwise specified.

3.10.3 CONSTRUCTION METHODS

3.10.3.1 **Preparing Subgrade Surface**

Where specified by the Consultant, the subgrade surface shall be prepared in accordance with the provisions of Specification 3.1, Subgrade Preparation, prior to application of the asphalt surface treatment.

3.10.3.2 **General**

Unless otherwise specified, asphalt surface treatment materials shall be mixed and processed on the subgrade surface of the roadbed.

Application of asphaltic binder shall be performed only when the air temperature in the shade is 5ºC or higher, and when the weather conditions are otherwise acceptable to the Consultant. Application temperature of the asphaltic binder will be as specified by the Consultant.

Placement of asphalt surface treatment materials on a frozen subgrade will not be permitted.

3.10.3.3 **Road Mixing Methods**

When the roadbed to be treated already has surfacing gravel, with or without asphalt, this material shall be scarified with approved equipment only to the depth of the existing surfacing aggregate, windrowed

uniformly upon the subgrade, additional aggregate added as directed by the Consultant, and mixed and dried by blading back and forth. When the material has been dried to a moisture content of 2% or lower, it shall be spread by blades and asphalt shall be uniformly applied by an approved type of pressure distributor at a rate of from 45 litres to 90 litres per cubic metre, as directed by the Consultant. Lesser quantities of asphalt may be required when aggregates being used have been treated previously. Care shall be taken to avoid rich or lean areas at the ends of each distributor run. Mixing shall start immediately, and shall continue until uniform colour is obtained and the cutback has been released by thorough aeration of the material.

Mixing shall be accomplished by approved types of pulvi-mixers, motor graders, gravel mixers, or other approved equipment only, and shall be continued until the resulting mixture is entirely uniform in asphalt content. Mixing shall be carried out between passes of the distributor, as well as subsequent to the completion of addition of asphalt.

Mixing equipment used shall be controlled and operated on each pass to pick up and/or mix all the material to be treated, and to avoid cutting into the subgrade or picking up unmixed material on successive passes of the mixer.

The mixture shall then be brought to a single windrow, and from there bladed out to required cross-section and uniform depth. The surface shall then be rolled with pneumatic-tired rollers, or such other equipment as approved by the Consultant, in conjunction with light blading where necessary to maintain the required cross-section and grade. Rolling shall be continued until all aggregate is firmly embedded and the asphalt surface treatment layer is impervious to moisture penetration.

In lieu of mixing the asphaltic binder as specified above, the Contractor may employ such other procedures as approved by the Consultant.

Spreading equipment shall be constructed and operated to produce a layer of material of uniform thickness and width. The type of spreading equipment used shall be approved by the Consultant.

Where the asphalt surface treatment has been aerated or mixed in a blanket type layer on the subgrade, it shall be windrowed to a uniform windrow prior to spreading and compaction.

Where spreading of the asphalt surface treatment mixture is carried out by motor grader, the material shall be thoroughly compacted by equipment hereinbefore specified immediately upon completion of each portion of the spreading operation. Rolling shall be performed in such a manner as to avoid the formation of irregularities.

3.10.4 MISCELLANEOUS CONSTRUCTION REQUIREMENTS

3.10.4.1 **General**

Where traffic must travel over the roadway surface during the curing period, the Contractor shall restrict traffic speeds sufficiently to prevent surface damage.

Prior to the final acceptance, the Contractor shall reconstruct, to the satisfaction of the Consultant and at no additional cost to the Department, any portion of the Asphalt Surface Treatment damaged by traffic.

3.10.5 MEASUREMENT AND PAYMENT

3.10.5.1 **Application of Asphalt Surface Treatment**

Payment for Asphalt Surface Treatment will be made at the unit price bid per square metre for "Asphalt Surface Treatment". This payment will be full compensation for applying asphalt binder, mixing, spreading, compacting, maintaining traffic, and all labour, tools, equipment and incidentals necessary to complete the Work.

3.10.5.2 **Crushed Aggregate**

When crushed aggregate is required to complete the Work, payment for "Crushed Aggregate" will be made at the unit price bid per tonne or per cubic metre, whichever is specified in the tender for "Crushed Aggregate". This payment will be full compensation for processing, hauling and placing the material.

3.10.5.3 **Supply of Aggregate**

Aggregate materials incorporated into the Work will be paid for in accordance with Specification 5.2, Supply of Aggregate.

3.10.5.4 **Supply of Asphalt**

Payment for the supply of asphalt binder will be made at the unit price bid per tonne for “Supply of Asphalt for Surface Treatment.”

TABLE OF CONTENTS

3.16 COLD MILLING ASPHALT PAVEMENT

3.16.1 GENERAL

3.16.1.1 **Description**

Cold milling asphalt pavement is the process of removing existing pavement from the roadway to the lines and dimensions shown on the plans or as directed by the Consultant.

3.16.2 RECLAIMED ASPHALT PAVEMENT (RAP)

The material produced as a result of cold milling shall be defined as Reclaimed Asphalt Pavement (RAP).

Ownership of the RAP will be specified in the Special Provisions and shall be one of or a combination of the following:

(a) Department Ownership of the RAP

The Department will retain ownership of the RAP material, and the Contractor shall haul it to a designated location.

(b) Contractor Ownership of the RAP

The Contractor will assume ownership of the RAP material and shall haul it from the roadway to his own storage site or otherwise dispose of it.

3.16.3 SAMPLING AND TESTING

3.16.3.1 **General**

Sampling and testing will only be required if RAP is to be used for the production of asphalt concrete pavement or stockpiled for the Department.

The Consultant shall have access to the Work at all times for taking samples. 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.

3.16.3.2 **Methods of Testing**

Unless otherwise specified, the latest edition of the following standard Alberta Transportation test methods (ATT) shown in Table 3.16.3.2 will be used to determine material characteristics of the RAP.

TABLE 3.16.3.2
TEST METHODS

TEST DESCRIPTION	TEST METHOD
1. Sampling Mixes	ATT - 37
2. Sieve Analysis, RAP	ATT - 53
3. Extraction	ATT - 12
4. Sieve Analysis, 20 000 Fm Minus	ATT - 26

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.

3.16.3.3 **Quality Control Testing**

Quality control testing is the responsibility of the Contractor. 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 perform all quality control testing necessary to determine and monitor the characteristics of the RAP and to ensure that it meets specification requirements.

Test methods, sampling and minimum frequency of testing are described in Section 3.16.3.2, Methods of Testing and Table 3.16.3.3 Quality Control Testing Requirements.

Results of all quality control tests shall be submitted to the Consultant on a daily basis.

TABLE 3.16.3.3
QUALITY CONTROL TESTING REQUIREMENTS

TEST	STANDARD	MINIMUM FREQUENCY
Sampling Mixes	ATT - 37	One per 1000 tonnes
RAP Sieve Analysis	ATT -53	One per 1000 tonnes
RAP Asphalt Content (Extraction)	ATT - 12	One per 1000 tonnes
Extraction Sieve Analysis	ATT - 26	One per extraction test

3.16.3.4 **Acceptance Sampling and Testing**

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 measured and accepted based on the Consultant's quality assurance test results.

3.16.4 CONSTRUCTION

3.16.4.1 **Cold Milling Equipment**

The Contractor shall use equipment with automatic grade and slope controls, capable of cold milling existing asphalt pavement to an accurate depth of cut, profile and cross slope and shall be capable of loading the milled material directly into trucks.

The cutting head of the cold milling machine shall be a minimum width of 1.9 metres.

3.16.4.2 **Cold Milling Asphalt Pavement**

Cold milling asphalt pavement shall be performed in a manner which prevents the tearing and breaking of underlying and adjacent pavement and the contamination of the RAP with granular, subgrade or deleterious materials. All RAP shall be loaded directly to trucks from the milling machine and hauled to stockpile or disposed of.

The milled roadway surface shall be swept clean prior to opening to traffic. At locations including but not limited to urban areas and bridge decks, the Contractor shall sweep the surface in a manner which minimizes dust.

The Contractor shall, at his own expense, promptly repair any localized areas of distress in the milled surface that may present a hazard to traffic.

At the point of daily termination of cold milling operations, changes in roadway surface profile or cross-section shall be limited to 50 mm and longitudinal transitions shall be a maximum of 25 mm vertically per metre.

In the event of rain or other inclement weather, the Contractor shall suspend cold milling operations. The Contractor shall make necessary allowances for drainage of water that may pond in areas where the milled sections have not been paved.

3.16.5 STOCKPILING RECLAIMED ASPHALT PAVEMENT

3.16.5.1 **Department Ownership**

When stockpiling of RAP for Department ownership is specified, it shall be performed in accordance with Specification 3.2 Aggregate Production and Stockpiling and the following:

(i) A granular stockpile base layer shall be constructed upon the prepared stockpile site to a compacted thickness of at least 150 mm, using granular material containing 100 percent passing the 16 000 sieve, and no more than 10% passing the 80 sieve. The stockpile base layer shall be of such dimensions as to accommodate the maximum quantity of RAP which will exist in the stockpile.

(ii) No equipment shall operate on the stockpile at anytime.

3.16.5.2 **Contractor Ownership**

When it is specified that the Contractor shall assume ownership of the RAP and he elects to use this material in the production of asphalt concrete pavement, stockpiling of the RAP shall be performed in a manner which prevents contamination and consolidation of the RAP material being used.

All costs associated with the construction of a stockpile base will be considered incidental to the work and will not be paid for separately.

3.16.5.3 **Gradation of Reclaimed Asphalt Pavement**

Reclaimed asphalt pavement to be used in the production of asphalt concrete pavement shall meet the gradation requirements specified in Table 3.16.5.3.

TABLE 3.16.5.3
GRADATION SPECIFICATIONS FOR
RECLAIMED ASPHALT PAVEMENT

Percent Passing Metric Sieve (CGSB 8-GP-2M) Fm	125 000	100
	80 000	99 - 100
	40 000	95 - 100

3.16.5.4 **Hauling**

Haul of RAP shall be carried out in accordance with Specification 4.5, Hauling.

3.16.6 MEASUREMENT AND PAYMENT

3.16.6.1 **Cold Milling Asphalt Pavement**

Measurement of cold milling asphalt pavement will be made in square metres of roadway milled, or tonnes or cubic metres (truck box measurement), whichever is specified, of RAP produced.

Payment will be made at the unit price bid per square metre, tonne, or cubic metre, whichever is specified, for "Cold Milling Asphalt Pavement". This payment will be full compensation for cold milling the asphalt pavement, sweeping the milled surface, loading the RAP into trucks, stockpiling or disposing of the RAP and quality control testing as required.

3.16.6.2 **Granular Stockpile Base Layer**

When RAP is stockpiled for Department ownership, separate payment will be made for the granular stockpile base layer.

Measurement of the granular stockpile base layer will be in tonnes or cubic metres (truck box measurement), whichever is specified.

Payment will be made at the unit price bid per tonne or cubic metre, whichever is specified, for "Granular Stockpile Base Layer". This payment will be full compensation for excavating, processing, hauling, placing and compacting the material.

TABLE OF CONTENTS

3.18 SURFACING BRIDGE DECKS

3.18.1 GENERAL

The work shall consist of surfacing bridge decks with asphalt concrete, removing existing asphalt pavements, or removing and replacing asphalt pavement on bridge decks and/or bridge approaches as called for in the plans, the special provisions or as designated by the Consultant.

3.18.2 MATERIALS

Asphalt concrete mix as produced under Specification 3.50, Asphalt Concrete Pavement-EPS will be accepted under this specification.

The requirements under Section 3.50.2, Materials, in Specification 3.50, Asphalt Concrete Pavement-EPS shall apply.

3.18.3 CONSTRUCTION

Detouring of traffic will not be allowed unless permission is granted by the Department in writing.
The requirements in Specification 3.50, Asphalt Concrete Pavement-EPS shall apply in all respects for construction of asphalt concrete pavement under this specification except that vibratory compaction will not be permitted. Compaction requirements shall be achieved by static rolling only.

Where an existing pavement is required to be removed from bridge decks and/or approaches, the work shall be performed with equipment and in a manner acceptable to and approved by the Department before the work commences. Cold milling of ACP on bridge decks shall not be permitted.

The Consultant may direct the removal, by cold milling, of asphalt concrete pavement on bridge approaches beyond the tie-in requirements listed in Specification 3.50 for Transverse Pavement Joints. In this case, if a unit price for this work is not contained in the Contract, the work shall be performed on an Extra Work basis in accordance with Specification 1.2, General.

The Contractor shall take ownership of all debris and dispose of it in a manner suitable to the Consultant.

Damage to bridge components and appurtenances due to the Contractor's operations shall be repaired by the Contractor at no cost to the Department.

The exposed concrete bridge deck shall be thoroughly cleaned of all dirt and debris to the satisfaction of the Consultant.

The cleaned bridge deck shall be tack coated with two applications of an SS-1 emulsified asphalt.

The SS-1 emulsion material, as delivered by the supplier shall be diluted by adding an equal amount of water and the first of the two applications shall be applied at a rate of 1.0 kg per square metre.

The second application shall not proceed until the first has cured or as approved by the Consultant and shall be applied at the rate of 0.5 kg per square metre.

Cutback type asphalts will not normally be used but the Consultant may permit their use for tacking bridge decks if delays will be incurred due to low ambient temperatures that do not permit the use of emulsions.

If a cutback asphalt is used for the tack coat, the first coat shall be applied at the rate of 0.5 kg per square metre. The second application shall not proceed until the first has cured or as directed by the Consultant, and shall be applied at the rate of 0.25 kg per square metre.

Normally, the depth of surfacing will be a nominal 50 mm. The Consultant may adjust this depth as necessary to match up to existing gutters, joints, etc. to ensure a satisfactory riding surface is achieved.

The Contractor shall take all necessary precautions to ensure that deck joints and drains are left clear and open upon completion of his paving operation. The finished pavement surface shall be free of depressions capable of retaining water.

Where improvements are to be made to bridge approaches, the Consultant will detail the work required.

The Department may restrict loading on bridge decks.

3.18.4 MEASUREMENT AND PAYMENT

Removal and disposal of existing asphalt concrete pavement from bridge decks will be measured in square metres and payment will be made at the unit price bid for "Removal of Asphalt Concrete Pavement From Bridge Decks".

Removal and disposal of existing asphalt concrete pavement and other subgrade excavation material from bridge approaches will be measured in cubic metres and payment will be made at the unit price bid for "Subgrade Excavation".

Surfacing bridge decks will be measured in tonnes of mix and payment will be made at the unit price bid for "Asphalt Concrete Pavement-EPS".

TABLE OF CONTENTS

3.19 PRIME, TACK AND FOG COATS

3.19.1 GENERAL

3.19.1.1 **Description**

The Work shall consist of placing an asphalt material on a prepared surface at locations shown on the plans or designated by the Consultant.

3.19.1.2 **Definitions**

Prime Coat

An application of a liquid asphalt to an absorbent surface to waterproof and promote bonding between the surface being primed and the next course.

Tack Coat

An application of a liquid asphalt to ensure a bond between the surface being paved and the next course.

Fog Coat

An application of a liquid asphalt to seal small cracks and surface voids and as a curing seal for Cement Stabilized Base Course.

3.19.2 MATERIALS

The Contractor shall supply the asphalt material in accordance with Specification 5.7, Supply of Asphalt.

The types and grades of liquid asphalts for Prime Coat, Tack Coat, Curing Fog Coat for Cement Stabilized Base Course, and Fog Coat shall be as follows:

Prime Coat:

The Contractor's choice of SEP-1, SEP-2 or SS-1 for application through August 31 each season. The Contractor's choice of MC-30, SEP-1, SEP-2 or SS-1 for application after August 31 each season.

Sand used for the blotting of excess asphalt due to prime shall be supplied by the Contractor.

Tack Coat and Curing Fog Coat for Cement Stabilized Base Course:

SS-1 or MS-1 for application throughout the construction season. As well, the Contractor has the option of using RC-30 or RC-70 for application after August 31 each season.

Fog Coat:

SS-1 for application through August 31 each season. The Contractor's choice of MC-30 or SS-1 for application after August 31 each season.

The estimated range in application rates for Fog Coat to a pavement surface is from 0.4 to 0.7 kilograms per square metre of undiluted SS-1 or 0.2 to 0.5 kilograms per square metre of MC-30. The actual application rate is to be chosen by the Contractor in consultation with the Consultant at the beginning of the project to ensure that complete and uniform coverage is achieved without streaking.

3.19.3 CONSTRUCTION

Except for cement stabilized bases where it is preferred that the Fog Coat seal be applied while the surface is still moist, asphalt material for Tack Coat and Fog Coat shall be applied only when the surface to be treated is dry, when the weather is not foggy or rainy, and when the surface temperature is above zero degrees Celsius for application of cutback asphalts and 5 degrees Celsius for emulsions, or as otherwise approved by the Consultant.

If SS-1 is used for Fog Coat, the material as delivered by the supplier shall be diluted by adding an amount of water to be determined by the Contractor.

The asphalt material shall be applied by means of a self-powered pressure distributor equipped with the following control devices.

(1) Tachometer.

(2) Pressure gauge.

(3) Adjustable length spray bar.

(4) Positive displacement asphalt pump with separate power unit.

(5) Heating coils and burner capable of applying even heat to the asphalt material.

(6) Thermometer well and accurate thermometer.

Before applying asphalt material, the Contractor shall ensure that the distributor meets the following adjustments and requirements:

(1) The distributor vehicle will maintain a constant height of the spray bar as the tank is unloaded.

(2) All spray bar nozzles are of the same manufacture, type, and size.

(3) Clogged nozzles have been removed and cleaned with solvent.

(4) All nozzles have been set in the spray bar so that the nozzle slots make the same angle (15^{o} to 30^{o}) with the longitudinal axis of the spray bar.

(5) The spray bar has been adjusted to the correct height to ensure uniform application without streaking.

(6) The spray bar has been provided with a positive shut-off to prevent dribbling.

(7) The distributor is capable of maintaining a uniform speed.

The distributor may be checked for calibration by the Consultant before being used on the work.

Before applying the asphalt material, loose dirt or other objectionable material shall be removed from the prepared surface by brooming or by other methods acceptable to the Consultant. Where base courses

become ravelled, the loose material shall be moistened and recompacted to achieve a tight, uniform surface.

The asphalt shall be uniformly applied without streaking.

Joints and seams shall not be excessively overlapped. Structures, wheel guards, guardrail, and other roadway appurtenances shall not be spattered by the asphalt material. The Contractor shall remove, at his own expense, any spattering caused by his operation.

Areas missed by the distributor or inaccessible to the distributor shall be treated using a hand spray or pouring pot.

Traffic shall not to be permitted to travel on Tack or Fog Coat until it has cured.

Traffic shall not to be permitted to travel on prime coat until 6 hours after application or until it has cured. After this period of time, excess asphalt material remaining on the surface shall be blotted by sand before traffic is permitted to travel on the surface. The "blotter sand" can be any clean sand.

Where traffic must be accommodated, the Contractor shall apply the Prime, Tack or Fog coat covering up to only one-half of the roadway surface at a time. Other portions across the roadway shall not be sprayed until previous applications have properly cured and in the case of Prime Coat, all puddles and excess free asphalt has been blotted.

In all situations, Prime Coat and Tack Coat shall be maintained by the Contractor at his own expense including the cost of the required liquid asphalt. Any area of Prime Coat or Tack Coat that has become fouled shall be repaired before Asphalt Stabilized Base Course or Asphalt Concrete Pavement is placed.

3.19.4 MEASUREMENT AND PAYMENT

3.19.4.1 **Fog Coat**

Measurement for the application of Fog Coat will be in square metres. Payment will be made at the unit price bid per square metre for "Fog Coat."

Measurement of the supply of asphalt for Fog Coat will be in tonnes. Payment will be made at the unit price bid per tonne for "Supplying Asphalt for Fog Coat."

3.19.4.2 **Prime Coat**

Payment for supplying, applying and maintaining the prime coat will be included in the unit price bid per tonne for "Granular Base Course" and no separate payment will be made.

3.19.4.3 **Tack Coat**

Payment for supplying, applying and maintaining Tack Coat will be included in the unit price bid per tonne for "Asphalt Concrete Pavement-EPS" and no separate payment will be made.

TABLE OF CONTENTS

3.20 SLURRY SEAL

3.20.1 GENERAL

A slurry seal is a designed mixture of crushed aggregate, additives (as needed), emulsified asphalt, and water applied to a prepared pavement as a surface treatment, at locations and conforming to the lines and dimensions specified.

3.20.2 MATERIALS

3.20.2.1 **Aggregate**

The Contractor shall produce crushed aggregate 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 aggregate materials in accordance with Specification 4.5, Hauling.

3.20.2.2 **Additives**

Additives, when required, shall be supplied by the Contractor. The Contractor shall arrange delivery, store and handle additives. Acceptable additives will be Portland Cement and other materials approved by the Consultant.

3.20.2.3 **Asphalt**

The Contractor shall supply asphalt material in accordance with Specification 5.7, Supply of Asphalt.

The asphalt binder used for slurry seal shall be either a QS-Kh or an SS-1H emulsified asphalt. The Contractor shall choose between the two.

The same asphalt chosen for the slurry seal binder shall be used for tack and fog coat applications.

3.20.2.4 **Water**

The Contractor shall supply suitable water.

3.20.3 TESTING

3.20.3.1 **Materials Testing**

Quality control and quality control testing are the responsibility of the Contractor throughout every stage of the work, from production of aggregates to the final accepted product. Tests performed by the Consultant will be quality assurance tests and will not be considered as quality control tests.

Quality assurance testing will be done by the Consultant to determine compliance with the specifications.

The standard test methods to be used for determining material characteristics are:

TABLE 3.20.3.1
TEST METHODS

	TEST DESCRIPTION METHOD	ALBERTA TRANSPORTATION DESIGNATION
1.	Sampling Slurry Seal Asphalt Mixes	ATT-60
2.	Asphalt Extraction	ATT-12
3.	Sieve Analysis	ATT-26

Testing of materials supplied will be done in accordance with the appropriate sections of Specification 3.2, Aggregate Production and Stockpiling, and Specification 5.7, Supply of Asphalt by Contractor.

3.20.4 MIX DESIGN AND TRIAL BATCH

3.20.4.1 **Responsibility for Mix Design**

Preparation and submission of mix designs for Consultant approval are the responsibility of the Contractor.

The Contractor shall use licensed professional Engineering services and a qualified, recognized testing laboratory to assess the aggregate material proposed for use and to carry out the design of the slurry mixture.

3.20.4.2 **Requirements for Mix Design**

The mix design shall follow ASTM D3910, Standard Practice for Design, Testing, and Construction of Slurry Seal. The wet track abrasion test loss shall not exceed 800 g/m^2. The residual asphalt content shall be between 7.5% and 13.5%. The mix design shall also contain the following information:

(a) gradation of aggregate to be used,

(b) the design proportions of each component including additives,

(c) other characteristics of the aggregate specified in Specification 3.2, Aggregate Production and Stockpiling,

(d) all test results used in producing the mix design.

3.20.4.3 **Approval of Mix Design and Trial Batch**

The Consultant will require up to 3 working days, from the time of receipt of the mix design, for evaluation of the material characteristics. This mix design will be used for the trial batch.

The Contractor shall mix a trial batch using the mix design submitted and place it in an area of least traffic.

If the mix does not produce an acceptable product, additional trial batches shall be prepared and placed using modified mix designs which must be submitted for approval or modified machine calibrations or both until an acceptable product is produced.

If the trial batch is acceptable, the mix design used for that batch will become the approved mix design.

The Contractor shall cover unaccepted trial batches with a second application of slurry seal.

3.20.5 CONSTRUCTION

3.20.5.1 **Seasonal and Weather Limitations**

The placement of slurry seal shall be limited to the period from May 1 to September 15. Slurry seal shall not be placed when, in the opinion of the Consultant, damage to the finished product may occur for any reason.

The slurry seal shall not be applied when:

(a) The atmospheric temperature at the construction area is less than 10 degrees Celsius, or

(b) The weather is misty or rainy, or

(c) Precipitation is a threat for the construction area within twelve hours as forecast by Environment Canada for the vicinity, or

(d) An atmospheric temperature at the construction area of less than 5 degrees Celsius is predicted by Environment Canada within twenty-four hours.

3.20.5.2 **Equipment**

3.20.5.2.1 Slurry Seal Machine

Slurry seal shall be mixed in continuous flow travelling pugmill mixers capable of delivering predetermined proportions of emulsion, water and aggregate. Each mixer shall be equipped with feeders that provide accurate metering devices or methods of introducing predetermined amounts of additives when the aggregate is fed. Calibrated controls for aggregate and asphalt emulsion, capable of proportioning accurately, shall be provided.

The spreader box shall be capable of spreading a mat up to 3.7 metres wide, and shall have flexible squeegee strike-off strips on each side maintaining contact with the surface to be sealed. The flexible strike-off strips shall make close contact with the surface and shall be adjustable to the various slopes of the surface to be sealed. The box shall contain baffles or other suitable means to help in lateral distribution of slurry and to provide uniform application.

3.20.5.2.2 Compaction Equipment

The slurry seal shall be rolled with a vibratory, double drum, steel roller weighing at least 10 tonnes.

3.20.5.3 **Surface Preparation**

The Contractor shall remove all surface painted markings in areas where slurry seal is to be applied. The method and equipment used by the Contractor shall be such that no structural damage is caused to the existing pavement.

Repair of existing surfaces, including crack filling, prior to sealing will be identified by the Consultant and

the required repairs shall be carried out by the Contractor.

The pavement surface to be slurry sealed shall be swept and all dirt, dust, and other objectionable matter removed.

Tack coat shall be applied in accordance with Specification 3.19, Prime, Tack and Fog Coats.

3.20.5.4 **Mixing**

The Contractor shall thoroughly mix the slurry seal in a slurry seal machine. If a mineral filler is used it shall be blended into the mixture. A minimum amount of additional water may be added to obtain a fluid, homogeneous mixture.

3.20.5.5 **Application**

After the tack coat has cured sufficiently, the surface to be sealed shall be wetted immediately before application of the slurry seal.

The surface shall be damp, but no standing free water will be permitted.

Slurry seal shall be deposited in a continuous flow from the pugmill mixer into a controlled spreader box. The spreader unit shall proceed at a rate of not more than 55 metres per minute.

Slurry seal shall be applied in the direction of the longitudinal axis of the area to be sealed unless otherwise directed by the Consultant. The application shall be uniform and homogenous with no uncovered areas, ridges or loose aggregate.

Hand squeegees shall be used to spread slurry seal in areas not accessible to the mixer. The Contractor shall protect manholes, valve boxes and bridge expansion joints from application of slurry seal during spreading operations. Spillage shall be removed with hand tools before initial set of the mix.

If the slurry seal is to be applied in two layers, compaction and fog coating of the first layer is not required and the first layer shall be allowed to cure before application of the second layer.

3.20.5.6 **Compaction**

Compaction by rolling shall commence as soon after application as possible and when pickup of the slurry material by the roller is at a minimum. A fog spray of water shall be applied to the roller drums, as necessary, to prevent pickup. The compacted surface shall be free of ridges, oversize rocks and bond failures.

3.20.5.7 **Fog Coat Application**

After compaction and prior to painting of applicable surface markings, the Contractor shall apply a fog coat seal to the entire slurry seal surface in accordance with Specification 3.19, Prime, Tack and Fog Coats.

3.20.5.8 **Protection**

The completed slurry seal shall be kept free of all traffic until it has cured sufficiently to prevent pickup of aggregate particles.

3.20.6 MEASUREMENT AND PAYMENT

Slurry Seal will be measured in square metres. Payment will be made at the unit price bid per square metre for "Slurry Seal". This payment will be full compensation for designing the mix; supplying and processing the aggregate; supplying the asphalt binder, water, and additives; surface preparation except for the removal of painted lines; processing, hauling and placing the mixture; supplying and applying fog coat; and quality control.

Payment for preparing trial batches of slurry for evaluating the proper proportions of the various ingredients will not be made directly, but will be included in the unit price bid for "Slurry Seal". If the trial batch is acceptable as applied, it will be measured and paid for at the unit price. If it is unacceptable and covered by a second application, no payment will be made for the trial batch applied.

If the contract stipulates a double layer application each layer will be measured and paid for at the unit price bid for "Slurry Seal".

If a second layer of slurry is required as a result of failure of the first layer, no payment will be made for the failed layer.

Payment for removal of painted lines and markings will be made at the lump sum price bid for "Removal of Painted Markings".

3.20.6.1 **Supply of Aggregate**

Contrary to Specification 5.2, Supply of Aggregate separate payment for the supply of aggregate will not be made.

3.20.6.2 **Fog Coat**

Contrary to Specification 3.19, Prime, Tack and Fog Coats, separate payment for the application of fog coat will not be made.

TABLE OF CONTENTS

3.21 DOUBLE SEAL COAT

3.21.1 GENERAL

Double Seal Coat shall consist of a wearing course composed of two applications of processed aggregate held in place by an asphalt binder, spread and rolled on a prepared surface to the lines and dimensions shown on the plans or as designated by the Consultant.

3.21.2 MATERIALS

3.21.2.1 **Aggregate**

The Contractor shall produce crushed aggregate 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 aggregate in accordance with Specification 4.5, Hauling.

3.21.2.2 **Asphalt**

The Contractor shall supply a high float type emulsion binder in accordance with Specification 5.7, Supply of Asphalt.

3.21.2.3 **Line Painting Materials**

The Contractor shall supply all required line painting materials in accordance with Specification 5.20, Supply of Line Painting Materials.

3.21.3 TESTING

3.21.3.1 **Quality Control Testing**

Quality control and quality control testing are the responsibility of the Contractor throughout every stage of the Work from the crushing and production of aggregates to the final accepted product. The Contractor shall provide and pay for equipment and qualified personnel to perform all field testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the Work, and the final product produced.

3.21.3.2 **Testing by the Consultant**

The Consultant may from time to time take samples, and carry out testing and inspection of materials incorporated or being incorporated into the Work. Tests performed by the Consultant will not be considered to be quality control tests. The Contractor shall cooperate with the Consultant for such sampling, testing and inspection. Such testing and inspection shall not relieve the Contractor from any obligation to perform all the Work strictly in accordance with the requirements of the Contract.

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

3.21.4 EQUIPMENT

The following equipment shall be used:

(i) A self-powered pressure asphalt distributor meeting the requirements as listed in Specification 3.19, Prime, Tack and Fog Coats.

(ii) A self-propelled aggregate spreader capable of spreading the aggregate uniformly at the applicable rate in one application over the full width of the asphalt applied. The spreader shall be capable of controlling and adjusting the width and rate of spread. The spreader shall be equipped with the necessary devices to enable it to be attached securely to the aggregate haul truck while in the process of dumping the aggregates into the spreader.

(iii) Self-propelled pneumatic tire rollers. Wobble wheel type rollers shall not be used. The rollers shall be capable of reversing direction without causing backlash or damage to theSeal Coat.

(iv) A sufficient number of power sweepers to adequately broom loose aggregate from all sections of seal coated roadway. All power sweepers shall be equipped with a minimum of one yellow rotating warning light.

(v) The Contractor shall supply pilot vehicles for convoying traffic. The pilot vehicles shall have sufficient accompanying personnel to provide convoy services on a 24 hour a day availability. The standard number of pilot vehicles to be provided shall be two for two lane highways or as specified in the special provisions. Additional vehicles may be required as determined by the Consultant at the time of construction. All pilot vehicles shall be equipped as follows:

- A two way radio for communication.

- An overhead revolving beacon with an amber lens a minimum of 180 mm high and 180 mm wide. The beacon shall be mounted on the top of the vehicle fully visible to traffic approaching from both the front and rear.

- A sequential arrowboard meeting the requirements as shown in Specification 1.2 General.

- The arrowboard shall be controlled from a console located in the vehicle cab.

- The arrowboard display shall be visible to traffic approaching the rear of the trucks.

- Additional pilot vehicles beyond the standard number specified, may be exempt from including a sequential arrowboard with the approval of the Consultant.

The Contractor shall cease seal coat application if any equipment integral to either the compaction, sweeping or traffic accommodation operations is not available or is not in good working order, as determined by the Consultant.

3.21.5 CONSTRUCTION

3.21.5.1 **General**

Double Seal Coat construction shall be performed prior to September 15 and during daylight hours only.

The method of application of the Double Seal Coat including application rates for the asphalt binder and the processed aggregate shall be determined by the Contractor.

The Contractor shall also determine the amount of compaction required based on consideration of compaction equipment, atmospheric conditions and acceptance requirements.

Double Seal Coat shall be constructed in two courses in accordance with the following sections of this specification. A minimum of 48 hours shall be allowed for curing of the first course before application of the second course.

3.21.5.2 **Surface Preparations**

Before the asphalt binder is applied, the surface to be treated shall be swept clean of all dirt, sand, dust or objectionable matter by means of a power sweeper. If base courses become ravelled, the loose material shall be compacted before brooming and a prime coat applied. Prime coat shall be repaired at no direct expense to the Department. Dried mud or other foreign matter which cannot be removed with the power sweeper shall be removed by hand, blade, or other methods.

Application of prime coats shall be in accordance with Specification 3.19, Prime, Tack and Fog Coats.

3.21.5.3 **Application of Asphalt Binder**

For all courses, asphalt binder shall not be applied until the surface has been cleaned as required and the section approved by the Consultant.

The asphalt binder shall be applied with a pressure distributor in a single uniform continuous spread over the section to be treated.

Skipped areas shall be corrected by hand spray. The application of asphalt binder shall not precede the application of seal coat aggregate by more than 30 metres. Asphalt binder shall not be spilled, sprayed or tracked on completed sections of seal coat.

3.21.5.4 **Application of Aggregate**

The application of asphalt binder shall be followed immediately with the applicable course of aggregate, of the designation and class shown on the plans. It shall be uniformly spread by means of an approved mechanical spreader.

3.21.5.5 **Rolling**

Immediately after spreading of each course, the aggregate shall be rolled. One total compaction coverage by the rollers shall be completed within one quarter hour after the aggregate has been spread and rolling shall continue until a smooth, thoroughly compacted surface has been obtained.

3.21.5.6 **Initial Brooming**

Between the time period of 4 hours and 6 hours after rolling of each course has been completed or after the initial set of the asphalt, the surface shall be broomed to remove any remaining loose aggregate.

3.21.5.7 **Repair of Improperly Covered Areas**

Any areas of either course that have not been properly covered after brooming, shall be treated using hand methods if necessary.

3.21.5.8 **Final Brooming**

The Contractor shall continue to broom the surface to remove any loose aggregate when required, and as often as required, during a two week period following the final application or as directed by the Consultant.

All highway-to-highway junctions and all junctions of paved highways with municipal roads shall be swept clear of loose aggregate.

The Contractor shall use a pickup broom for all brooming in urban and other areas where loose aggregate cannot be swept onto sideslopes or onto ditches.

3.21.5.9 **Traffic Accommodation and Signing**

The Contractor shall erect and maintain temporary construction signs in accordance with the Traffic Accommodation in Work Zones manual.

A Traffic Accommodation Strategy as outlined in Specification 7.1, Temporary Construction Signing will be required for all phases of construction including line painting activities. The signing strategy shall be developed based upon the requirements of the Traffic Accommodation in Work Zones manual.

3.21.5.9.1 Traffic Convoy

Traffic shall be accommodated through the work. The Contractor shall, at his own expense, provide flagmen, pilot vehicles and/or illuminated arrow boards as required.

Traffic and construction equipment including aggregate haul trucks shall not travel over uncovered surfaces of fresh asphalt binder. Traffic shall not use the sections of seal coat until after rolling is complete. Traffic convoy, at speeds not exceeding 50 km per hour, shall commence at the start of seal coat application and shall continue up to six hours after all rolling has been completed as directed by the Consultant.

3.21.5.10 **Interim Lane Markings**

The Contractor shall provide interim painted lane markings on all newly constructed surfaces once sufficient brooming has been complete, or on tacked surfaces that are to be exposed to traffic overnight. 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, shall employ the same paint colour as the permanent marking and shall be completely covered with glass beads at the time of painting.

3.21.5.11 **Protection of Highway Appurtenances**

The Contractor shall ensure that all highway appurtenances including wheel guards, guardrail, signs and delineators as well as bridge structures and appurtenances are protected from asphalt and/or aggregate contamination.

In addition to being responsible for the cleanup of any contaminated areas, the Contractor is advised that many bridge components and materials are affected by cleanup and any costs for repair of damaged structures will be charged to the Contractor.

3.21.6 PAINTED ROADWAY LINES AND PAVEMENT MESSAGES

The Contractor shall paint all roadway lines and pavement messages for the areas receiving Seal Coat in accordance with Specifications 7.2, Painted Roadway Lines and 7.3, Painted Pavement Messages.

All painted roadway lines and painted pavement messages applied to the final Seal Coat surface shall be applied twice at the full application rate for each application. The second application shall be completed after the Contractor's final brooming. On two lane highways the second application will be from the opposite direction of the initial application.

In all cases, the roadway shall not be posted at gazetted highway speeds until all work including line painting has been completed. The maximum length of roadway posted at less than gazetted highway speeds shall not exceed 30 km.

3.21.7 REQUIREMENTS FOR ACCEPTANCE

Requirements for the acceptance of the completed Double Seal Coat include the following:

(i) Materials shall meet all specified requirements;

(ii) A minimum of 99% chip coverage shall be obtained with no single bare area greater than 0.01 m2 in any one square metre;

(iii) There shall be no streaking or ravelling;

(iv) The finished surface shall have a uniform, even texture;

(v) No over-rich or bleeding areas shall be evident;

(vi) No loose aggregate shall be evident; and

(vii) All new lane markings as required, have been applied in accordance with Specifications 7.2, Painted Roadway Lines.

Work that does not meet the foregoing requirements shall be repaired or reconstructed to the satisfaction of the Consultant.

3.21.8 COMPLETION OF LINE PAINTING

The Contractor shall complete the painting of roadway lines within five days of completing the placing of the double seal on each individual roadway. Failure to meet this requirement will result in a penalty of $900.00 per day for each calendar day delay in completing the painting. The Department may extend the time allowed to complete the painting up to a maximum of ten days providing:

(i) The Contractor submits a written request to the Consultant accompanied by a detailed proposed line painting schedule.

(ii) The reason for the request, stated in the request, is one of the following:

(a) The double seal coat requires additional curing time and subsequent brooming work prior to painting the traffic markings, or

(b) The work site is not available to the Contractor through no fault of the Contractor, or

(c) The Consultant suspends the Work and standby payments are due in accordance with Specification 1.2, General, or

(d) There is a delay resulting from an order of a court, or from strikes or lock-outs, or

(e) The traffic markings cannot be painted for reasons of inclement weather, or conditions resulting from inclement weather.

3.21.9 MEASUREMENT AND PAYMENT

The Double Chip Seal Coat will be measured in square metres and payment will be made at the unit price bid per square metre for "Application of Seal Coat", for each course applied. This payment will be full compensation for preparing the existing surface; supplying paint and painting interim lane markings; supplying and applying the asphalt binder; supplying, processing, hauling, placing and rolling the aggregate; brooming; quality control; traffic accommodation and traffic convoy services using the standard number of pilot vehicles as specified.

Payment for additional pilot vehicles, as approved by the Consultant, shall be paid as Extra Work in accordance with Specification 1.2, General.

No separate payment will be made for any additional equipment, tools or labour employed to satisfy special brooming requirements.

No payment will be made for any costs incurred to rectify defective work.

3.21.9.1 **Line and Pavement Message Painting**

Payment for supplying paint and painting roadway lines, intersections, interchanges and messages will be made in accordance with the applicable sections of Specifications 7.2, Painted Roadway Lines and 7.3, Painted Pavement Messages. This payment will be made separately for each application of painted roadway lines and/or painted pavement messages.

3.21.9.2 **Supply of Aggregate**

Contrary to Specification 5.2, Supply of Aggregate, no separate payment will be made for supplying aggregate for the seal coat. However, if the Contractor supplies aggregate from a Crown source on undeeded land, operated primarily under lease or licence and for which the Department does not have a reservation, the Department will deduct $ 0.48 per tonne from the total payments made under the Contract. The tonnage will be determined by multiplying the total square metres for each course applied, by a conversion factor of 20 kilograms per square metre.

TABLE OF CONTENTS

3.22 GRADED AGGREGATE SEAL COAT

3.22.1 GENERAL

Graded aggregate seal coat shall consist of a surface treatment composed of an asphalt binder and a graded aggregate, spread and compacted in one application on a prepared surface to the lines and dimensions shown on the plans or as designated by the Consultant.

3.22.2 MATERIALS

3.22.2.1 **Aggregate**

The Contractor shall produce crushed aggregate 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 aggregate materials in accordance with Specification 4.5, Hauling.

3.22.2.2 **Asphalt**

The Contractor shall supply a high float type emulsified asphalt binder in accordance with Specification 5.7, Supply of Asphalt.

3.22.2.3 **Line Painting Materials**

The Contractor shall supply all line painting materials in accordance with Specification 5.20, Supply of Line Painting Materials.

3.22.3 EQUIPMENT

The Contractor shall use the following equipment:

(a) A self-powered pressure asphalt distributor meeting the requirements as listed in Specification 3.19, Prime, Tack and Fog Coats.

(b) A sufficient number of power sweepers to adequately broom loose aggregate from all sections of seal coated roadway. All power sweepers shall be equipped with a minimum of one yellow rotating warning light.

(c) A self-propelled aggregate spreader capable of spreading the aggregate uniformly at the specified rate in one application over the full-width of the asphalt applied. The spreaders shall be capable of controlling and adjusting the width and rate of spread. The spreaders shall be equipped with the necessary devices to enable it to be attached securely to the aggregate haul truck while in the process of dumping the aggregates into the spreader.

(d) A minimum of two self-propelled pneumatic rollers, each with a minimum static weight of 9 tonnes. The rollers shall be capable of reversing direction without causing backlash or damage to the seal coat.

(e) The Contractor shall supply pilot vehicles for convoying traffic. The pilot vehicles shall have sufficient accompanying personnel to provide convoy services on a 24 hour a day availability. The standard number of pilot vehicles to be provided shall be two for two lane highways or as

specified in the special provisions. Additional vehicles may be required as determined by the Consultant at the time of construction. All pilot vehicles shall be equipped as follows:

- A two way radio for communication.
- An overhead revolving beacon with an amber lens a minimum of 180 mm high and 180 mm wide. The beacon shall be mounted on the top of the vehicle fully visible to traffic approaching from both the front and rear.
- A sequential arrowboard meeting the requirements as shown in Specification 1.2 General.
- The arrowboard shall be controlled from a console located in the vehicle cab.
- The arrowboard display shall be visible to traffic approaching the rear of the trucks.
- Additional pilot vehicles beyond the standard number specified, may be exempt from including a sequential arrowboard with the approval of the Consultant.

The Contractor shall cease seal coat application if any equipment integral to either the compaction, sweeping or traffic accommodation operations is not available or is not in good working order, as determined by the Consultant.

3.22.4 TESTING

3.22.4.1 **Quality Control Testing**

Quality control and quality control testing are 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 perform all field testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the Work, and the final product produced.

3.22.4.2 **Testing by the Consultant**

The Consultant may from time to time take samples, and carry out testing and inspection of materials incorporated or being incorporated into the Work. Tests performed by the Consultant will not be considered to be quality control tests. The Contractor shall cooperate with the Consultant for such sampling, testing and inspection. Such testing and inspection shall not relieve the Contractor from any obligation to perform all the Work strictly in accordance with the requirements of the Contract.

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

3.22.5 CONSTRUCTION

The placement of graded aggregate seal coat shall be limited to the period from May 1 to September 15. The extent of surface preparation required and the method of application of the Graded Aggregate Seal Coat including application rates for the asphalt binder and the processed aggregate shall be determined by the Contractor.

The Contractor shall also determine the amount of compaction required based on consideration of compaction equipment, atmospheric conditions and acceptance requirements.

Construction shall be carried out during daylight hours only.

3.22.5.1 **Surface Preparations**

Before the asphalt binder is applied, the surface to be treated shall be cleaned of all dirt, sand, dust or objectionable matter. Asphalt binder shall not be applied until the surface has been cleaned as required and the section approved by the Consultant.

3.22.5.2 **Application Areas**

Unless otherwise specified or shown on the plans, the Contractor shall not apply seal coat to roadway shoulders or to bridge decks.

The Contractor shall apply seal coat as follows:

(i) To each through travel lane to the widths shown on the Contract Plan, regardless of the widths shown on the intersection plans.

(ii) At intersections, to all parallel lanes and their respective tapers, in general conformance with the drawing entitled "Seal Coat Applications at Intersections" (CB6-3.23M1 or CB6-3.23M2 as applicable), or as shown on the shaded intersection plans if provided.

(iii) To all passing and climbing lanes and their respective tapers.

(iv) Application on bridge decks where required will generally be from curb face to curb face.

3.22.5.3 **Rolling and Brooming**

Immediately after spreading, the aggregate shall be rolled.

After initial set of the binder (normally 1 to 3 hours depending on atmospheric condition), further compaction of the seal coat shall continue by using either further rolling or controlled traffic or a combination of both, until a thoroughly compacted surface is obtained. The Contractor shall determine the amount of additional compaction required based on consideration of compaction equipment, traffic conditions, atmospheric conditions and acceptance requirements.

Once compaction has been achieved, light brooming of the surface shall be undertaken to remove any loose aggregate.

The Contractor shall broom the graded aggregate seal coat in daylight hours only, when required and as often as required during a two week period following the initial application or as directed by the Consultant.

All highway-to-highway junctions and all junctions of paved highways with municipal roads shall be swept clear of loose aggregate.

The Contractor shall use a pickup broom for all brooming in urban and other areas where loose aggregate cannot be swept onto sideslopes or onto ditches.

3.22.5.4 **Protection of Structures**

Structures, curbs, guardrail, and other appurtenances shall not be spattered with the asphalt binder. The Contractor shall remove any spattering caused by his operation. Asphalt binder shall not be spilled, sprayed, or tracked on completed sections of seal coat.

The Contractor shall not operate vibratory rollers in vibratory mode on any bridge deck.

The Contractor shall ensure that bridge expansion joints, drains, curbs and appurtenances are protected from asphalt and/or chip contamination.

In addition to being responsible for the cleanup of any contaminated areas, the Contractor is advised that many bridge components and materials are affected by cleanup and any costs for repair of damaged structures will be charged to the Contractor.

3.22.5.5 **Traffic Accommodation and Signing**

The Contractor shall erect and maintain temporary construction signs in accordance with the Traffic Accommodation in Work Zones manual.

A Traffic Accommodation Strategy as outlined in Specification 7.1, Temporary Construction Signing will be required for all phases of construction including subsequent brooming and line painting activities. The signing strategy shall be developed based upon the requirements of the Traffic Accommodation in Work Zones manual.

3.22.5.5.1 Traffic Convoy

Traffic shall be accommodated through the work. The Contractor shall, at his own expense, provide flagmen, pilot vehicles and/or illuminated arrow boards as required.

Traffic and construction equipment including aggregate haul trucks shall not travel over uncovered surfaces of fresh asphalt binder. Traffic convoy, at speeds not exceeding 50 km per hour, shall commence at the start of seal coat application and shall continue up to six hours after all rolling has been completed as directed by the Consultant.

3.22.5.6 **Temporary Markers**

The Contractor shall supply and install temporary, reflectorized centreline markings (Davidson Temporary Road Pavement Markers or equivalent) on the centreline of the roadway immediately before applying the asphalt binder. Markers shall be placed at 25 m intervals on tangent sections and at 15 m intervals on curves and shall remain in place.

3.22.6 PAINTED ROADWAY LINES AND PAVEMENT MESSAGES

The Contractor shall paint all roadway lines and pavement messages for the areas receiving Graded Aggregate Seal Coat in accordance with Specifications 7.2, Painted Roadway Lines and 7.3, Painted Pavement Messages.

All painted roadway lines and painted pavement messages applied to the seal coat surface shall be applied twice at the full application rate for each application. The second application shall be completed after the Contractor's final brooming. On two lane highways the second application will be from the opposite

direction of the initial application.

All edge lines shall be painted completely off "but next to" the seal coat "edge" and will only require one paint application.

In all cases, the roadway shall not be posted at gazetted highway speeds until all work including line painting has been completed. The maximum length of roadway posted at less than gazetted highway speeds shall not exceed 30 km.

3.22.7 REQUIREMENTS FOR ACCEPTANCE

Requirements for the acceptance of the completed graded aggregate seal coat include the following:

(i) Materials shall meet all specified requirements;

(ii) a minimum of 99% aggregate coverage has been obtained with no single bare area greater than $0.01m^2$ in any one square metre,

(iii) there is no streaking or ravelling,

(iv) the surface of the seal has a uniform, even texture,

(v) no over-rich or bleeding areas are evident, and

(vi) no loose aggregate is evident.

(vii) All existing pavement markings have been preserved or replaced in accordance with Specifications 7.2, Painted Roadway Lines and 7.3, Painted Pavement Messages.

Graded aggregate seal coat that does not meet the foregoing requirements shall be repaired or reconstructed at the Contractor's expense to the satisfaction of the Consultant.

3.22.8 COMPLETION OF LINE PAINTING

The Contractor shall complete the replacement of roadway lines within five days of completing the placing of the seal coat on each individual roadway. Failure to meet this requirement will result in a penalty of $900.00 per day for each calendar day delay in completing the painting. The Department may extend the time allowed to complete the painting up to a maximum of ten days providing:

(i) The Contractor submits a written request to the Consultant accompanied by a detailed proposed line painting schedule.

(ii) The reason for the request, stated in the request, is one of the following:

(a) The seal coat requires additional curing time and subsequent brooming work prior to painting the traffic markings, or

(b) The work site is not available to the Contractor through no fault of the Contractor, or

(c) The Consultant suspends the Work and standby payments are due in accordance with Specification 1.2, General, or

(d) There is a delay resulting from an order of a court, or from strikes or lock-outs, or

(e) The traffic markings cannot be painted for reasons of inclement weather, or conditions resulting from inclement weather.

3.22.9 MEASUREMENT AND PAYMENT

The amount of Graded Aggregate Seal Coat considered for acceptance will be based upon the estimated quantities as shown in the unit price schedule. Generally, a variance in these quantities will only be considered when the scope of the Work has been modified by the Department. However, the Department reserves the right to measure the Work actually constructed to confirm compliance with the design and any such measurement will become the basis for the final payment.

Payment will be made at the unit price bid per square metre for "Graded Aggregate Seal Coat". This payment will be full compensation for preparing the existing surface; supplying and installing temporary lane markers; supplying and applying the asphalt binder; supplying, processing, hauling, placing and rolling the aggregate; brooming the finished surface; replacing and/or maintaining pavement markings; quality control; traffic accommodation and traffic convoy services using the standard number of pilot vehicles as specified.

Payment for pilot vehicle requirements, as approved by the Consultant, in excess of the standard number specified, shall be paid as Extra Work in accordance with Specification 1.2, General.

No separate payment will be made for any additional equipment, tools or labour employed to satisfy special brooming requirements.

No payment will be made for any costs incurred to rectify defective work.

3.22.9.1 **Line and Pavement Message Painting**

Contrary to Specifications 5.20, Supply of Line Painting Materials; 7.2, Painted Roadway Lines and 7.3, Painted Pavement Messages, no separate payment will be made for the supply of painting materials nor for replacing the lines and pavement message markings. The cost of this Work shall be included in the unit price bid for "Graded Aggregate Seal Coat."

3.22.9.2 **Supply of Aggregate**

Contrary to Specification 5.2, Supply of Aggregate, separate payment will not be made for supplying aggregate for graded aggregate seal coat. However, if the Contractor supplies aggregate from a Crown source on undeeded land, operated primarily under lease or licence and for which the Department does not have a reservation, the Department will deduct $ 0.48 per tonne from the total payments made under the Contract. The tonnage will be determined by multiplying the total square metres of seal work performed, by a conversion factor of 20 kilograms per square metre.

TABLE OF CONTENTS

3.24 CHIP SEAL COAT

3.24.1 GENERAL

Chip Seal Coat shall consist of a wearing course composed of processed aggregates held in place by an asphalt binder, spread and rolled on a prepared surface to the lines and dimensions shown on the plans or as designated by the Consultant.

3.24.2 MATERIALS

3.24.2.1 **Aggregate**

The Contractor shall produce crushed aggregate 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 aggregate in accordance with Specification 4.5, Hauling.

3.24.2.2 **Temporary Markers**

The Contractor shall supply temporary, reflectorized, centerline markings in accordance with the Alberta Transportation Products List. Temporary markings shall be applied on the centreline of the roadway immediately before applying the asphalt binder. Markers shall be placed at 25 m intervals on tangent sections and at 15 m intervals on curves and shall remain in place.

3.24.2.3 **Asphalt**

The Contractor shall supply a cationic, rapid set asphalt binder in accordance with Specification 5.7, Supply of Asphalt.

3.24.2.4 **Water**

The Contractor shall supply all water required for washing the aggregate.

3.24.2.5 **Line Painting Materials**

The Contractor shall supply all line painting materials in accordance with Specification 5.20, Supply of Line Painting Materials.

3.24.3 TESTING

3.24.3.1 **Quality Control Testing**

Quality control and quality control testing are the responsibility of the Contractor throughout every stage of the Work from the crushing and production of aggregates to the final accepted product. The Contractor shall provide and pay for equipment and qualified personnel to perform all field testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the Work, and the final product produced.

3.24.3.2 **Testing by the Consultant**

The Consultant may from time to time take samples, and carry out testing and inspection of materials incorporated or being incorporated into the Work. Tests performed by the Consultant will not be considered to be quality control tests. The Contractor shall cooperate with the Consultant for such sampling, testing and inspection. Such testing and inspection shall not relieve the Contractor from any obligation to perform all the Work strictly in accordance with the requirements of the Contract.

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

3.24.4 EQUIPMENT

The following equipment shall be used:

(i) A self-powered pressure asphalt distributor meeting the requirements as listed in Specification 3.19, Prime, Tack and Fog Coats.

(ii) A self-propelled aggregate spreader capable of spreading the aggregate uniformly at the specified rate in one application over the full width of the asphalt applied. The spreader shall be capable of controlling and adjusting the width and rate of spread. The spreader shall be equipped with the necessary devices to enable it to be attached securely to the aggregate haul truck while in the process of dumping the aggregates into the spreader.

(iii) A minimum of two self-propelled pneumatic rollers, each with a minimum static weight of 9 tonnes. The rollers shall be capable of reversing direction without causing backlash or damage to the Chip Seal Coat.

(iv) A minimum of three power sweepers in working condition prior to the start of seal coat activities. Two of the brooms shall be dedicated to sweeping Chip Seal Coat placed that same day. A third broom shall be used for brooming loose chips on Chip Seal Coat placed in previous days. All power sweepers shall be equipped with a minimum of one yellow rotating warning light.

(v) The Contractor shall supply pilot vehicles for convoying traffic. The pilot vehicles shall have sufficient accompanying personnel to provide convoy services on a 24 hour a day availability. The standard number of pilot vehicles to be provided shall be two for two lane highways and four for multi-lane highways or as specified in the special provisions. Additional vehicles may be required as determined by the Consultant at the time of construction. All pilot vehicles shall be equipped as follows:

- A two way radio for communication.

- An overhead revolving beacon with an amber lens a minimum of 180 mm high and 180 mm wide. The beacon shall be mounted on the top of the vehicle fully visible to traffic approaching from both the front and rear.

- A sequential arrowboard meeting the requirements as shown in Specification 1.2 General.

- The arrowboard shall be controlled from a console located in the vehicle cab.

- The arrowboard display shall be visible to traffic approaching the rear of the trucks.

- Additional pilot vehicles beyond the standard number specified, may be exempt from including a sequential arrowboard with the approval of the Consultant.

The Contractor shall cease Chip Seal Coat application if any equipment integral to either the compaction, sweeping or traffic accommodation operations is not available or is not in good working order, as determined by the Consultant.

3.24.5 CONSTRUCTION

3.24.5.1 **General**

Chip Seal Coat application shall be performed prior to August 15 and during daylight hours only.

The extent of surface preparation required and the method of application of the Chip Seal Coat including application rates for the asphalt binder and the processed aggregate shall be determined by the Contractor.

The Contractor shall also determine the amount of compaction required based on consideration of compaction equipment, atmospheric conditions and acceptance requirements.

3.24.5.2 **Application Areas**

Unless otherwise specified or shown on the plans, the Contractor shall not apply seal coat to roadway shoulders or to bridge decks.

The Contractor shall apply seal coat as follows:

(i) To each through travel lane to the widths shown on the Contract Plan, regardless of the widths shown on the intersection plans.

(ii) At intersections, to all parallel lanes and their respective tapers, in general conformance with the drawing entitled "Seal Coat Applications at Intersections" (CB6-3.23M1 or CB6-3.23M2 as applicable), or as shown on the shaded intersection plans if provided.

(iii) To all passing and climbing lanes and their respective tapers.

(iv) Application on bridge decks where required will generally be from curb face to curb face.

3.24.5.3 **Protection of Bridge Structures**

The Contractor shall not operate vibratory rollers in vibratory mode on any bridge deck.

The Contractor shall ensure that bridge expansion joints, drains, curbs and appurtenances are protected from asphalt and/or chip contamination.

In addition to being responsible for the cleanup of any contaminated areas, the Contractor is advised that many bridge components and materials are affected by cleanup and any costs for repair of damaged structures will be charged to the Contractor.

3.24.5.4 **Rolling and Brooming**

Immediately after spreading, the chips shall be rolled.

No traffic shall be allowed on freshly placed Chip Seal Coat until rolling has been completed.

After rolling and initial set of the binder, the driving lanes and paved shoulders shall be broomed to remove any loose chips. Any brooming activities performed during days following chip application shall be referred to as "subsequent brooming".

The Contractor shall continue to broom the driving lanes and paved shoulders to remove any loose chips when required, and as often as required, during a two week period following the initial application or as directed by the Consultant.

All highway-to-highway junctions and all junctions of paved highways with municipal roads shall be swept clear of loose chips.

The Contractor shall use a pickup broom for all brooming in urban and other areas where loose chips cannot be swept onto sideslopes or onto ditches.

Brooming operations that are against traffic flow shall only be carried out if the Contractor has implemented proper traffic accommodation operations.

On all highways, brooming operations done during hours of darkness shall be accompanied with a trailing arrow board capable of operating in hazard mode where applicable.

3.24.5.5 **Speed Restrictions**

For "subsequent brooming" activities within the driving lanes, the posted speed restriction shall be 50 km per hour for two lane highways and 80 km per hour for multi-lane highways. In all cases, the total length of roadway under 50 km per hour speed restriction, including application activities and subsequent brooming activities, shall not exceed 20 kilometres.

3.24.5.6 **Traffic Accommodation and Signing**

The Contractor shall erect and maintain temporary construction signs in accordance with Drawings TCS-B-1.17A or TCS-B-1.17B as shown in the Traffic Accommodation in Work Zones manual.

A Traffic Accommodation Strategy as outlined in Specification 7.1, Temporary Construction Signing will be required for all phases of construction including subsequent brooming and line painting activities. The signing strategy shall be developed based upon the requirements of Drawing TCS-B-1.17A or TCS-B-1.17B as appropriate.

3.24.5.6.1 Traffic Convoy

Traffic convoy by pilot vehicles not exceeding 50 km per hour shall be used on all Chip Seal Coat projects.

On two lane highways, traffic convoy shall be initiated at the commencement of Chip Seal Coat application.

On divided highways, traffic convoy shall commence after rolling is complete.

Traffic convoy may be required for subsequent brooming activities depending upon site specific traffic conditions such as length of work zone, available site distances, traffic volumes, etc. Notwithstanding the previous, traffic convoy will be required whenever the length of subsequent brooming activities within the driving lanes is greater than 5 kilometres.

On all highways, traffic convoy shall continue until second brooming of the Chip Seal Coat is complete and the speed restriction has been increased to 80 km per hour or as otherwise directed by the Consultant.

3.24.6 PAVEMENT MARKINGS

The Contractor shall paint all roadway lines and pavement messages for the areas receiving Chip Seal Coat in accordance with Specifications 7.2, Painted Roadway Lines and 7.3, Painted Pavement Messages.

All painted roadway lines and painted pavement messages applied to the Chip Seal Coat surface shall be applied twice at the full application rate for each application. On two lane highways the second application will be from the opposite direction of the initial application.

All edge lines shall be painted completely off the seal coat and will only require one paint application.

In all cases, the roadway shall not be posted at gazetted highway speeds until all work including line painting has been completed. The maximum length of roadway posted at less than gazetted highway speeds shall not exceed 30 km.

3.24.7 REQUIREMENTS FOR ACCEPTANCE

Requirements for the acceptance of the completed Chip Seal Coat include the following:

(i) Materials shall meet all specified requirements;

(ii) A minimum of 99% chip coverage shall be obtained with no single bare area greater than 0.01 m^2 in any one square metre;

(iii) There shall be no streaking or ravelling;

(iv) The finished surface shall have a uniform, even texture;

(v) No over-rich or bleeding areas shall be evident;

(vi) No loose chips shall be evident; and

(vii) All existing pavement markings have been preserved or replaced in accordance with Specifications 7.2, Painted Roadway Lines and 7.3, Painted Pavement Messages.

Work that does not meet the foregoing requirements shall be repaired or reconstructed to the satisfaction of the Consultant.

3.24.8 TIMING FOR COMPLETION OF PAVEMENT MARKINGS

The Contractor shall complete the first application of paint for roadway lines and pavement messages within five days of completing the placement of chip seal on each separate roadway. Failure to meet this requirement will result in a penalty of $900.00 per day for each calendar day delay in completing the

painting. The Department may extend the time allowed to complete the painting up to a maximum of ten days providing:

(i) The Contractor submits a written request to the Consultant accompanied by a detailed proposed line painting schedule.

(ii) The reason for the request, stated in the request, is one of the following:

(a) The chip seal coat requires additional curing time and subsequent brooming work prior to painting the traffic markings, or

(b) The work site is not available to the Contractor through no fault of the Contractor, or

(c) The Consultant suspends the Work and standby payments are due in accordance with Specification 1.2, General, or

(d) There is a delay resulting from an order of a court, or from strikes or lock-outs, or

(e) The traffic markings cannot be painted for reasons of inclement weather, or conditions resulting from inclement weather.

The second application of paint shall commence no earlier than two weeks following the first application of paint, but shall be completed prior to the Contract completion date.

3.24.9 MEASUREMENT AND PAYMENT

The amount of Chip Seal Coat or Chip Seal Coat - Bridge Decks considered for acceptance will be based upon the estimated quantities as shown in the unit price schedule. Generally, a variance in these quantities will only be considered when the scope of the Work has been modified by the Department. However, the Department reserves the right to measure the Work actually constructed to confirm compliance with the design and any such measurement will become the basis for the final payment.

Payment will be made at the unit price bid per square metre for "Chip Seal Coat" or "Chip Seal Coat - Bridge Decks" as applicable. Payment will be full compensation for preparing the existing surface; protecting bridge structures where applicable, supplying and installing temporary lane markers; supplying and applying the asphalt binder; supplying, processing, hauling and placing the aggregate; brooming the finished surface; replacing and/or maintaining pavement markings; quality control; traffic accommodation and traffic convoy services using the standard number of pilot vehicles as specified.

Payment for pilot vehicle requirements, as approved by the Consultant, in excess of the standard number specified, shall be paid as Extra Work in accordance with Specification 1.2, General.

No separate payment will be made for any additional equipment, tools or labour employed to satisfy special brooming requirements.

No payment will be made for any costs incurred to rectify defective work.

3.24.9.1 **Line and Pavement Message Painting**

Contrary to Specifications 5.20, Supply of Line Painting Materials; 7.2, Painted Roadway Lines and 7.3, Painted Pavement Messages, no separate payment will be made for the supply of painting materials nor for

replacing the lines and pavement message markings. The cost of this Work shall be included in the unit price bid for "Chip Seal Coat."

3.24.9.2 **Supply of Aggregate**

Contrary to Specification 5.2, Supply of Aggregate, no separate payment will be made for supplying aggregate for chip seal. However, if the Contractor supplies aggregate from a Crown source on undeeded land, operated primarily under lease or licence and for which the Department does not have a reservation, the Department will deduct $ 0.48 per tonne from the total payments made under the Contract. The tonnage will be determined by multiplying the total square metres of chip seal work performed, by a conversion factor of 20 kilograms per square metre.

TABLE OF CONTENTS

3.30 ASPHALT PAVEMENT CRACK ROUTING AND SEALING

3.30.1 GENERAL

The purpose of crack sealing is to prolong the life of existing pavements by preventing moisture from penetrating the roadway structure, and by preventing the spalling of material from the edges of the cracks.

The Work shall consist of routing, cleaning and drying cracks and sealing them with crack sealant between the limits shown on the plans or as directed by the Consultant.

3.30.2 MATERIALS

3.30.2.1 **Crack Sealant**

The Contractor shall choose and supply hot pour rubberized crack sealant material from the proven products of the Alberta Transportation Products List. Products not listed as proven require the Department's approval prior to use.

The Contractor shall provide the Consultant with the following information five days prior to commencing the Work:

- Name and mailing address of crack sealant supplier and manufacturer
- Name of crack sealant product to be supplied
- Written confirmation from the manufacturer that the crack sealant to be supplied meets all specified requirements along with test results that demonstrate that the product meets all specified requirements.

The Contractor shall verify that all crack sealant delivered and used in the Work is the type and grade ordered.

The Contractor shall supply the Consultant with the manufacturer's quality control test results (indicating at the minimum cone penetration and flow) for each batch of crack sealant. These test results shall be supplied at the time of delivery of each batch of crack sealant to the Work.

All crack sealant supplied shall be subject to inspection, sampling and testing by the Department and the Contractor shall cooperate in the inspection and sampling process. When directed by the Consultant, the Contractor shall obtain representative samples of the crack sealant delivered to the Work.

3.30.2.2 **Blotting Agents**

When necessary, the Contractor shall supply one of the following blotting agents:

- screened sand with a maximum topsize of 2 mm
- cement
- flyash

The use of other products shall be subject to the approval of the Consultant.

3.30.3 EQUIPMENT

The Contractor shall supply all equipment necessary for completion of the Work including but not limited to the melting kettle, air compressor unit, hot compressed air lance, routing and crack sealing equipment and all related equipment such as fork lifts, hoists, and transport vehicles.

The melting kettle shall consist of a double jacketed oil bath kettle with thermometric controls which automatically control the product temperatures and with continuous agitation equipment to prevent localized variations in temperature. The kettle shall be equipped with two calibrated thermometers to monitor the temperature of the crack sealant and the temperature of the heat transfer oil.

The mechanical router shall be capable of producing the specified rout cross-section.

The compressed air unit shall be equipped with water and oil traps and must produce sufficient air volume and pressure to remove all debris from the cracks. It shall be capable of delivering a continuous stream of clean, dry air at 600 kPa and 4.5 m^3 /min.

Application equipment shall be capable of regulating the application of crack sealant directly to the road and shall be equipped with a thermometer to monitor the temperature of the material as it is applied.

The hot compressed air lance shall be capable of providing a continuous hot, high pressure air stream (1000ºC at a rate of 1000 m/sec) with no flame at the exit nozzle.

3.30.4 CRACK ROUTING AND SEALING

All Work shall be performed during daylight hours only. No Work shall be performed if the visibility is less than 700 metres. No Work shall be performed during rain or snow or when the pavement surface is wet. The maximum work area shall be 3 km in length.

The crack sealant shall not be applied when the pavement temperature is below 10E Celsius.

Unless otherwise directed by the Consultant, all transverse cracks between 2 mm and 25 mm in width and longitudinal cracks between 2 mm and 12 mm in width which are within the driving lanes of the pavement surface shall be routed and sealed. Routing and sealing shall extend 0.5 m into the pavement shoulders.

Cracks shall be routed to the applicable cross-section shown on Drawing CB6-10.6M1, keeping the crack in the centre of the rout cross-section.

Prior to the application of crack sealant, the road surface adjacent to the cracks shall be cleaned and all loose material and moisture shall be removed from the routed cracks. All debris resulting from the cleaning and routing operation shall be removed from the road surface. The routed cracks shall be treated with the hot compressed air lance until the pavement in the routed crack is dry and slightly darkened. There shall be a maximum time period of 2 minutes between cleaning and drying the routed cracks and the application of the crack sealant.

Crack sealant shall be heated and applied within the applicable specified temperature ranges and in accordance with the manufacturer's recommendations. The heat transfer oil in the melting kettle shall not be heated in excess of 50EC above the safe heating temperature.

Routed cracks shall be filled with crack sealant such that upon cooling, the filled crack is as shown on the drawings.

Excessive crack sealant shall be removed from the pavement surface immediately following application.

Traffic shall be kept off sealed cracks until the crack sealant has cured. At locations such as intersections where this is not practical, the Contractor shall prevent tracking by applying a blotting agent to the crack sealant. When a blotting agent is used, it shall not be applied until the sealant has cooled sufficiently to prevent inclusion of the blotting agent into the sealant.

Fuel, asphalt and any other spills shall be cleaned up to the satisfaction of the Consultant at the Contractor's expense.

3.30.5 SAMPLING AND TESTING

3.30.5.1 **General**

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

Acceptance testing is the responsibility of the Consultant.

Quality control, including the provision of quality control test results for the crack sealant materials, is the responsibility of the Contractor.

Accommodation of traffic for all sampling and testing is the responsibility of the Contractor.

3.30.5.2 **Definitions**

LOT - a day's production of at least 1500 linear metres of crack. If a day's production is less than 1500 linear metres, it shall be added to the production of subsequent days until a minimum of 1500 linear metres is obtained for the Lot. If the last day's production is less than 1500 linear metres of crack, it shall be added to the previous Lot.

3.30.5.3 **Test Methods**

The latest edition of the following standard Alberta Transportation test methods (ATT) will be used for acceptance sampling and testing.

TABLE 3.30.5.3 TEST METHODS

Test Description	Test Method
1. Sampling Crack Sealant	ATT-42
2. Measurement of Rout Cross-section	ATT-73
3. Measurement of Sealant Filling	ATT-73
4. Measurement of Crack Missed	ATT-73
5. Appeal of Quality Assurance Results	ATT-73
6. Random Test Site Selection	ATT-56 Part III

3.30.5.4 **Acceptance Sampling and Testing of Crack Sealant Material**

The Consultant will obtain a sample of crack sealant material for each Lot in accordance with ATT-42. Testing of crack sealant material will be in accordance with the manufacturer's specifications. The Department will determine the frequency of testing of sealant. Failing sealant test results will be reported within seven days of the Department's designated quality assurance testing firm receiving the samples. Materials that do not conform to the stated tolerance shall result in a unit price adjustment for the linear metres of crack sealant for the Lot, or rejection as specified in Table 3.30.6.

The Consultant will measure the sealant temperatures. Temperatures measured in excess of 10EC above the manufacturer's specified safe heating temperature will result in the rejection of the material in use and the Contractor shall dispose of the overheated materials in a manner acceptable to the Consultant.

3.30.5.5 **Acceptance Sampling and Testing of Routing and Sealing**

The Consultant will measure sections of routed transverse and longitudinal cracks to determine compliance to the specified rout cross-section and the conformance of the rout to the path of the crack being routed. If the existing crack is partially or entirely outside the rout cross-section or is within the rout cross-section but touching the side edge of the rout, it shall be considered "crack missed." The Consultant will measure sections of sealed crack to determine compliance with the specified filling requirements. All sample locations will be determined on the basis of stratified random sampling in accordance with ATT-56 Part III.

The random sites inspected by the Consultant will be a minimum of 1 m in length and, for the purpose of price adjustment, there will be a minimum of 6 sites measured per lot for rout cross-section, crack missed and for filling of the rout with sealant. Sites will be inspected for rout cross-section after routing and before sealant is placed. Sites will be inspected for filling a minimum of 1 hour after the cracks are filled. Inspection for rout cross-section, crack missed and rout filling shall be performed in accordance with ATT-73.

The Contractor shall cooperate with the Consultant obtaining test measurements and the Department will

not be responsible for any costs due to delays in the Contractor's operation due to testing activities.

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

The following procedures will apply for an appeal:

(i) Appeals will only be considered if the Contractor can demonstrate to the satisfaction of the Consultant that there is sufficient cause to support the appeal.

(ii) Acceptance test results for any rejected or penalized Lot may be appealed only once.

(iii) The Contractor shall serve notice of an appeal to the Consultant, in writing, within 24 hours of receipt of the test results.

(iv) For an appeal of the rout cross-sections, the Contractor shall locate and prepare the appeal sites at the locations determined by the Consultant. The cracks shall be cleaned to an acceptable condition to allow for the measurement of the rout cross-section and the percent of the crack missed. When the Consultant has completed the measurements, the Contractor shall immediately reseal the test sites. No separate payment will be made for site preparation for retesting and the resealing of cracks.

(v) For an appeal of the percent of crack filled, the Consultant will determine new test sites and evaluate the filling of the routed crack at these new sites. The Contractor shall provide assistance as required for this appeal testing.

(vi) For an appeal of the material's characteristics testing, the Consultant will request a retest on the original material sample for the Lot.

(vii) The results of the original measurements will be averaged with the results of the new tests and the new averages shall form the basis for payment except for Compatibility and Bond tests, where a single acceptable test result will be considered sufficient for acceptance of the applicable characteristic.

If the new averages indicate that a penalty or rejection still apply for the Lot or sublot then the Contractor shall be responsible for the costs of the retesting. The costs for retesting of crack sealant or rout cross-sections shall be $500.00 per Lot. The cost of retesting for the percent of crack filled shall be $100.00 per Lot. If the results of retesting indicate that the subject lot has a reduced penalty then the Department will be responsible for the cost of retesting.

3.30.6 MEASUREMENT AND PAYMENT

Measurement will be made in metres of the length of cracks on which crack routing and sealing has been performed.

Payment will be made at the unit price bid per metre for "Crack Routing and Sealing" subject to the unit price adjustments specified in this section. This payment will be full compensation for routing, cleaning and drying the cracks, cleaning the pavement surface, supplying and applying the crack sealant, quality control and traffic accommodation.

When payment adjustments equal 100% or greater, the Contractor may be required to remedy the Lot to meet specified tolerances. This shall include removing all sealant, preparing the routs and resealing.

Payment for the Lot shall be based on the new work.

TABLE 3.30.6
LOT UNIT PRICE ADJUSTMENTS

Parameter	Limits	Adjustment Factor
Crack Sealant Material	**(based on material specification for each product)**	**100% penalty if all 5 material parameters exceed specified requirements**
Flow	+ 25%	No individual penalty
Cone Penetration	+ 20%	1% per dmm outside limit
Bond Test	Pass	No individual penalty
Resilience	- 20%	1% per point outside limit
Compatibility	Pass	No individual penalty
Rout Cross-section, Crack Missed and Crack Filled	**(Function of the specified rout cross-section)**	
Width	Maximum of 10% deviation from the specified width	Penalty equal to 0.5 times the % of crack with š10% deviation less than the specified width
Depth	Maximum of 20% deviation from the specified depth	Penalty equal to 0.5 times the % of crack with š20% deviation less than the specified depth
% of crack missed	maximum 5% missed	Penalty equal to the total % of crack missed when ™5% has been missed
Filling of routed crack	maximum 30 % subsidence from flush fill	Penalty equal to 0.5 times the % of crack underfilled

The unit price applicable to each Lot quantity of "Crack Routed and Sealed" shall be as follows:

LU = BP - (BP * (AF + CA))

Where LU is the Lot Unit Price per lineal metre;
BP is the Contract Bid Price per lineal metre for "Crack Routing and Sealing";
AF is the Sum of the Adjustment Factors for the Crack Sealant; and
CA is the Sum of the Adjustments for Crack Missed, Crack Filled and Cross-section deviations.

TABLE OF CONTENTS

3.31 ASPHALT PAVEMENT CRACK SEALING

3.31.1 GENERAL

The purpose of crack sealing is to prolong the life of existing pavements by preventing moisture from penetrating the roadway structure, and by preventing the spalling of material from the edges of the cracks.

The Work shall consist of sealing cracks with crack sealant between the limits shown on the plans or as directed by the Consultant.

3.31.2 MATERIALS

The Contractor shall supply all materials necessary for the Work including the crack sealant.

The Contractor shall supply EC-101 or HC-200 crack sealant in accordance with specification 5.7, Supply of Asphalt. Products not listed as proven in the Alberta Transportation Products List require Department approval prior to use.

The Contractor shall provide the Consultant with the following information 5 days prior to commencing the Work:

- Name and mailing address of crack sealant supplier and manufacturer
- Name of crack sealant product to be supplied
- Written confirmation from the manufacturer that the crack sealant to be supplied meets all specified requirements along with test results that demonstrate that the product meets all specified requirements.

The Contractor shall verify that all crack sealant delivered and used in the Work is the type and grade ordered.

The Contractor shall supply the Consultant with the manufacturer's quality control test results (as identified in Table 3.31.2) for each batch of crack sealant. These test results shall be supplied at the time of delivery of each batch of crack sealant to the Work.

Table 3.31.2

PRODUCT	QUALITY CONTROL TESTING REQUIREMENTS
COLD POUR	a) Uniformity TLT-226 b) Viscosity TLT-227 c) Solids Content ASTM D244 (residue by evaporation, procedure A) d) Rate of Curing (24 hour) TLT-230
HOT POUR	a) Softening Point ASTM D36 b) Penetration @ 25EC ASTM D5 c) Viscosity ASTM D2170

When necessary, the Contractor shall supply one of the following blotting agents:

- screened sand with a maximum topsize of 2 mm
- cement
- flyash

The use of other products shall be subject to the approval of the Department

3.31.3 EQUIPMENT

The Contractor shall supply all equipment necessary for completion of the Work including but not limited to the melting kettle (Hot Pour only), crack sealing equipment and all related equipment such as fork lifts, hoists, and transport vehicles.

The melting kettle shall consist of a double jacketed oil bath kettle with continuous agitation equipment to prevent localized heating. The kettle must be equipped with two thermometers to show the temperature of the crack sealant and the temperature of the heat transfer oil.

Application equipment must be capable of regulating the application of crack sealant directly to the road.

3.31.4 CRACK SEALING

All Work shall be performed during daylight hours only. No Work shall be performed if the visibility is less than 700 metres. No Work shall be performed during rain or snow or when the pavement surface or cracks are wet. The maximum work area shall be 3 km in length.

Crack sealant shall not be applied when the atmospheric temperature at the construction site is below 0E Celsius.

All cracks within the entire width of the pavement surface, which are 5 mm and greater in width shall be sealed.

Prior to the application of crack sealant, the Contractor shall ensure that the road surface adjacent to the cracks is clean.

Hotpour crack sealant shall be heated to the temperature specified by the manufacturer. Overheating will not be permitted.

Crack sealant shall be applied within the manufacturer's specified temperature range.

Crack sealant shall be applied so that the crack is flush filled immediately following application and a thin overband of sealant extends approximately 25 mm beyond the edges of the crack.

Excess crack sealant shall be removed from the pavement surface immediately following application. Removal shall involve the use of a squeegee, starting from the centerline and proceeding to the shoulder.

Traffic shall be kept off sealed cracks until the crack sealant will not track under the action of traffic. At locations such as intersections where this is not practical, the Contractor shall prevent tracking by applying a blotting agent to the crack sealant.

Fuel, asphalt and any other spills shall be cleaned up to the satisfaction of the Consultant at the Contractor's expense.

Work that does not meet the foregoing requirements shall be repaired or reconstructed to the satisfaction of the Consultant and at the Contractor's expense.

3.31.5 ACCEPTANCE SAMPLING AND TESTING

3.31.5.1 **Acceptance Sampling and Testing of Crack Sealant**

All crack sealant supplied shall be subject to inspection, sampling and testing by the Department and the Contractor shall cooperate in the inspection and sampling process. The Contractor shall obtain and submit to the Consultant two representative samples of crack sealant material in accordance with ATT-42 for each Lot of production.

A Lot is defined as a day's production of at least 5 km of roadway. If a day's production is less than 5 km, it shall be added to the production of subsequent days until a minimum of 5 km is obtained for the Lot. If the last day's production is less than 5 km, it shall be added to the previous Lot.

The Department will determine the frequency of testing of sealant. Cold Pour materials that do not conform to the specification limits shall result in a unit price adjustment for each km of roadway in the Lot in accordance with Table 3.31.6.

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

The following procedures will apply for an appeal:

(i) Appeals will only be considered if the Contractor can demonstrate to the satisfaction of the Consultant that there is sufficient cause to support the appeal.

(ii) Acceptance test results for any penalized Lot may be appealed only once.

(iii) The Contractor shall serve notice of an appeal to the Consultant, in writing, within 24 hours of receipt of the test results.

(iv) For an appeal of the materials characteristics testing, the Consultant will conduct a retest on the duplicate material sample for the Lot.

(vii) The results of the original measurements will be averaged with the results of the new tests and the new averages shall form the basis for payment.

3.31.6 MEASUREMENT AND PAYMENT

Measurement will be made of the length of roadway, in kilometres, on which crack sealing has been performed.

A roadway will include all travel lanes, shoulders, acceleration and deceleration lanes, truck turnouts and intersections. A divided or twinned highway will be considered two separate roadways.

Payment will be made at the unit price bid per kilometre for "Crack Sealing" subject to the unit price adjustments specified herein. This payment will be full compensation for cleaning the road surface adjacent to the cracks, supplying and applying the crack sealant, quality control, traffic accommodation and signing.

The following unit price adjustments apply only to EC-101 or other approved cold pour materials and do not relieve the Contractor of the requirements to complete the Work in accordance with these specifications.

Table 3.31.6
LOT UNIT PRICE ADJUSTMENTS

Requirement	Unit Price Adjustment
Solids (%)	
$ 59	No Adjustment
58.9 to 54.0	5 %
53.9 to 49.0	10 %
< 49	15 %

The unit price applicable to each Lot quantity of "Crack Sealing" shall be as follows:

Lk = BP - (BP * AF)

Where Lk is the Lot Unit Price per kilometre;
BP is the Contract Bid Price per kilometre; and
AF is the Adjustment Factor for the Crack Sealant.

TABLE OF CONTENTS

3.33 CRACK REPAIR - SPRAY PATCH

3.33.1 GENERAL

The work consists of repairing transverse and longitudinal cracks by cleaning the defect of all rock, dirt, sand or other objectionable material, applying asphalt binder as a tack material, filling with a mixture of asphalt binder and crushed aggregate and compacting the mix.

3.33.2 MATERIALS

Aggregate shall be supplied in accordance with Specification 3.2, Aggregate Production and Stockpiling and Specification 5.2, Supply of Aggregate.

The Contractor shall produce crushed aggregate meeting the following gradation specifications.

Metric Sieve Size Fm	% Passing
12 500	100
10 000	90 - 100
5 000	20 - 100
2 500	5 - 30
1 250	0 - 10

The Contractor shall supply an emulsified asphalt binder appropriate for the aggregate materials used.

3.33.3 EQUIPMENT

The Contractor shall supply all equipment necessary to complete the work. The equipment required includes but is not limited to the following:

- A compressor for high pressure air with a minimum rated capacity of 5.2 cubic metres per minute (185 CFM) capable of blowing the crack clean of all dirt, sand, rock, or other objectionable material.

- A proprietary or prototype machine capable of spraying the asphalt into the crack, and then combining crushed aggregate and asphalt and spraying the mixture into the crack.

- Appropriate compaction equipment.

3.33.4 PROCEDURE

The Consultant will determine which cracks are to be repaired. Generally, cracks less than 5mm width will not require repair. Potholes or other surface defects that are contiguous with cracks are considered to be 'crack related' and are to be repaired by spray patching.

Work shall not be performed when the atmospheric temperature at the work site is below 5^0C.

All objectionable material shall be removed from the open crack and surrounding area by blowing with high pressure air streams or other means acceptable to the Consultant.

Cleaned cracks shall be sprayed with the emulsified asphalt, and then sprayed with the combined asphalt and crushed aggregate mixture.

Some over-spraying of the crack will be required to ensure a smooth transition between the repaired crack and the adjacent undisturbed pavement surface.

The repaired area shall be compacted to ensure adequate embedment of the asphalt aggregate mixture into and over the crack.

All loose aggregate and debris shall be swept or removed from the pavement surface and disposed of to the satisfaction of the Consultant. Generally, the debris may be swept or blown evenly over the sideslopes however, in some cases as determined by the Consultant, the Contractor shall pickup, haul and dispose of it in an approved site.

3.33.5 SCHEDULE LIMITATIONS

The Contractor shall schedule his operations to ensure that crack repair is completed a minimum of two weeks prior to any required pavement overlay.

3.33.6 MEASUREMENT AND PAYMENT

Measurement will be in metres based on the length of cracks treated.

Payment will be made at the unit price bid per metre for “Crack Repair - Spray Patch”. This payment will be full compensation for cleaning the cracks; disposing of the debris; tacking; providing the crushed aggregate and asphalt binder; producing, hauling, placing and compacting the mix; traffic accommodation and signing; and all labour, materials, equipment, tools and incidentals necessary to complete the work.

Payment for the supply of aggregate will be made in accordance with Specification 5.2, Supply of Aggregate.

TABLE OF CONTENTS

3.35 CRACK REPAIR - MILL AND FILL

3.35.1 GENERAL

The Work consists of repairing cracks by milling a trapezoidal-shaped notch centred over the crack, then filling the notch with asphalt concrete pavement mix and compacting the mix.

3.35.2 MATERIALS

3.35.2.1 **General**

All materials necessary for the work described herein shall be supplied by the Contractor.

3.35.2.2 **Aggregate**

The Contractor shall produce crushed aggregate in accordance with specification 3.2, Aggregate Production and Stockpiling. Unless otherwise specified, aggregate shall meet the requirements for Designation 1 material. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate and haul aggregate in accordance with Specification 4.5, Hauling.

3.35.2.3 **Asphalt**

The Contractor shall supply asphalt in accordance with Specification 5.7, Supply of Asphalt. The type and grade of asphalt shall be as specified in Section 3.35.2.4, Asphalt Mix Design.

The type and grade of liquid asphalt for tack coat shall be in accordance with Specification 3.19.2, Materials, unless otherwise specified.

3.35.2.4 **Asphalt Mix Design**

The asphalt mix design shall be prepared and submitted to the Consultant in accordance with Specification 3.50.3 or Specification 3.53.3, Asphalt Mix Design and Job Mix Formula. Unless otherwise specified, the mix type shall be at the Contractor's discretion.

3.35.3 EQUIPMENT

The Contractor shall supply all equipment necessary for completion of the Work including, but not limited to, the following:

- A dry process cold milling machine capable of milling a trapezoidal shaped notch as shown on Drawing CB6 - 3.35M1. Milling machines using water to cool the milling head will not be permitted.
- Sweeping and blowing equipment capable of removing all loosened material from the milled notch and off the roadway surface.
- Hand spraying equipment for applying the tack coat.
- All equipment necessary for supplying, placing and compacting the asphalt concrete mix.

3.35.4 CONSTRUCTION

3.35.4.1 **General**

No Work shall be performed when the pavement surface is wet.

The Consultant will determine and identify which cracks are to be repaired.

The maximum work area shall be 3 km in length. For transverse crack repair, work shall be confined to one lane at a time. The Contractor shall include these requirements in his Traffic Accommodation Strategy.

3.35.4.2 **Crack Repair**

Unless otherwise specified, the Contractor shall mill a trapezoidal-shaped notch centred over the crack as shown on diagram CB6-3.35M1. For transverse cracks, the notch shall extend across the width of the lane and 0.3 m into the shoulder, or as otherwise specified.

All loosened material shall be removed from the notch and the milled surfaces shall be left clean and dry. Milled material shall be spread evenly over the sideslopes or disposed of as determined by the Consultant. Milled material identified by the Consultant for disposal shall be hauled and disposed of by the Contractor at an approved site.

The Contractor shall apply tack coat to all exposed pavement edges by means of hand spraying.

The asphalt concrete pavement mix shall be placed and compacted to the top of the milled notch in lifts not greater than 75 mm thick to a minimum of 96% Marshall density, or as otherwise specified. Asphalt cores taken for density testing shall be taken from the center of the notch.

The Contractor shall backfill all milled notches the same day.

3.35.5 ACCEPTANCE CRITERIA

The Work shall comply with the following for final acceptance by the Consultant:

- all milled cracks conform with the specified milling profile;
- the milling conforms to the path of the crack with no part of the crack outside or touching the edge of the milled cross-section;
- all milled cracks are filled with the proper asphalt mix;
- the asphalt mix is compacted to the required density;
- the completed work provides a smooth transition between the infilled material and the adjacent undisturbed pavement surface; and
- all milled material has been properly spread over the sideslope or disposed of and the work area left in a neat and tidy condition.

Treated cracks failing to meet these criteria shall be repaired by the Contractor at his own expense.

3.35.6 MEASUREMENT AND PAYMENT

Measurement will be in metres based on the length of cracks repaired.

Payment will be made at the unit price bid for "Crack Repair - Mill and Fill" and will be full compensation for cold milling, disposal of milled material, supplying and applying tack coat, supplying, placing and compacting the asphalt mix and all labour, equipment, tools and incidentals necessary to complete the work.

TABLE OF CONTENTS

3.50 ASPHALT CONCRETE PAVEMENT - END PRODUCT SPECIFICATION

3.50.1 GENERAL

3.50.1.1 **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.

3.50.1.2 **Definitions**

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

3.50.1.2.1 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 3.50 A, or full or reduced payment for Actual Asphalt Content as shown in Table 3.50 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 3.50 C.

(iii) Gradation - Acceptance Limit for gradation is the limiting value of the Lot Mean within which the Lot will be accepted as shown in Table 3.50 E.

3.50.1.2.2 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.

3.50.1.2.3 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.

3.50.1.2.4 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.

3.50.1.2.5 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 Consultants 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.

3.50.1.2.6 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 3.50 A, and 3.50 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 3.50 C.

(iii) Gradation - Rejection limit for gradation is the limiting value of the Lot Mean beyond which a Lot is rejected and not paid for as shown in Table 3.50 E.

3.50.1.2.7 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.

3.50.1.2.8 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.

3.50.1.2.9 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.

3.50.1.2.10 Alberta Transportation Test Procedures

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

3.50.1.2.11 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.

3.50.1.2.12 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.

3.50.1.2.13 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, except for Mix Type S1 in which case the first Lot shall be used, and;

(ii) Minimum of 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.

3.50.2 MATERIALS

3.50.2.1 **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.

3.50.2.2 **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.

3.50.2.3 **Interim Lane Markings**

The Contractor shall supply interim lane marking paint and glass beads from the list of approved products shown in the special provisions or specification amendments.

The Contractor has the option of supplying reflectorized temporary pavement markers or self-adhesive reflectorized pavement marking tape. Acceptable temporary pavement markers are shown on the Alberta Transportation Products List.

3.50.2.4 **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.

3.50.3 ASPHALT MIX DESIGN AND JOB MIX FORMULA

3.50.3.1 **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 shall have obtained pre-qualification status from the Department in the category of Mix Design - Marshall.

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.

3.50.3.2 **Requirements for Mix Design**

The asphalt mix design shall follow the Marshall method of Mix Design as outlined in design procedure TLT-301. The mix design, at the Design Asphalt Content, shall meet the requirements in Table 3.50.3.2 for the Asphalt Concrete Mix Type specified.

Table 3.50.3.2 Asphalt Concrete Mix Types and Characteristics

Mix Type	Aggregate Criteria			Marshall Mix Design Criteria							
	Top Size (mm) (Class for Des. 1 Aggregate)	% MF. -5000 (min) Note 1	% Fractures +5000 (2 faces) (min)	Marshall Stability N (min)	No. of Blows	Flow (mm)	Air Voids (%)	VMA % (min) by % Air Voids		Voids Filled with Asphalt %	Retained Stability % (min)
								3.5	4.0		
H1	16	75	98 (one face) 90	12000	75	2 to 3.5	Note 3	13.0	13.5	65-75	70
H2	12.5	70	80	11500	75	2 to 3.5	Note 3	13.5	14.0	65-75	70
M1	12.5	50	60	8000	75	2 to 3.5	Note 3	13.5	14.0	65-75	70
L1	12.5	Note 5	60	5300	50	2 to 4	Note 3,4	13.5	14.0	65-78	70
S1	10.0	Note 5	70	5300	Note 2	2 to 4	Note 3	14.5	15.0	65-78	70
S2	10.0	75	90	10000	75	2 to 3.5	Note 3	14.5	15.0	65-78	70
S3	25	Note 5	60	8000	75	2 to 4	Note 3	11.5	12.0	65-78	70

Note 1 - The Percentage of Manufactured Fines in the -5000 Portion of the Combined Aggregate.

Note 2 - Use the same number of blows as for the surface course.

Note 3 - The Design Air Voids shall be chosen as the lowest value, within the range of 3.5 to 4.0% inclusive, such that all other mix design criteria are met.

Note 4 - Air Void limits listed in Note 3 shall be reduced by 0.5% for community airports. VMA at 3.0% Air Voids shall be a minimum of 13.0%.

Note 5 - All fines manufactured by the process of crushing shall be incorporated into the mix.

Note 6 - Theoretical Film Thickness shall be as follows, depending on the specified Mix Type and Design Air Voids. The Theoretical Film Thickness value shall be established in accordance with TLT-311.

Design Air Voids	**Minimum Theoretical Film Thickness Requirements (mm)**	
	Mix Types H1, H2, M1	**Mix Type L1, S2**
4.0 and 3.9	6.0	6.5
3.7 and 3.8	6.1	6.6
3.5 and 3.6	6.2	6.7
3.3 and 3.4 (L1 for Community Airports only)	-	6.8
3.0, 3.1 and 3.2	-	6.9

3.50.3.3 **Verification of Mix Design**

The Contractor shall submit the mix design to the Consultant for verification. 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.

(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 Specification 3.2, Aggregate Production and Stockpiling.

(vi) All Marshall Mix Design characteristics, including graphs used in arriving at the final mix design, the bulk specific gravity of the combined aggregates, theoretical maximum specific gravities, and the asphalt absorption of the combined aggregates.

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

(viii) Percent uncompacted voids (Fine Aggregate Angularity) of loosely compacted minus 2500 portion of the combined aggregate in accordance with TLT-125. No minimum value specified.

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

(x) Voids table 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).

(xi) 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 charts used.

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

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 verification by the Consultant.

The Consultant may, at any time, require the Contractor to provide representative samples of each of the aggregate components, asphalt cement 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.

The Contractor shall not produce any asphalt mix prior to receiving the Consultant's written notice that the mix design has been verified. Any mix produced prior to receiving such notice will not be accpeted.

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.

3.50.3.4 **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 Marshall Air Voids, as determined by the Consultant, shall not vary from the 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.

Any change to the approved Job Mix Formula shall not result in a Theoretical Film Thickness value less than that specified in Table 3.50.3.2 Asphalt Concrete Mix types and Characteristics for the applicable Design Air Voids.

3.50.4 SAMPLING AND TESTING

3.50.4.1 **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.

3.50.4.2 **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 3.50.4.2 will be used to determine material characteristics.

TABLE 3.50.4.2
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	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 Marshall Specimens, Field Method	ATT-13
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
	ADDITIONAL TEST METHODS FOR QC ACCEPTANCE LOTS ONLY	
18	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.

3.50.4.3 **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.

If 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 three samples shall be tested for each RAP source.

Test methods, sampling and minimum frequency of testing are described in Section 3.50.4.2, Methods of Testing For Acceptance and Appeal Testing and Table 3.50.4.3, Quality Control Testing Requirements. 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 3.50.4.3
QUALITY CONTROL TESTING REQUIREMENTS - 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

TEST	STANDARD	MINIMUM FREQUENCY
5 QA Cores - Stratified Random Test Sites Chosen By The Consultant	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 Marshall Briquettes	ATT-13	-1
2 Density Immersion Method, Saturated Surface Dry	ATT-7	-1
3 Void Calculations, Cores or Formed Specimens	ATT-36	-1
4 Temperatures	ATT-30	-1
5 Percent Compaction, Cores or Nuclear Density	ATT-67, ATT-5 or ATT-11	-1
6 Random Test Site Locations	ATT-56	-1
7 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.

3.50.4.4 **Acceptance Sampling and Testing**

3.50.4.4.1 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 both 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 location for obtaining cores.

3.50.4.4.2 Acceptance Sampling and Testing Procedures

3.50.4.4.2.1 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.

3.50.4.4.2.2 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.

Smoothness testing will also be undertaken on all passing, climbing, deceleration and acceleration lanes that are greater than 100 m in length, and on all interchange ramps. Tapers will not be subject to smoothness testing.

3.50.4.4.2.3 Asphalt Mix Sampling

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

3.50.4.4.2.4 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.

3.50.4.5 **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 only be allowed on Sublots that are in penalty or reject according to the criteria contained in Table 3.50 C, 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.

3.50.4.6 **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 sieve size, as shown in Tables 3.50 D and 3.50 E and the corresponding adjustment points as shown in Table 3.50 F.

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, up to the limits shown in Table 3.2.3.1 of Specification 3.2, Aggregate Production and Stockpiling. When the Lot Mean Gradation is outside the limits of Table 3.2.3.1, the penalty assessment will be $0.20 per tonne for each Mean Adjustment Point outside those limits, regardless of the Job Mix Formula tolerance. If the maximum deviation shown in Table 3.50 E is exceeded, the lot is rejected.

When the Lot Mean Gradation for all sieve sizes is within the Job Mix Formula tolerance and within the limits of Table 3.2.3.1 and individual test results for each sieve size are within the allowable range shown in Table 3.50 D, a bonus of $0.10 per tonne will be applied.

3.50.4.7 **Pavement Segregation Requirements**

3.50.4.7.1 General

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

3.50.4.7.2 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 $0.1 m^2$ 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".

3.50.4.7.3 Inspections for Pavement Segregation

3.50.4.7.3.1 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.

3.50.4.7.3.2 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 3.50.4.7.4 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.

3.50.4.7.4 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 3.50.6.3 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.

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

3.50.4.8.1 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 3.50.4.4.2. 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.

3.50.4.8.2 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.

3.50.4.8.3 Segregation Rating

The Contractor may appeal the segregation rating in any portion of the Work or the entire project for lane.km(s) that are not in bonus.

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 a written segregation assessment. The written notice shall detail the lane·km (s) and nature of the appeal.

(ii) The Department will determine a representative sample of the portion of the Work appealed, and will reassess this area. Generally, this reassessment will be completed within 1 week of the Consultant's receipt of the written notice of appeal.

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

3.50.4.8.4 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).

3.50.4.8.5 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.

3.50.4.8.6 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 the appealed work is reduced by an amount of $1,000 or greater, the cost of the reassessment will be borne by the Department.

If there is no change to the overall payment adjustment or if the overall payment is decreased by an amount less than $1,000 or if the overall payment adjustment is increased, the Contractor will be charged an amount of $3,500.00 for the appeal.

3.50.5 CONSTRUCTION

3.50.5.1 **Equipment**

3.50.5.1.1 General

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

3.50.5.1.2 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.

3.50.5.1.3 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 asphalts, as recommended in writing by the asphalt supplier.

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

3.50.5.2 **Preparation of Existing Surface**

3.50.5.2.1 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.

3.50.5.2.2 Preliminary Levelling

Areas that require preliminary levelling will be as shown on the plans or as identified in the field 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.

Pavement lifts that are specified, or shown on the plans, with designated lift thickness less than 20 mm shall be considered as preliminary levelling and shall be placed using a paver. Preliminary levelling not specified to be placed using a paver lift shall be spread using a motor grader or other methods approved by the Consultant. All of the following shall apply for acceptance:

(i) if the material type for preliminary levelling is not specified or shown on the plans it shall be the same designation and class as specified for the subsequent lift of asphalt concrete pavement;

(ii) regardless of how the asphalt mix is spread, a minimum of one pneumatic tired roller shall be used for compaction, and a minimum density of 91.0% of the Marshall density, as determined by the Consultant, is required;

(iii) 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.

For the purposes of determining the unit price adjustments listed in Table 3.50 A and lump sum sublot assessments listed in Table 3.50 C, preliminary levelling is not considered to be a lift.

3.50.5.2.3 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 CB6-3.50 M16. 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.

3.50.5.3 **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.

3.50.5.4 **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.

(e) The minimum lift thickness for any lift using a Mix type S3 shall be 50 mm.

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.

3.50.5.5 **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.

3.50.5.6 **Compacting the Mix**

All asphalt mix, including those areas of the mat which are excluded from testing as noted in Section 3.50.4.4.2, 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.

3.50.5.7 **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.

3.50.5.8 **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 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.

3.50.5.9 **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.

3.50.6 END PRODUCT ACCEPTANCE OR REJECTION

3.50.6.1 **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.

3.50.6.2 **End Product Acceptance**

3.50.6.2.1 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) The Lot Mean for density of the compacted mix in the Lot is not in penalty or reject according to the criteria outlined in Table 3.50 A.

(ii) 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.

(iii) for smoothness, full payment will occur if the Profile Index of all Sublots in the Lot in the top lift of pavement are not in penalty or reject according to the criteria outlined in Table 3.50 .

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

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

(v) 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 3.50 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.

3.50.6.2.2 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 ?, Measurement and Payment.

3.50.6.3 **End Product Rejection**

If the Lot Mean for Density, Actual Asphalt Content or Gradation 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 3.50.4.7, 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 3.50.1.2 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 the lesser of 40 mm or the design lift thickness of the defective material.

3.50.7 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.

3.50.7.1 **Asphalt Concrete Pavement - EPS**

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 - EPS" 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.

3.50.7.1.1 Pay For Acceptable Work

The following end product properties of "Asphalt Concrete Pavement - EPS" will be measured for acceptance in accordance with Section 3.50.4.4, Acceptance Sampling and Testing.

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

For the Density, Actual Asphalt Content and Gradation of a Lot to be acceptable, the Lot Means must be within the acceptance limits shown in Tables 3.50 A, 3.50 B and 3.50 E respectively.

For each Lot, the unit price adjustments for Density and Actual Asphalt Content will be the amounts shown in Tables 3.50 A and 3.50 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 3.50.4.6, Aggregate Gradation Adjustments.

The Unit Price applicable to each Lot quantity of "Asphalt Concrete Pavement - EPS" 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 3.50 C. For each Sublot in the top lift of ACP, the penalty assessment for Smoothness will be the amounts shown in Table 3.50 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-EPS.

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.

3.50.7.1.2 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.

3.50.7.1.3 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 3.50 C and will be based on Profilograph tests following any corrective action taken by the Contractor.

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.

If bumps or dips are treated by the Contractor prior to Profilograph tests by the Consultant, such defects will be considered greater than 8 mm and will be assessed as a $300 penalty for each individual bump or dip.

(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.

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

Repair of failed areas in existing surfaces as identified under Section 3.50.5.2 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.

3.50.7.3 **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.

3.50.7.4 **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.

3.50.7.5 **Preliminary Levelling**

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

3.50.7.6 **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.

3.50.7.7 **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 3.50 A
UNIT PRICE ADJUSTMENT FOR DENSITY

% of Marshall Density	UNIT PRICE ADJUSTMENT - DOLLARS PER TONNE				
Lot Mean	**DESIGN LIFT THICKNESS**				
	35 MM OR GREATER LOWER LIFTS	**LESS THAN 35 MM AND GREATER THAN 20 MM LOWER LIFTS**	**20 MM LOWER LIFTS**	**35 MM OR GREATER TOP LIFT ONLY**	**LESS THAN 35 MM AND GREATER THAN 20 MM TOP LIFT ONLY**
$ 98.0	+ 0.50	+ 0.50	+ 0.50	+ 0.50	+ 0.50
97.9	+ 0.45	+ 0.45	+ 0.45	+ 0.45	+ 0.45
97.8	+ 0.40	+ 0.40	+ 0.40	+ 0.40	+ 0.40
97.7	+ 0.35	+ 0.35	+ 0.35	+ 0.35	+ 0.35
97.6	+ 0.30	+ 0.30	+ 0.30	+ 0.30	+ 0.30
97.5	+ 0.25	+ 0.25	+ 0.25	+ 0.25	+ 0.25
97.4	+ 0.20	+ 0.20	+ 0.20	+ 0.20	+ 0.20
97.3	+ 0.15	+ 0.15	+ 0.15	+ 0.15	+ 0.15
97.2	+ 0.10	+ 0.10	+ 0.10	+ 0.10	+ 0.10
97.1	+ 0.05	+ 0.05	+ 0.05	+ 0.05	+ 0.05
97.0	0.00	0.00	0.00	0.00	0.00
96.9	-0.10	0.00	0.00	-0.10	0.00
96.8	-0.20	0.00	0.00	-0.20	0.00
96.7	-0.30	0.00	0.00	-0.30	0.00
96.6	-0.40	0.00	0.00	-0.40	0.00
96.5	-0.50	0.00	0.00	-0.50	0.00
96.4	-0.60	0.00	0.00	-0.60	0.00
96.3	-0.70	0.00	0.00	-0.70	0.00
96.2	-0.80	0.00	0.00	-0.80	0.00
96.1	-0.90	0.00	0.00	-0.90	0.00
96.0	-1.00	0.00	0.00	-1.00	0.00
95.9	-1.10	0.00	0.00	-1.10	-0.10
95.8	-1.20	0.00	0.00	-1.20	-0.20
95.7	-1.30	0.00	0.00	-1.30	-0.30
95.6	-1.40	0.00	0.00	-1.40	-0.40
95.5	-1.50	0.00	0.00	-1.50	-0.50
95.4	-1.60	0.00	0.00	-1.60	-0.60
95.3	-1.70	0.00	0.00	-1.70	-0.70
95.2	-1.80	0.00	0.00	-1.80	-0.80
95.1	-1.90	0.00	0.00	-1.90	-0.90
95.0	-2.00	0.00	0.00	-2.00	-1.00
94.9	-2.20	0.00	0.00	-2.20	-1.10
94.8	-2.40	0.00	0.00	-2.40	-1.20
94.7	-2.60	0.00	0.00	-2.60	-1.30
94.6	-2.80	0.00	0.00	-2.80	-1.40
94.5	-3.00	0.00	0.00	-3.00	-1.50
94.4	-3.20	0.00	0.00	-3.20	-1.60
94.3	-3.40	0.00	0.00	-3.40	-1.70
94.2	-3.60	0.00	0.00	-3.60	-1.80
94.1	-3.80	0.00	0.00	-3.80	-1.90
94.0	-4.00	0.00	0.00	-4.00	-2.00
93.9	**50% of Unit Price**	-0.10	0.00	**Overlay or R. & R.**	-2.20
93.8	50% of Unit Price	-0.20	0.00	Overlay or Rm.&Rp.	-2.40
93.7	50% of Unit Price	-0.30	0.00	Overlay or Rm.&Rp.	-2.60
93.6	50% of Unit Price	-0.40	0.00	Overlay or Rm.&Rp.	-2.80
93.5	50% of Unit Price	-0.50	0.00	Overlay or Rm.&Rp.	-3.00
93.4	50% of Unit Price	-0.60	0.00	Overlay or Rm.&Rp.	-3.20

TABLE 3.50 A
UNIT PRICE ADJUSTMENT FOR DENSITY

% of Marshall Density	UNIT PRICE ADJUSTMENT - DOLLARS PER TONNE				
Lot Mean	DESIGN LIFT THICKNESS				
	35 MM OR GREATER LOWER LIFTS	LESS THAN 35 MM AND GREATER THAN 20 MM LOWER LIFTS	20 MM LOWER LIFTS	35 MM OR GREATER TOP LIFT ONLY	LESS THAN 35 MM AND GREATER THAN 20 MM TOP LIFT ONLY
93.3	50% of Unit Price	-0.70	0.00	Overlay or Rm.&Rp.	-3.40
93.2	50% of Unit Price	-0.80	0.00	Overlay or Rm.&Rp.	-3.60
93.1	50% of Unit Price	-0.90	0.00	Overlay or Rm.&Rp.	-3.80
93.0	50% of Unit Price	-1.00	0.00	Overlay or Rm.&Rp.	-4.00
92.9	50% of Unit Price	-1.10	-0.10	Overlay or Rm.&Rp.	-4.20
92.8	50% of Unit Price	-1.20	-0.20	Overlay or Rm.&Rp.	-4.40
92.7	50% of Unit Price	-1.30	-0.30	Overlay or Rm.&Rp.	-4.60
92.6	50% of Unit Price	-1.40	-0.40	Overlay or Rm.&Rp.	-4.80
92.5	50% of Unit Price	-1.50	-0.50	Overlay or Rm.&Rp.	-5.00
92.4	50% of Unit Price	-1.60	-0.60	Overlay or Rm.&Rp.	-5.20
92.3	50% of Unit Price	-1.70	-0.70	Overlay or Rm.&Rp.	-5.40
92.2	50% of Unit Price	-1.80	-0.80	Overlay or Rm.&Rp.	-5.60
92.1	50% of Unit Price	-1.90	-0.90	Overlay or Rm.&Rp.	-5.80
92.0	50% of Unit Price	-2.00	-1.00	Overlay or Rm.&Rp.	-6.00
91.9	50% of Unit Price	-2.20	-1.10	**Remove & Replace**	-6.20
91.8	50% of Unit Price	-2.40	-1.20	Remove & Replace	-6.40
91.7	50% of Unit Price	-2.60	-1.30	Remove & Replace	-6.60
91.6	50% of Unit Price	-2.80	-1.40	Remove & Replace	-6.80
91.5	50% of Unit Price	-3.00	-1.50	Remove & Replace	-7.00
91.4	50% of Unit Price	-3.20	-1.60	Remove & Replace	-7.20
91.3	50% of Unit Price	-3.40	-1.70	Remove & Replace	-7.40
91.2	50% of Unit Price	-3.60	-1.80	Remove & Replace	-7.60
91.1	50% of Unit Price	-3.80	-1.90	Remove & Replace	-7.80
91.0	50% of Unit Price	-4.00	-2.00	Remove & Replace	-8.00
90.9	**Remove & Replace**	**50% of Unit Price**	-2.20	Remove & Replace	**50% of Unit Price**
90.8	Remove & Replace	50% of Unit Price	-2.40	Remove & Replace	50% of Unit Price
90.7	Remove & Replace	50% of Unit Price	-2.60	Remove & Replace	50% of Unit Price
90.6	Remove & Replace	50% of Unit Price	-2.80	Remove & Replace	50% of Unit Price
90.5	Remove & Replace	50% of Unit Price	-3.00	Remove & Replace	50% of Unit Price
90.4	Remove & Replace	50% of Unit Price	-3.20	Remove & Replace	50% of Unit Price
90.3	Remove & Replace	50% of Unit Price	-3.40	Remove & Replace	50% of Unit Price
90.2	Remove & Replace	50% of Unit Price	-3.60	Remove & Replace	50% of Unit Price
90.1	Remove & Replace	50% of Unit Price	-3.80	Remove & Replace	50% of Unit Price
90.0	Remove & Replace	50% of Unit Price	-4.00	Remove & Replace	50% of Unit Price
89.9	Remove & Replace	**Remove & Replace**	**50% of Unit Price**	Remove & Replace	**Overlay or R. & R.**
89.8	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
89.7	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
89.6	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
89.5	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
89.4	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
89.3	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
89.2	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
89.1	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
89.0	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
88.9	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
88.8	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
88.7	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.

TABLE 3.50 A
UNIT PRICE ADJUSTMENT FOR DENSITY

% of Marshall Density	UNIT PRICE ADJUSTMENT - DOLLARS PER TONNE				
Lot Mean	DESIGN LIFT THICKNESS				
	35 MM OR GREATER LOWER LIFTS	LESS THAN 35 MM AND GREATER THAN 20 MM LOWER LIFTS	20 MM LOWER LIFTS	35 MM OR GREATER TOP LIFT ONLY	LESS THAN 35 MM AND GREATER THAN 20 MM TOP LIFT ONLY
88.6	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
88.5	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
88.4	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
88.3	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
88.2	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
88.1	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
88.0	Remove & Replace	Remove & Replace	50% of Unit Price	Remove & Replace	Overlay or Rm.&Rp.
# 87.9	Remove & Replace	Remove & Replace	**Remove & Replace**	Remove & Replace	Overlay or Rm.&Rp.

Notes: 1 - Single Lifts Only are considered as a Top Lift; 2 - Preliminary Levelling is not considered as a Lift.

TABLE 3.50 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	0	0	0
From 0.31 to 0.35	-1.1	-0.9	-1.1	-0.9
From 0.36 to 0.40	-2.2	-1.8	-2.2	-1.8
From 0.41 to 0.45	-3.3	-2.7	-3.3	-2.7
From 0.46 to 0.50	-4.4	-3.6	-4.4	-3.6
From 0.51 to 0.55			-5.5	-4.5
From 0.56 to 0.60			-6.6	-5.4
From 0.61 to 0.65			-7.7	-6.3

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 3.50 C
LUMP SUM SUBLOT ASSESSMENT FOR SMOOTHNESS

PrI	Assessment for Smoothness of Top Lift $ per Sublot Lump Sum		
	Multilift	Single Lift with Design Lift Thickness Greater Than or Equal to 35 mm	Curb and Gutter or Single Lift with Design Lift Thickness Less Than 35 mm.
0	25	25	25
>0 and 10 or less	0	0	0
11	-40	0	0
12	-65	0	0
13	-90	0	0
14	-115	0	0
15	-140	0	0
16	-165	-40	0
17	-190	-80	0
18	-215	-120	0
19	-240	-160	0
20	-265	-200	0
21	-290	-240	0
22	-315	-280	0
23	-340	-320	-40
24	REJECT	REJECT	-80
25	"	"	-120
26	"	"	-160
27	"	"	-200
28	"	"	-240
29	"	"	-280
30	"	"	-320
Greater than 30	"	"	REJECT[1]

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 and Hot In-Place Recycling. Design lift thickness for inlay and Hot In-Place Recycling shall be equal to the design depth of treatment.

Note 1 - Sublot may be accepted by the Department with an assessement of -$400 if the posted speed limit is less than 70 km per hour.

TABLE 3.50 D

GRADATION 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] 20000, 16000, 12500 10000, 5000	1250	630	315	160	80
Tolerances for the Lot Mean from the Job Mix Formula	+/-5	+/-3	+/-2	+/-2	+/-1.5	+/-1.5
Maximum Range Between Individual Test Results in a Lot	10	6	5	4	3	3

[1] Note: Include all sieves up to one size smaller than topsize.

TABLE 3.50 E

MAXIMUM DEVIATION FOR THE LOT MEAN FROM THE GRADATION LIMITS SPECIFIED IN TABLE 3.2.3.1 OF SPECIFICATION 3.2, AGGREGATE PRODUCTION AND STOCKPILING

CHARACTERISTIC	SIEVE SIZE Fm		
	[1] 20000 16000 12500 10000	5000 1250 630 315	160 80
Maximum Deviation for the Lot Mean from Specification 3.2 Gradation Limits	2	1	0.5

[1] Note: Include all sieves up to one size smaller than topsize.

TABLE 3.50 F

ADJUSTMENT POINTS FOR DEVIATIONS IN GRADATION BEYOND THE REQUIREMENTS IN TABLE 3.50 D

SIEVE SIZE Fm	MEAN
[1] 20000, 16000, 12500, 10000, 5000	5 for each 1% Deviation
1250	1 for each 1% Deviation
630	2 for each 1% Deviation
315	2 for each 1% Deviation
160	0.2 for each 0.1% 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 up to one size smaller than topsize.

Lot Mean Adjustment points will be calculated for each Lot. A Lot Gradation Price Adjustment per tonne will be applied based on the following formula, if the Lot Mean does not exceed the requirements in Table 3.50 E.

PAg = (A x -$0.02) + (B x -$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 Specification 3.2
B = Mean Adjustment Points assessed outside the gradation limits specified in Specification 3.2.
Bonus = +$0.10 when there are no Mean Adjustment Points and the maximum range as shown in Table 3.50 D, is not exceeded for any sieve size in the Lot.

TABLE OF CONTENTS

3.52 MILLED RUMBLE STRIPS

3.52.1 GENERAL

This specification covers the construction of milled rumble strips on the shoulders of roadways to alert drivers when they leave the travel lanes and across the travel lanes to alert drivers of an upcoming stop condition.

3.52.2 EQUIPMENT

3.52.2.1 **General**

The Contractor shall provide all equipment necessary for completion of the Work.

3.52.2.2 **Milling Machine**

The milling machine shall be equipped to meet or exceed the following requirements:

(i) For milling of shoulder strips, the cutting head shall be capable of producing grooves meeting the requirements as shown on Dwg. No. CB6-3.52M1 or CB6-3.52M2 as applicable.

For milling of rumble strips for stop conditions, the cutting head shall be capable of producing grooves meeting the requirements as shown on Dwg. No. CB6-3.52M3.

(ii) The machine shall either be equipped with an integral sweeping device mounted directly behind the cutter or,

a separate sweeping operation shall be conducted as construction of the rumble strips progresses within the signed construction zone.

3.52.3 CONSTRUCTION

3.52.3.1 **General**

All work shall be performed during daylight hours only. No Work shall be performed if the visibility is less than 700 metres. The maximum work area shall be 4 kilometres in length.

The Contractor shall supply a sequential arrowboard in accordance with Specification 1.2, General.

3.52.3.2 **Construction of Milled Rumble Strips**

For milling of shoulder strips, the Contractor has the option of choosing either the intermittent typical layout or the continuous typical layout for milled rumble strips. The Contractor shall construct milled rumble strips as shown on either Drawing CB6-3.52M1 - Typical Layout for Continuous Milled Rumble Strips for Shoulders or CB6-3.52M2 - Typical Layout for Intermittent Milled Rumble Strips for Shoulders.

When required, the Contractor shall construct milled rumble strips for stop conditions as shown on Drawing CB6-3.52M3 - Typical Layout for Milled Rumble Strips for Stop Conditions. Due to space constraints, it may not be possible to construct all of the strips at some intersections. In these cases, the Contractor shall construct the number of strips as shown in the special provisions or as directed by the

Consultant.

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

After milling the grooves, the Contractor shall pickup and dispose of all detritus created from the milling operation.

Patterns of milled rumble strips constructed outside the tolerances as shown on the plans or exhibiting obvious defects will be rejected, and the Contractor shall be responsible for repairing the unacceptable work.

3.52.4 MEASUREMENT AND PAYMENT

3.52.4.1 **Milled Rumble Strips**

Measurement of milled rumble strips 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 milled rumble strips have been constructed.

Payment will be made at the unit price bid per kilometre per side for "Milled Rumble Strips." Payment will be the same for either the continuous or intermittent layout pattern. This payment will be full compensation for constructing the milled rumble strips, removing and disposing of all debris and traffic accommodation.

3.52.4.2 **Milled Rumble Strips for Stop Conditions**

Milled Rumble strips for stop conditions will be measured by the set as the total of all completed strips at each stop location.

Payment will be made at the unit price bid per set for "Milled Rumble Strips for Stop Conditions". This payment will be full compensation for constructing the milled rumble strips, removing and disposing of all debris and traffic accommodation.

TABLE OF CONTENTS

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) Minimum of 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

Sieve Size (Fm)	Nominal Maximum Size (mm)		
	10.0	**12.5**	**20.0**
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
<1.0	-/60	40	10	40		
1.0 to <3	75/-70	45	10	45		
3 to <6	85/80	45	10	45		
6 to < 10	95/90	45	10	45		
10 to < 20	95/90	45	10	45		
$ 20	95/90	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 from the list of approved products shown in the special provisions or specification amendments.

The Contractor has the option of supplying reflectorized temporary pavement markers or self-adhesive reflectorized pavement marking tape. Acceptable temporary pavement markers are shown on the Alberta Transportation Products List.

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

"1" - for $< 1.0 \times 10^6$ ESALs
"3" - for ≥ 1.0 and $< 3.0 \times 10^6$ ESALs
"6" - for ≥ 3.0 and $< 6.0 \times 10^6$ ESALs
"10" - for ≥ 6.0 and $< 10 \times 10^6$ ESALs
"20" - for ≥ 10 and $< 20 \times 10^6$ ESALs
"100" - for $> 20 \times 10^6$ 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 1.0 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}	$N_{maximum}$		
3.0	90.5	= 96	< 98	4	65 - 78
3.0 to > 10	< 89	= 96	< 98	4	65 - 75[2]
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}	$N_{maximum}$
<3	7	75	115
3 to < 20	8	100	160
$ 20	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 table 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	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 three 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 Consultant	ATT-56	One per segment for each Lot.
i) QA Cores for Pavement Density	ATT-5	One per segment for selected Lots as directed by the Consultant.
ii) QA Cores for Asphalt Content and Gradation	ATT-5	
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

TEST	STANDARD	MINIMUM FREQUENCY
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)
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.

Smoothness testing will also be undertaken on all passing, climbing, deceleration and acceleration lanes that are greater than 100 m in length, and on all interchange ramps. Tapers will not be subject to smoothness testing.

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 only be allowed on Sublots that are in penalty or reject according to the criteria contained in Table 3.53 C, 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 for lane.km(s) that are not in bonus.

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 as shown on the plans or as identified in the field 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.

Pavement lifts that are specified, or shown on the plans, with designated lift thickness less than 20 mm shall be considered as preliminary levelling and shall be placed using a paver. Preliminary levelling not specified to be placed using a paver lift shall be spread using a motor grader or other methods approved by the Consultant. All of the following shall apply for acceptance:

(i) if the material type for preliminary levelling is not specified or shown on the plans it shall be the same designation and class as specified for the subsequent lift of asphalt concrete pavement;

(ii) regardless of how the asphalt mix is spread, a minimum of one pneumatic tired roller shall be used for compaction, and a minimum density of 91.0% of the Marshall density, as determined by the Consultant, is required;

(iii) 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.

For the purposes of determining the unit price adjustments listed in Table 3.53 A and lump sum sublot assessments listed in Table 3.53 C, preliminary levelling is not considered to be a lift.

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 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) The Lot Mean for density of the compacted mix in the Lot is not in penalty or reject according to the criteria outlined in Table 3.53 A.

(ii) 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.

(iii) for smoothness, full payment will occur if the Profile Index of all Sublots in the Lot in the top lift of pavement are not in penalty or reject according to the criteria outlined in Table 3.53 C.

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

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

(v) 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 the lesser of 40 mm or the design lift thickness of the defective material.

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** LOWER LIFTS	**LESS THAN 35 MM AND GREATER THAN 20 MM** LOWER LIFTS	**20 MM** LOWER LIFTS	**35 MM OR GREATER** TOP LIFT ONLY
$ 94.0	+ 0.50	+ 0.50	+ 0.50	+ 0.50
93.9	+ 0.45	+ 0.45	+ 0.45	+ 0.45
93.8	+ 0.40	+ 0.40	+ 0.40	+ 0.40
93.7	+ 0.35	+ 0.35	+ 0.35	+ 0.35
93.6	+ 0.30	+ 0.30	+ 0.30	+ 0.30
93.5	+ 0.25	+ 0.25	+ 0.25	+ 0.25
93.4	+ 0.20	+ 0.20	+ 0.20	+ 0.20
93.3	+ 0.15	+ 0.15	+ 0.15	+ 0.15
93.2	+ 0.10	+ 0.10	+ 0.10	+ 0.10
93.1	+ 0.05	+ 0.05	+ 0.05	+ 0.05
93.0	0.00	0.00	0.00	0.00
92.9	- 0.10	0.00	0.00	- 0.10
92.8	- 0.20	0.00	0.00	- 0.20
92.7	- 0.30	0.00	0.00	- 0.30
92.6	- 0.40	0.00	0.00	- 0.40
92.5	- 0.50	0.00	0.00	- 0.50
92.4	- 0.60	0.00	0.00	- 0.60
92.3	- 0.70	0.00	0.00	- 0.70
92.2	- 0.80	0.00	0.00	- 0.80
92.1	- 0.90	0.00	0.00	- 0.90
92.0	- 1.00	0.00	0.00	- 1.00
91.9	- 1.10	0.00	0.00	- 1.10
91.8	- 1.20	0.00	0.00	- 1.20
91.7	- 1.30	0.00	0.00	- 1.30
91.6	- 1.40	0.00	0.00	- 1.40
91.5	- 1.50	0.00	0.00	- 1.50
91.4	- 1.60	0.00	0.00	- 1.60
91.3	- 1.70	0.00	0.00	- 1.70
91.2	- 1.80	0.00	0.00	- 1.80
91.1	- 1.90	0.00	0.00	- 1.90
91.0	- 2.00	0.00	0.00	- 2.00
90.9	- 2.20	0.00	0.00	- 2.20
90.8	- 2.40	0.00	0.00	- 2.40
90.7	- 2.60	0.00	0.00	- 2.60
90.6	- 2.80	0.00	0.00	- 2.80
90.5	- 3.00	0.00	0.00	- 3.00
90.4	- 3.20	0.00	0.00	- 3.20
90.3	- 3.40	0.00	0.00	- 3.40
90.2	- 3.60	0.00	0.00	- 3.60
90.1	- 3.80	0.00	0.00	- 3.80
90.0	- 4.00	0.00	0.00	- 4.00
89.9	**50% OF UNIT PRICE**	- 0.10	0.00	**OVERLAY OR RM. & RP.**
89.8	50% OF UNIT PRICE	- 0.20	0.00	OVERLAY OR RM. & RP.
89.7	50% OF UNIT PRICE	- 0.30	0.00	OVERLAY OR RM. & RP.
89.6	50% OF UNIT PRICE	- 0.40	0.00	OVERLAY OR RM. & RP.

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 LOWER LIFTS	LESS THAN 35 MM AND GREATER THAN 20 MM LOWER LIFTS	20 MM LOWER LIFTS	35 MM OR GREATER TOP LIFT ONLY
89.5	50% OF UNIT PRICE	- 0.50	0.00	OVERLAY OR RM. & RP.
89.4	50% OF UNIT PRICE	- 0.60	0.00	OVERLAY OR RM. & RP.
89.3	50% OF UNIT PRICE	- 0.70	0.00	OVERLAY OR RM. & RP.
89.2	50% OF UNIT PRICE	- 0.80	0.00	OVERLAY OR RM. & RP.
89.1	50% OF UNIT PRICE	- 0.90	0.00	OVERLAY OR RM. & RP.
89.0	50% OF UNIT PRICE	- 1.00	0.00	OVERLAY OR RM. & RP.
88.9	50% OF UNIT PRICE	- 1.10	-0.10	OVERLAY OR RM. & RP.
88.8	50% OF UNIT PRICE	- 1.20	-0.20	OVERLAY OR RM. & RP.
88.7	50% OF UNIT PRICE	- 1.30	-0.30	OVERLAY OR RM. & RP.
88.6	50% OF UNIT PRICE	- 1.40	-0.40	OVERLAY OR RM. & RP.
88.5	50% OF UNIT PRICE	- 1.50	-0.50	OVERLAY OR RM. & RP.
88.4	50% OF UNIT PRICE	- 1.60	-0.60	OVERLAY OR RM. & RP.
88.3	50% OF UNIT PRICE	- 1.70	-0.70	OVERLAY OR RM. & RP.
88.2	50% OF UNIT PRICE	- 1.80	-0.80	OVERLAY OR RM. & RP.
88.1	50% OF UNIT PRICE	- 1.90	-0.90	OVERLAY OR RM. & RP.
88.0	50% OF UNIT PRICE	- 2.00	-1.00	OVERLAY OR RM. & RP.
87.9	50% OF UNIT PRICE	- 2.20	-1.10	**REMOVE & REPLACE**
87.8	50% OF UNIT PRICE	- 2.40	-1.20	REMOVE & REPLACE
87.7	50% OF UNIT PRICE	- 2.60	-1.30	REMOVE & REPLACE
87.6	50% OF UNIT PRICE	- 2.80	-1.40	REMOVE & REPLACE
87.5	50% OF UNIT PRICE	- 3.00	-1.50	REMOVE & REPLACE
87.4	50% OF UNIT PRICE	- 3.20	-1.60	REMOVE & REPLACE
87.3	50% OF UNIT PRICE	- 3.40	-1.70	REMOVE & REPLACE
87.2	50% OF UNIT PRICE	- 3.60	-1.80	REMOVE & REPLACE
87.1	50% OF UNIT PRICE	- 3.80	-1.90	REMOVE & REPLACE
87.0	**REMOVE & REPLACE**	- 4.00	-2.00	REMOVE & REPLACE
86.9	REMOVE & REPLACE	**50% OF UNIT PRICE**	-2.20	REMOVE & REPLACE
86.8	REMOVE & REPLACE	50% OF UNIT PRICE	-2.40	REMOVE & REPLACE
86.7	REMOVE & REPLACE	50% OF UNIT PRICE	-2.60	REMOVE & REPLACE
86.6	REMOVE & REPLACE	50% OF UNIT PRICE	-2.80	REMOVE & REPLACE
86.5	REMOVE & REPLACE	50% OF UNIT PRICE	-3.00	REMOVE & REPLACE
86.4	REMOVE & REPLACE	50% OF UNIT PRICE	-3.20	REMOVE & REPLACE
86.3	REMOVE & REPLACE	50% OF UNIT PRICE	-3.40	REMOVE & REPLACE
86.2	REMOVE & REPLACE	50% OF UNIT PRICE	-3.60	REMOVE & REPLACE
86.1	REMOVE & REPLACE	50% OF UNIT PRICE	-3.80	REMOVE & REPLACE
86.0	REMOVE & REPLACE	50% OF UNIT PRICE	-4.00	REMOVE & REPLACE
85.9	REMOVE & REPLACE	**REMOVE & REPLACE**	**50% OF UNIT PRICE**	REMOVE & REPLACE
85.8	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
85.7	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
85.6	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
85.5	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
85.4	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
85.3	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
85.2	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
85.1	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE

Table 3.53 A
UNIT PRICE ADJUSTMENT FOR DENSITY

% of Maximum Specific Gravity	UNIT PRICE ADJUSTMENT - DOLLARS PER TONNE			
Lot Mean	**DESIGN LIFT THICKNESS**			
	35 MM OR GREATER LOWER LIFTS	**LESS THAN 35 MM AND GREATER THAN 20 MM LOWER LIFTS**	**20 MM LOWER LIFTS**	**35 MM OR GREATER TOP LIFT ONLY**
85.0	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
84.9	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
84.8	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
84.7	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
84.6	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
84.5	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
84.4	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
84.3	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
84.2	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
84.1	REMOVE & REPLACE	REMOVE & REPLACE	50% OF UNIT PRICE	REMOVE & REPLACE
# 84.0	REMOVE & REPLACE	REMOVE & REPLACE	**REMOVE &REPLACE**	REMOVE & REPLACE

Notes: 1 - Single Lifts Only are considered as a Top Lift;
2 - Preliminary Levelling is not considered as a Lift.

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	Assessment for Smoothness of Top Lift $ per Sublot Lump Sum		
	Multilift	Single Lift with Design Lift Thickness Greater Than or Equal to 35 mm	Curb and Gutter or Single Lift with Design Lift Thickness Less Than 35 mm.
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[1]

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. Design lift thickness for inlay shall be equal to the design depth of treatment.

Note 1 - Sublot may be accepted by the Department with an assessement of -$400 if the posted speed limit is less than 70 km per hour.

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.

TABLE OF CONTENTS

4.1 ASPHALT CURB, MEDIANS, TRAFFIC ISLANDS AND FLUMES

4.1.1 GENERAL

4.1.1.1 **Description**

This work shall consist of the construction of asphalt curbs, medians, traffic islands and flumes, using well graded crushed aggregate, and asphalt cement, combined as hereinafter specified, placed and compacted on a prepared base, in conformity with lines, grade and cross-section as shown on the plans herein, at specified locations or as directed by the Consultant.

4.1.2 MATERIALS

4.1.2.1 **General**

All materials necessary for the construction of the works described herein shall be supplied by the Contractor.

4.1.2.2 **Aggregate**

The Contractor shall produce crushed aggregate in accordance with Specification 3.2, Aggregate Production and Stockpiling. Unless otherwise specified or directed by the Consultant, aggregate shall meet the requirements for Designation 1 Class 12.5 material. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate and haul aggregate in accordance with Specification 4.5, Hauling.

4.1.2.3 **Asphalt**

The Contractor shall supply asphalt in accordance with Specification 5.7, Supply of Asphalt. The type and grade of asphalt shall be as specified in Section 4.1.2.4, Asphalt Mix Design.

Asphalt used for tack coats shall be of the type and grade designated by the Consultant.

4.1.2.4 **Asphalt Mix Design**

The asphalt mix design shall be prepared and submitted according to the requirements of Section 3.50.3, Asphalt Mix Design and Job Mix Formula. Unless otherwise specified, a Mix Type 7 shall be designed with the following changes:

(i) 150-200A or 200-300A asphalt cement grade shall be used in place of 300-400A grade.
(ii) Design Air Voids shall be 3%.

4.1.3 CONSTRUCTION

4.1.3.1 **Preparation of Surface for Asphalt Curbs**

Before placing asphalt curbs, the existing surface in the curb locations shall be cleaned of all foreign, loose or deleterious material. All broken or defective areas in the locations shall be repaired by removing the broken and defective material and replacing it with asphalt concrete patching material as directed by the Consultant.

An asphalt tack coat shall be uniformly applied at the location, rate, temperature, and to the dimensions as approved by the Consultant. The surface to be tacked shall be dry and free from loose or deleterious material when the tack coat is applied.

Following the curing of the asphalt tack coat, depressions shall be eliminated by placing asphalt concrete levelling patches at the locations and to the dimensions designated by the Consultant.

The asphalt concrete material used for patching and levelling shall conform to, and be placed in accordance with, the requirements of Specification 3.50, Asphalt Concrete Pavement-EPS, using the designation and class of aggregate specified or directed by the Consultant. The patching and levelling shall be performed in such a way as to result in a surface which is tight, neat, uniform, and well bonded to the underlying surface. The patched and levelled areas shall be fully compacted so that the final surface is flush with the surrounding surface, and does not pond water when asphalt curb construction is complete.

An asphalt tack coat shall be applied to levelled and patched areas as directed by the Consultant.

4.1.3.2 **Mixing and Placing Asphalt Curb Material**

The bituminous mixture shall be produced, transported, and placed in accordance with the requirements of Specification 3.50, Asphalt Concrete Pavement-EPS.

Mix temperatures shall be sufficiently high to enable adequate mixing and compaction, but shall not be so high as to cause asphalt damage or curb instability.

The placing, compacting and finishing of asphalt curbs shall be accomplished by use of a mechanical curb machine of a type approved by the Consultant. The bituminous mixture shall be laid only upon a dry, clean surface, on which the tack coat has fully cured and under weather conditions acceptable to the Consultant.

Curb shall be placed in a continuous, one step operation, in one direction, with a minimum number of joints. Where joints are absolutely necessary, they shall be constructed so that they are virtually indistinguishable from the adjacent curb. Cold joints shall be tacked before new material is placed against them.

The finished asphalt curb shall be true to alignment and cross-section, thoroughly compacted, and shall have a smooth, tight, uniform surface texture which is free from segregation, defects, blemishes or other irregularities.

4.1.3.3 **Gravel Fill for Asphalt Curb, Medians and Traffic Islands**

Median fill gravel shall be placed within the asphalt curbs forming the outside perimeter of medians and traffic islands, and shall be thoroughly compacted in layers not exceeding 150 mm in depth, to a tight, smooth surface within 50 mm of the top of the curbs, or as otherwise specified.

4.1.3.4 **Median Surfacing**

The compacted gravel fill within medians and traffic islands shall be surfaced with asphalt concrete material in accordance with the requirements of Specification 3.50, Asphalt Concrete Pavement- EPS, using the designation and class of aggregate specified or directed by the Consultant. The finished surface shall be true to cross-section and grade, thoroughly compacted, and shall have a smooth, tight, uniform surface texture.

4.1.3.5 **Asphalt Flumes**

Where asphalt flume outlet drains are specified, they shall be constructed in accordance with the typical plans and the requirements of Specification 3.50, Asphalt Concrete Pavement - EPS, using the designation and class of aggregate specified or directed by the Consultant. The finished surface shall be true to the lines, grades and cross-sections established by the Consultant, and shall be smooth, tight, and compact over its entire length. The excavated material from the flume trench shall be spread uniformly over the adjacent sideslope as directed by the Consultant.

The flume bedding material shall be select pit-run gravel, or crushed aggregate of the Designation and Class specified, or as otherwise directed by the Consultant. Bedding material shall be placed and thoroughly compacted to the depths and widths specified or as directed by the Consultant.

Hand laid rock forms shall be produced and placed in a neat manner, in accordance with the typical plans.

4.1.3.6 **Protection**

Care shall be taken to prevent damage to the work during subsequent construction operations forming part of this Contract. All means and materials required to protect the work from damage shall be provided by the Contractor at his expense. Works damaged by traffic, construction operations, weather conditions or any other cause, for the duration of the Contract, shall be repaired, or removed and replaced as directed by the Consultant, at the Contractor's expense.

4.1.3.7 **Cleanup**

All construction materials and other debris, resulting from the execution of the work covered by these specifications, shall be removed and disposed of to the satisfaction of the Consultant.

4.1.4 MEASUREMENT AND PAYMENT

4.1.4.1 **Repair and Levelling Patches**

Measurement and payment for asphalt concrete material for repair and levelling patches will be made in accordance with Specification 3.50, Asphalt Concrete Pavement - EPS.

4.1.4.2 **Asphalt Curbs**

Measurement of asphalt curbs will be by the length in metres, along the centreline of the curb.

Payment will be made at the unit price bid per metre for "Asphalt Curb". This payment will be full compensation for preparing the original surface; supplying and applying the tack coat; supplying asphalt binder; and processing, hauling and placing the bituminous mixture.

4.1.4.3 **Gravel for Median Fill**

Measurement of gravel fill material for medians and traffic islands will be in tonnes.

Payment will be made at the unit price bid per tonne for "Median Fill Gravel". This payment will be full compensation for producing, hauling and placing the fill material.

4.1.4.4 **Median Surfacing**

Measurement of median surfacing will be in tonnes.

Payment will be made at the unit price bid per tonne for "Median Surfacing". This payment will be full compensation for producing, hauling and placing the asphalt concrete material.

4.1.4.5 **Asphalt Flume Outlet Drains**

Measurement of asphalt flume outlet drains will be by length in metres, along the flow line of the flume.

Payment will be made at the unit price bid per metre for "Asphalt Flume Outlet Drains". This payment will be full compensation for excavating and disposing of earth materials for the flume trench; producing, hauling and placing of hand-laid rock forms, bedding aggregate and asphalt concrete materials.

4.1.4.6 **Supply of Aggregate**

Aggregate materials incorporated into the Work will be paid for in accordance with Specification 5.2, Supply of Aggregate.

TABLE OF CONTENTS

4.2 CONCRETE CURBS, GUTTERS, SIDEWALKS, MEDIANS, AND TRAFFIC ISLANDS

4.2.1 GENERAL

The work shall include construction of the following items:

(a) Curbs, gutters and combination curb and gutter sections,
(b) Curbs for medians and traffic islands which have concrete, asphalt or topsoil surfacing,
(c) Solid concrete medians, traffic islands and sign islands,
(d) Separate sidewalks,
(e) Monolithic sidewalk curb and gutter sections,
(f) Concrete swales,
(g) Outlet gutters, and
(h) Concrete barriers.

These cast in place, extruded or precast structures shall consist of air entrained portland cement concrete with or without reinforcing steel, prepared in accordance with the specifications and to the lines, grades and typical cross-sections as shown on the plans or as designated by the Consultant.

Curbs shall include mountable, semi-mountable and barrier types.

4.2.2 MATERIALS

4.2.2.1 **General**

The Contractor shall supply all materials, including forms for the construction of the work.

4.2.2.2 **Aggregate**

The Contractor shall produce aggregate materials in accordance with Specification 3.2, Aggregate Production and Stockpiling. Gravel or sand bedding material shall be select and shall consist of well graded sand or a well graded mixture of natural sand, gravel and/or crushed rock, all of which shall pass a 40 mm sieve opening. Any processing required to meet this gradation requirement shall be the responsibility of the Contractor. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate and haul aggregate in accordance with Specification 4.5, Hauling.

4.2.2.3 **Portland Cement Concrete**

Portland cement concrete shall comply with the requirements of Specification 5.5, Portland Cement Concrete for concrete class B except that the minimum air content shall be 6% unless otherwise directed by the Consultant, and except that for precast F type barrier curbs the compressive strength of the concrete at 28 days shall be 40 MPa.

4.2.2.4 **Expansion Joint Fillers**

Preformed expansion joint fillers shall conform to the requirements in the most recent edition of A.S.T.M. Designation D1751 and shall be of adequate dimensions to fill the joint fully and continuously throughout its entire depth.

4.2.2.5 **Curing and Sealing Compounds**

Curing compound shall conform to the most recent edition of A.S.T.M. Designation C309 and shall contain white fugitive dye.

Sealing compound shall be a mixture of 50% kerosene and 50% boiled linseed oil.

4.2.2.6 **Reinforcing Bars and Wires**

Steel reinforcing bars shall be deformed bars in accordance with the most recent edition of CSA G30.12 - M "Billet Steel Bars for Concrete Reinforcement". For F type barrier curbs the bars shall also be epoxy coated.

Cold drawn wire or welded wire fabric for concrete reinforcement shall conform to the requirements of the latest edition of CSA G30.5.

4.2.2.7 **Median Fill Materials**

Fill material for medians to be surfaced with portland cement concrete or Asphalt Concrete shall be crushed aggregate of the Designation and Class specified. The Contractor shall process the material by crushing if required to meet the specifications.

Fill material for medians to be topsoiled shall be clayey soil free of stones, clods, sticks, roots, concrete and other debris.

Asphalt concrete for median surfacing shall be supplied, produced and placed in accordance with the requirements of Specification 3.50, Asphalt Concrete Pavement-EPS. Unless otherwise specified in the special provisions, the Mix Type shall be as used elsewhere on the project. Gradation of the median surfacing asphalt concrete aggregate shall be in accordance with the requirements for the Designation and Class specified or directed by the Consultant.

Topsoil for medians shall meet the requirements of Specification 2.6, Topsoil Placement.

4.2.3 SAMPLING AND TESTING

Sampling and Testing shall meet the requirements of Specification 5.5, Portland Cement Concrete.

4.2.4 CONSTRUCTION

4.2.4.1 **General**

The Contractor shall be responsible for the proper adjustment and calibration of his equipment.

4.2.4.2 **Preparation of Base and Bedding**

Soft, yielding or unsuitable base material shall be removed and disposed of, as directed by the Consultant, and replaced with approved material. The base material shall be thoroughly compacted to 95% of Standard Proctor Density at optimum moisture to a depth of 150 mm and finished to a smooth, uniform surface, true to established line and grade. Base preparation shall extend sufficiently beyond the edges of the structure to enable forming and construction of the work.

The Contractor shall place and compact a gravel or sand bedding course upon the prepared base to a minimum compacted depth of 50 mm, or as otherwise specified or directed by the Consultant. Gravel or sand bedding shall be placed to the widths as specified or as directed by the Consultant, and shall be thoroughly compacted to a smooth, uniform surface, true to established lines and grade. Bedding material shall extend sufficiently beyond the edges of the structure to enable support, forming and construction of the work.

4.2.4.3 **Adjusting Catch Basins and Manholes**

Raising or lowering catch basin or manhole frames when required to meet sidewalk or curb and gutter grades shall be done in accordance with Specification 2.10, Manholes, Inlets and Catch Basins.

4.2.4.4 **Forms**

Steel or wood forms shall conform to the shape, lines and dimensions of the concrete shown on the plans. Lumber used in forms for exposed surfaces shall be dressed to a uniform thickness and shall be free from loose knots or other defects. Forms shall extend the full depth of the section being formed, and shall be secure and sufficiently tight to prevent leakage of mortar. Forms shall be properly braced or tied together to maintain position and shape, and shall be thoroughly cleaned and coated with a non-staining form-release oil, before concrete is placed therein. Forms shall not be disturbed until the concrete has hardened sufficiently to prevent damage.

Where form ties are used they shall be cut off inside the surface of the concrete and the holes shall be patched.

4.2.4.5 **Extrusion**

Where slip-form paving machines or concrete extruding machines are used for placing concrete, they shall meet the following requirements:

(a) The machines shall be approved by the Consultant prior to commencement of the work.

(b) The vibrators on the equipment shall be adequate to produce a dense mass free of voids with a smooth surface free of honeycombing.

(c) The equipment shall have automatic grade and line control.

(d) The equipment shall, in a single pass, provide the specified shape and cross-section for the concrete items to be constructed.

4.2.4.6 **Steel Reinforcement**

Steel reinforcement, dowels or tie bars, when specified, shall be properly spaced, aligned, and held in correct position during the placement of the concrete by the use of bar chairs or other approved devices. Longitudinal bars shall extend through all contraction joints, and shall terminate a minimum of 50 mm from any expansion or construction joint. Bars shall overlap at splices by at least 300 mm.

4.2.4.7 **Wire Mesh Reinforcement**

Wire mesh reinforcement, when specified, shall be properly placed and held in position during the placement of the concrete by use of chairs or other approved devices. Joints in the wire mesh shall be

overlapped 100 mm. Wire mesh reinforcement shall terminate a minimum of 50 mm from any expansion or construction joint.

4.2.4.8 **Placing Concrete**

The bedding shall be in a moist condition immediately prior to the time the concrete is placed. The concrete shall be spread uniformly to the required cross-section, without segregation, and thoroughly consolidated to eliminate excess air voids and to bring sufficient mortar to the surface for proper finishing. Before final finishing, surfaces shall be tested with a 3 m straightedge, and any irregularities of more than 6 mm in 3 m shall be corrected.

Concrete placement between construction joints shall be continuous. Where there is a delay of more than 30 minutes in the placement of concrete a construction joint shall be formed.

Concrete shall not be placed during rain or during other adverse weather conditions.

Concrete shall not be placed on frozen base or frozen bedding.

4.2.4.9 **Crossings**

Lane, commercial and private crossings shall be constructed on prepared bases at locations and to the depths and widths as indicated on the drawings and as directed by the Consultant. When specified, crossings shall be reinforced with steel wire mesh.

4.2.4.10 **Precast Sections**

Precast sections shall be placed on a prepared base, to the line and grade specified, as shown on the plans or as directed by the Consultant.

4.2.4.11 **Joints**

4.2.4.11.1 General

Joints shall be perpendicular to the subgrade and at right angles to the longitudinal axis of the structure. Joints shall be formed and edged with a 6 mm radius so as to leave a neat finished appearance.

4.2.4.11.2 Contraction Joints

For curbs, combination curb and gutter sections, separate sidewalks, and monolithic sidewalk, curb and gutter sections, contraction joints shall be formed every 3 m except where shorter spacing is necessary for closures, but no section shall be less than 1 m in length. Contraction joints shall be made by the use of one of the following methods:

(i) Sawing a joint 50 mm deep with a concrete saw early enough after the concrete has set to prevent uncontrolled cracking, but not so soon as to displace the aggregate from the edges of the cut. The timing of sawing shall be the Contractor's responsibility.

(ii) Forming a joint 50 mm deep by inserting into the plastic concrete a metal or fibre strip or a polyethylene film, finishing the edges to a 6 mm radius, and removing the insert as soon as initial set of the concrete has taken place.

(iii) Forming a joint 50 mm deep with a jointing tool with a thin metal blade to impress a permanent plane of weakness into the plastic concrete.

For sidewalk construction a surface joint 15 mm in depth shall be constructed alternating with and halfway between contraction joints. This joint shall not extend into the curb and gutter section.

An additional surface joint 15 mm in depth shall be constructed longitudinally in monolithic curb, gutter and sidewalk for the purposes of delineating the back of the curb. This joint shall be located at the distance from the back of sidewalk as indicated on the drawings and shall be continuous for the entire length of the structure including driveway and lane crossings.

4.2.4.11.3 Expansion Joints

Expansion joints shall be constructed with a preformed expansion joint filler to the full depth of the concrete at the following locations:

(i) where the concrete structure abuts a building, pole or other permanent structure;

(ii) at construction joints;

(iii) where shown on the drawings; and

(iv) where directed by the Consultant.

4.2.4.11.4 Construction Joints

Construction joints shall be formed using steel divider plates, at specified locations, or as otherwise designated by the Consultant. Should concrete placing operations be unavoidably interrupted, construction joints shall be formed at the last fully completed panel.

Construction joint divider plates shall be left in place until the concrete has set sufficiently to hold its shape, and shall be removed without damaging the concrete.

Steel dowels, greased on one end, shall be incorporated into construction joints where specified or as directed by the Consultant.

4.2.4.12 **Finishing**

Exposed concrete surfaces shall have a brush finish. The brush grooves shall be transverse on the sidewalk and longitudinal on the curb and gutter.

Exposed edges on sidewalks including contraction and surface joints, shall be tooled for a width of 50 mm and rounded to a radius of 6 mm, or as otherwise specified.

The finished concrete shall be true to cross-section, line and grade, and the surface shall be tight, smooth and free of honeycombing and irregularities. Concrete with honeycombing or other irregularities shall be removed and replaced as directed by the Consultant.

4.2.4.13 **Identification of Work**

Identification marks showing the name of the Contractor and the year constructed, shall be placed at the end of each block or at the terminal points of the work in each block, in a neat, easily legible form, as approved by the Consultant.

4.2.4.14 **Curing, Sealing and Protection**

4.2.4.14.1 Curing

Immediately after finishing, the concrete shall be protected against moisture loss by the application of an approved curing compound.

Curing compounds shall be applied by spraying with pressure equipment. To ensure complete coverage, approximately one-half the quantity for a given area shall be applied in one direction and the remainder applied at right angles to this direction.

Curing compounds shall not be used on a surface where a bond is required with additional concrete to be placed later.

4.2.4.14.2 Sealing

The concrete shall be dry and swept clean prior to application of sealing solution as directed by the Consultant.

To protect the surface from deterioration by de-icing salt the sealing solution shall be applied by spraying with pressure equipment on all exposed surfaces. The first application of the sealing solution shall be made five to seven days after placing the concrete and shall have a coverage of not less than 0.1 P/m^2 and the second application shall be made immediately after the first has been absorbed and the concrete regains its first dry appearance. This application shall have a coverage rate of not less than 0.08 P/m^2. To ensure complete coverage, approximately one-half the quantity for each application on a given area shall be applied in one direction and the remainder applied at right angles to this direction.

4.2.4.14.3 Protection

Concrete shall be protected against damage in accordance with Specification 5.5, Supply of Portland Cement Concrete.

4.2.4.15 **Backfill**

For outlet gutters, sidewalks and monolithic curb, gutter and sidewalks, the Contractor shall backfill as soon as possible after the removal of forms. The backfill shall be mechanically tamped and trimmed.

For curb and gutter the Contractor shall backfill behind the curb with suitable material after the seven day curing and protection period has elapsed. The backfill shall extend to at least 600 mm behind the curb and shall be compacted in two lifts. The densities shall be obtained by means of a hand operated mechanical tamper or other equipment as approved by the Consultant.

Organic soils shall not be permitted for backfilling, except where topsoil is specified for the top 100 mm of fill.

4.2.4.16 **Fill for Medians, Sign Islands and Traffic Islands**

4.2.4.16.1 Topsoiled Medians

Fill for medians to be topsoiled shall be placed and moderately compacted to a smooth surface 150 mm below the top of the median curb. The material shall be classified in accordance with Specification 2.3, Grading.

4.2.4.16.2 Other Medians

Fill for medians to be asphalt concrete surfaced or concrete surfaced shall be crushed aggregate placed and compacted as shown on the drawings, and as directed by the Consultant.

4.2.4.17 **Median Surfacing**

4.2.4.17.1 Topsoil Surfacing

Topsoil surfacing of medians shall be placed in accordance with Specification 2.6, Topsoiling.

4.2.4.17.2 Asphalt Concrete Surfacing

Asphalt concrete material for median surfacing shall be supplied and placed in accordance with Specification 3.50, Asphalt Concrete Pavement-EPS except that the density requirements will not apply. The finished surface shall be true to cross-section and grade, shall be compacted and shall have a smooth, tight, uniform surface.

4.2.4.17.3 Concrete Surfacing

Concrete material for median surfacing shall be supplied in accordance with the requirements of Specification 5.5, Portland Cement Concrete and placed, finished, cured and sealed in accordance with the appropriate sections of this specification.

4.2.5 MEASUREMENT AND PAYMENT

4.2.5.1 **General**

The quantities, determined as specified, will be paid for at the contract unit prices which shall be compensation in full for base preparation and the furnishing of materials, labour, equipment, tools, and incidentals necessary to complete the work in accordance with the plans and specifications.

4.2.5.2 **Excavation, Base Preparation, and Gravel or Sand Bedding**

Where the excavation and base preparation is done as part of road construction, which is part of the Work, payment for the excavation and base preparation will be made in accordance with the appropriate unit prices bid for this Work. Otherwise, excavation, base preparation and bedding will not be measured and paid for separately but will be included in the contract unit price for the concrete structure.

4.2.5.3 **Concrete Structures**

4.2.5.3.1 Solid Concrete Medians and Islands

Solid concrete medians and solid concrete islands will be measured in square metres of completed top surface area and payment will be made at the applicable unit price bid per square metre for "Solid Concrete Medians" or "Solid Concrete Islands." These payments will be full compensation for supplying and installing any curbing or curb and gutter forming part of the solid concrete median or island.

4.2.5.3.2 Curbs, Gutters, Combination Curb and Gutter Sections, Sidewalks, Monolithic Sidewalk Curb and Gutter Sections, Concrete Barriers, and Swales or combinations thereof

Measurement will be made in linear metres to the nearest 0.1 metre and payment will be made at the applicable unit price bid for:

(i) "Concrete Curb", measured along the length of the curb, with separate payment for each type of curb.

(ii) "Gutters", and "Outlet Gutter", measured along the length of the gutter.

(iii) "Curb and Gutter", measured along the length of the curb face.

(iv) "Concrete Sidewalk", measured along the length, with separate payment for each specified width.

(v) "Monolithic sidewalk, Curb and Gutter", measured along the length, with separate payment for each specified width.

(vi) "Concrete Swale", measured along the flow line.

(vii) "Concrete Barrier", measured along the length.

4.2.5.3.3 Rip-Rap for Outlet Gutters

Contrary to Specification 2.5, Rip-Rap, rip-rap for outlet gutters will be measured in square metres and payment will be made at the unit price bid for "Rock Rip-Rap - Hand-Laid". This payment will be full compensation for supplying and installing the rip-rap.

4.2.5.4 **Median Fill**

Granular fill material for asphalt concrete or portland cement concrete surfaced medians will be measured in tonnes and payment will be made at the unit price bid for "Granular Fill for Medians".

Earth fill material will be measured and paid for separately at the applicable unit prices bid for the classification of excavation used in accordance with Specification 2.3, Grading.

4.2.5.5 **Median Surfacing**

Median asphalt concrete surfacing will be measured in tonnes and payment will be made at the contract unit price for "Median Asphalt Concrete Surfacing" for the quantity incorporated into the work.

Median portland cement concrete surfacing will be measured in square metres based on the width excluding the curbs and will be paid for at the unit price per square metre for "Median Concrete Surfacing". Separate payment will be made for the curb or curb and gutter section forming the perimeter of the median.

Median topsoiling will measured and paid for as specified in Specification 2.6, Topsoil Placement.

4.2.5.6 **Backfilling**

No separate payment will be made for backfilling behind structures. The cost of this work will be included in the contract unit price for the particular structure involved.

4.2.5.7 **Supply of Aggregate**

Payment for the supply of aggregate for median fill and median surfacing will be made in accordance with Specification 5.2, Supply of Aggregate.

TABLE OF CONTENTS

4.5 HAULING

4.5.1 GENERAL

4.5.1.1 Description

This specification applies to the hauling of all granular materials produced under Specification 3.2, Aggregate Production and Stockpiling including blend sand, and the hauling of all mixtures of granular material with asphalt or cement produced under the applicable specification as required by the Plans, Special Provisions or as designated by the Consultant. This specification covers the following:

(a) The administration of haul roads from all aggregate sources;

(b) Hauling granular materials and mixtures of granular material with asphalt or cement bid by unit weight or volume;

(c) Hauling granular materials and mixtures of granular material with asphalt or cement bid "In-Place".

4.5.1.2 Definitions

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

4.5.1.2.1 Aggregate Sources

The categories of aggregate sources are as specified in Specification 5.2, Supply of Aggregate.

4.5.1.2.2 Hauling

The process of transporting material from its point of loading to its designated delivery point.

4.5.1.2.3 Haul Road

A route over which materials are hauled for the performance of the Contract with the exception of any portion of the highway or road within the contract construction limits.

4.5.1.2.4 Conversion Factors

Where the application of conversion factors is necessary, the following standard values shall be used:

1.63 t/m^3 for gravel (pit-run and crushed, regardless of class), and

1.36 t/m^3 for sand.

4.5.2 IDENTIFICATION OF HAUL ROUTES

The Contractor shall state the location of his proposed aggregate sources and haul routes, at the time of tendering. The Contractor shall be responsible for obtaining authority to haul over the proposed haul routes from the agency having jurisdiction. The use of provincial highways as haul routes is subject to prior approval by the Department.

4.5.3 HAULING

4.5.3.1 **Vehicle Requirements**

Haul vehicles shall comply with the Alberta Traffic Safety Act and have Alberta Class 1 registration.

Haul vehicles shall be registered by the Contractor and bear a project registration number.

For vehicles hauling on a cubic metre basis the approved capacity will be the struck measure of the box as calculated by the Consultant to the closest 0.1 cubic metres.

4.5.3.2 **Hauling Restrictions**

The Consultant may direct that hauling operations will not be permitted if excessive damage to highways or public roads will occur or when hauling operations cause serious hazards or difficulties to the travelling public.

The conditions when this may occur will generally be:

(a) When spring thaw is taking place;

(b) During or after heavy rainfall;

(c) During periods of exceptionally heavy traffic.

The Contractor shall abide by all load restrictions established by the road or bridge authority having jurisdiction.

If work must be carried over from one construction season to the next, the Consultant may order that when work closes down for the season, the Contractor shall repair any damage to public roads caused by his hauling operations.

4.5.3.3 **Construction, Initial Conditioning and Maintenance of Haul Roads**

The Contractor shall initially condition, maintain and restore roads used as haul roads to the satisfaction of the agency having jurisdiction and in the case of provincially owned or controlled roads, to the satisfaction of the Consultant. The Contractor shall also be responsible for construction of new haul roads where necessary.

All costs incurred in such work shall be borne by the Contractor, except that the Department will share in the cost of the asphalt mixes required for the repair of paved surfaces on roads maintained by the Department in accordance with the following:

(a) On contracts with unit prices for asphalt mixes the Contractor shall supply and place the asphalt mix and the Department will pay for the quantity of mix used at 90% (ninety percent) of the applicable unit prices.

The Contractor shall, at his own expense, spread and compact the asphalt mixes.

(b) On contracts that do not include unit prices for asphalt mixes the Department will select the material source and pay for the asphalt mix required including haul.

The Contractor shall, at his own expense, spread and compact the asphalt mixes.

4.5.4 HAUL COMPUTATIONS

4.5.4.1 **Contracts With Bid Unit Prices for Haul**

The haul distance will be the measured distance in kilometres and hundredths of a kilometre along the designated route between the point of loading to trucks and the designated delivery point.

Haul will not be calculated for blend sand material obtained within 100 metres of a mixing plant or of the point of blending.

For the purpose of this specification, the designated delivery point shall be considered as the centre of the project kilometre, except:

(a) if a section is shorter than one kilometre, the designated delivery point will be the centre of the section.

(b) if a dead haul road splits a project kilometre into two sections, the designated delivery point will be the centre of each section.

4.5.5 MEASUREMENT AND PAYMENT

4.5.5.1 **Haul**

The haul distance will be measured in kilometres and hundredths of a kilometre along the designated route between the point of loading and the designated delivery point, and will be measured for record purposes and to enable computation of the Average Actual Haul Distance.

4.5.5.2 **Haul Roads**

Except for the supply of asphalt mixes for the repair of paved surfaces on haul roads, as defined in Section 4.5.3.3 of this Specification, the cost of new construction, initial conditioning, maintenance and final restoration of haul roads shall be the responsibility of the Contractor.

The Contractor shall initially condition, maintain and restore roads used as haul roads to the satisfaction of the agency having jurisdiction and in the case of provincially owned or controlled roads, to the satisfaction of the Consultant who will be the final authority.

The Contractor shall control dust on haul roads using water or other dust abatement materials approved by the Consultant. The Contractor shall supply and apply the materials and pay for all costs of dust control.

TABLE OF CONTENTS

5.2 SUPPLY OF AGGREGATE

5.2.1 GENERAL

This specification covers the general requirements for the supply of aggregate materials by the Contractor. Aggregate materials are considered the total of the granular portion of construction materials consisting of the coarse and fine gravel splits, blend sand and manufactured fines when required.

5.2.2 AGGREGATE CATEGORIES

For the purposes of administering the operational and payment conditions concerning the supply of aggregate for the Work, aggregate sources are categorized as follows:

5.2.2.1 **Aggregate Sources Controlled by the Department**

The following are deemed as aggregate sources controlled by the Department:

(i) a source owned by the Department, or

(ii) a Crown source for which the Department has a reservation, or

(iii) a private source for which the Department has a royalty agreement, and holds an approval under the Environmental Protection and Enhancement Act.

5.2.2.2 **Aggregate Sources Not Controlled by the Department**

The following are deemed as aggregate sources not controlled by the Department:

(i) a Crown source on undeeded land, operated primarily under lease or license and for which the Department does not have a reservation.

(ii) a private source for which the Department does not have a royalty agreement, and does not hold an approval under the Environmental Protection and Enhancement Act.

5.2.3 GENERAL REQUIREMENTS FOR THE USE OF ALL AGGREGATE SOURCES

When supplying aggregate from any source, the Contractor shall:

(i) ensure a Conservation and Reclamation Approval or a lease or license to extract from Alberta Environment and a clearance from the Archaeological Survey of Alberta are in place prior to commencement of the work;

(ii) assume full responsibility for the quantity and quality of the material in the aggregate source;

(iii) specify the location of the proposed aggregate source(s) and haul routes, prior to Contract award;

(iv) acquire the necessary rights to remove materials from all aggregate sources except sources controlled by the Department;

(v) explore and develop the aggregate sources; and

(vi) save the Department harmless from any and all claims resulting from the use of the aggregate sources.

The Department will not consider the use of aggregates from existing stockpiles unless the Contractor can satisfy the Department that the aggregate in question meets all required specifications. Agreement by the Department that such pre-prepared aggregates can be used will not constitute acceptance of the material in stockpile. Acceptance of such material will be based on testing done by the Consultant as the material is incorporated into the Work.

5.2.4 PIT OPERATIONS

5.2.4.1 **General**

In all aggregate sources, the Contractor shall comply with the conditions set by Alberta Environment when removing topsoil, subsoil and inorganic overburden, including if in a frozen condition. The standards and conditions for appropriate development and reclamation as required by Alberta Environment shall apply to all sources.

5.2.4.2 **Pit Operations in Aggregate Sources Controlled by the Department**

Unless modified by the Pit Operation Plan or the Special Provisions or as directed by the Consultant, pit operations in an aggregate source controlled by the Department shall comply with the requirements detailed in this section.

All reject material produced in an aggregate source controlled by the Department shall be disposed of as directed by the Consultant and the Contractor shall have no claim to the material.

When aggregate is to be produced from a source which has been partially excavated previously, the new excavation shall proceed as an extension of the previous excavation provided that suitable material is obtainable. Overburden or rejected materials from previous operations shall be removed and deposited, as indicated in the Plans and Special Provisions unless otherwise directed by the Consultant. The aggregate exposed shall be processed and used.

Normally, the cleared area shall extend beyond the final position of an open face by a minimum distance of four times the expected depth of excavation. Clearing and timber salvage shall be performed in accordance with Specification 2.1, Clearing.

The Contractor shall erect and maintain such temporary fences and livestock guards as may be required to prevent livestock from straying into the aggregate source.

Overburden shall be removed to a minimum 10 metres beyond the top of the backsloped aggregate face. Topsoil shall be stripped to a minimum distance of 5 metres beyond the top of the backsloped overburden face. The stripped buffers shall be maintained throughout the project.

The full depth of topsoil and subsoil shall be stripped from all temporary work sites including the crusher, plant, camp, parking areas and all access roads unless otherwise directed by the Consultant.

Overburden shall be removed in stages. The first stage shall be the removal and stockpiling of topsoil. The second stage shall be the removal and stockpiling of the subsoil. The final stage shall be the removal and deposition of the inorganic overburden, as indicated in the Plans or Special Provisions, or as directed by the Consultant. The Contractor shall remove topsoil and other overburden materials in a manner that

prevents contamination of one material with another. Dozers shall not be allowed to remove overburden unless authorized by the Consultant in writing. These materials shall be stockpiled uniformly and compactly in separate piles in an area designated by the Consultant. Temporary stockpiling of overburden shall be done in a manner which will minimize surface damage and interruption of natural drainage.

Where stockpiles of topsoil and overburden exist from previous pit operations, the Contractor shall, unless directed otherwise, use the same stockpile locations for deposit of topsoil and overburden.

During the term of the Contract, the Contractor shall prevent erosion of all topsoil and subsoil piles resulting from his operations. In the event such piles are remaining at the completion of construction, they shall be seeded by the Contractor.

All materials required for seeding shall be supplied by the Contractor. Grass seed shall conform to Specification 2.20, Seeding. The composition and application rate of the grass seed mixture will be determined by the Consultant at the time of construction.

The excavation of aggregate shall advance uniformly to obtain maximum yield from the deposit. Under no circumstances will waste of useable material be permitted, and excavations shall be continued to depths below water level if suitable material is available.

The Contractor shall clean-up the areas of pits affected by operations performed under this Contract in accordance with the following:

(i) All faces with potential future use for the removal of aggregate shall be sloped at a ratio of at least two horizontal to one vertical.

(ii) Faces designated to be abandoned in a deposit shall be sloped at a ratio of at least four horizontal to one vertical.

(iii) At boundaries of authorization or property lines, sloping shall be at a ratio of at least four horizontal to one vertical with the top of slopes terminating at a minimum distance of three metres from the boundary.

(iv) Upon completion of the Work, the site from which material has been removed shall be left in a neat and presentable condition, all fences removed for purposes of entry shall be replaced in a condition equal to or better than they were before being removed, and all debris resulting from the Contractor's operations shall be removed and disposed of as required by the Consultant.

In addition to the foregoing sloping operations, where practical, the Consultant may order that flatter slopes be constructed on selected areas using stockpiled overburden material. The quantity of overburden material available will determine the amount of sloping to be done. This operation may require some site preparation such as ripping of the compacted earth floor.

5.2.4.3 **Pit Operations in Aggregate Sources Not Controlled by the Department**

All aspects of clearing, removal of overburden, protection and safety of livestock, general pit management and clean up shall be the responsibility of the Contractor.

5.2.5 MEASUREMENT AND PAYMENT

5.2.5.1 **General**

"Supply of Aggregate" will not be paid for separately when the applicable specification states that the cost of supplying aggregate is considered incidental to the Work, or included in the unit price bid for the Work for which the aggregate is being produced. If this is the case for all applicable specifications for the Work, the Contract will not contain the bid item "Supply of Aggregate."

In Contracts which contain a bid item for supplying aggregate, payments made for "Supply of Aggregate" will be full compensation for the cost of the aggregate material. Any other costs incurred by the Contractor including but not limited to the cost of obtaining approvals and rights to use a source and the exploration, development and reclamation of the source, clearing, removal of overburden and the erection and removal of temporary fences will be considered included in the Contract item for which the aggregate is being produced.

5.2.5.2 **Supply of Aggregate Bid Item**

The Specification Amendments will indicate whether or not the Contractor has the option of using a specific aggregate source controlled by the Department for the gravel component of the aggregate.

If the Specification Amendments indicate that the Contractor has the option of using a specific aggregate source controlled by the Department, the Department will establish the unit price per tonne for “Supply of Aggregate” and insert the amount in the unit price schedule.

If the Specification Amendments indicate that the Contractor may not use an aggregate source controlled by the Department for the gravel component of the aggregate, the Contractor shall bid a unit price per tonne for “Supply of Aggregate.”

5.2.5.3 **Payment**

The payment conditions for supplying aggregate vary depending on the category of the aggregate source used (various categories of aggregate sources are listed in section 5.2.2 of this specification). Further, it is possible that more than one aggregate source may be used for the supply of aggregate for the Work.(eg. Portions or all of the pitrun gravel and/or the blend sand components of the aggregate may be obtained from separate aggregate sources of different categories).

The payment conditions for the various categories of aggregate sources are as follows:

No payment will be made for the quantity of aggregate material obtained from a source controlled by the Department

Payment for the quantity of aggregate obtained from a source not controlled by the Department will be made in accordance with the following:

(i) For material obtained from crown sources not controlled by the Department, payment will be made at the unit price per tonne established by the Department or bid by the Contractor (as applicable) for the item "Supply of Aggregate", minus $ 0.48 per tonne. The $ 0.48 reduction recognizes that royalty payments to Alberta Environment are not applicable to Public Works projects.

(ii) For material obtained from private sources not controlled by the Department, payment will be made at the unit price per tonne established by the Department or bid by the Contractor (as applicable) for the item "Supply of Aggregate."

(iii) The quantity for payment will be determined by the Consultant by measuring the material containing the aggregate which has been incorporated into the accepted Work and calculating the quantity of aggregate obtained from sources not controlled by the Department. In the event the material containing the aggregate contains asphalt, no deduction will be made for the asphalt material.

(iv) When the material measurement is by volume, a conversion factor of 1.632 tonnes per cubic metre will be used to determine the weight of a gravel component and 1.365 tonnes per cubic metre will be used for a blend sand component.

TABLE OF CONTENTS

5.5 SUPPLY OF PORTLAND CEMENT CONCRETE

5.5.1 DESCRIPTION

5.5.1.1 **General**

Portland Cement Concrete shall consist of a mixture of Portland Cement, fine aggregate, coarse aggregate, water, and admixtures where required, combined in proportions to meet the specifications herein.

5.5.1.2 **Class of Concrete**

The Contractor shall supply Portland Cement Concrete in accordance with the following requirements for the class of concrete specified or designated by the Consultant:

Class of Concrete	Minimum Compressive Strength @ 28 Days MPa	Size of Coarse Aggregate mm	Range of Slump mm	Entrained Air Cont. %	Maximum Water/ Cement Ratio
*A	25	40 to 5	50 to 70	5 - 8	0.45
B	25	28 to 5	50 to 70	5 - 8	0.45
C	30	20 to 5	60 to 80	5 - 8	0.42
**SF	35	20 to 5	80 to 110	5 - 8	0.38
D	30	14 to 5	50 to 70	5 - 8	0.42
S	20	28 to 5	50 to 70	5 - 8	0.50
Pile	25	28 to 5	50 to 70	5 - 8	0.45

NOTE:

* The Contractor will be permitted to supply Class "B" concrete where Class "A" has been specified; payment will be as if Class "A" had been supplied.

** Class SF Concrete shall be used for all cast to grade decks, curbs, medians and Deck Overlay Concrete. The requirements for Class SF Concrete with Steel Fibres are the same as for Class SF Concrete.

All properties shall be determined in accordance with the requirements of the latest version of CSA Standards A23.1, Concrete Materials and Methods of Concrete Construction, and A23.2, Methods of Test for Concrete.

5.5.2 MATERIALS

5.5.2.1 **Portland Cement**

The Contractor shall supply Portland Cement conforming to the requirements of Specification 5.11, Supply of Portland Cement and concrete products in accordance with A23.1, Concrete Materials and Methods of Concrete Construction.

Unless otherwise specified, directed or approved by the Consultant, Normal Type 10 Portland Cement shall be used.

5.5.2.2 **Water**

Mixing and curing water shall be supplied by the Contractor.

Water shall conform to the requirements of the latest version of CSA Standard A23.1, Concrete Materials and Methods of Concrete Construction. Water used in Portland Cement Concrete construction shall be subject to the prior approval of the Consultant.

5.5.2.3 **Aggregates**

The Contractor shall supply aggregates conforming to the requirements of the latest version of CSA Standard A23.1, Concrete Materials and Methods of Concrete Construction. Aggregates used in Portland Cement Concrete shall be subject to the prior approval of the Consultant.

5.5.2.4 **Air-Entraining Admixtures**

Air-entraining admixtures shall be supplied by the Contractor.

Air-entraining admixtures shall conform to the requirements of the latest version of CSA Standards A23.1, Concrete Materials and Methods of Concrete Construction, and A266.1, Air-Entraining Admixtures for Concrete. Air-entraining admixtures used in Portland cement concrete construction shall be subject to the prior approval of the Consultant.

5.5.2.5 **Other Admixtures**

Use of other admixtures shall be subject to the prior approval of the Consultant. Where the use of other admixtures is approved, such admixtures shall conform to the requirements of the latest version of CSA Standard A266.2, Chemical Admixtures for Concrete. Unless otherwise approved by the Department, the use of flyash is not permitted.

Where the approved admixture, or its method of use, is not covered by an appropriate CSA Standard, such admixtures shall be used in accordance with the manufacturer's recommendations, or as otherwise approved by the Consultant.

5.5.3 CONSTRUCTION

5.5.3.1 **Care and Storage of Materials**

All Portland Cement Concrete materials shall be handled and protected in such a way as to prevent segregation, damage and contamination.

All cement, aggregate and other concrete construction materials shall be stored in accordance with the requirements of the latest version of CSA Standards A5, Portland Cements and A23.1, Concrete Materials and Methods of Concrete Construction. Any segregated, damaged, or contaminated materials shall be rejected.

5.5.3.2 **Proportioning and Composition of Concrete**

The Contractor shall be responsible for providing concrete mix designs for each Class of concrete specified and proposed for use. The mix design shall be of a standard acceptable to the Consultant. The proposed mix design, certified by the Contractor or his design agent, shall be submitted to the Consultant for approval at least 72 hours before concrete production is due to start. The Contractor shall not produce concrete until the corresponding mix design has been approved by the Consultant.

If, during the progress of the work, it is determined that the concrete has inadequate workability, or does not meet the requirements of the specification, the Contractor shall provide a new mix design for the Consultants approval, in accordance with the foregoing requirements.

All concrete shall be proportioned in accordance with the approved mix designs.

The Contractor shall provide written certification that the concrete has been proportioned and produced in accordance with the approved mix designs and the requirements of these specifications.

5.5.3.3 **Consistency**

The slump shall be in accordance with the specifications herein, however, the slump for slip-formed concrete shall be limited to a maximum of 50 mm, or to such other value as may be necessary to enable the material to be slip-formed without subsequent distortion.

Generally, mass and mechanically vibrated concrete shall have slumps in the lower portion of the specified range, and heavily reinforced and/or inaccessible sections shall have slumps in the higher end of the range.

5.5.3.4 **Concrete Production**

Portland Cement Concrete shall be produced in accordance with the requirements of the latest version of CSA Standard A23.1, Concrete Materials and Methods of Concrete Construction, unless otherwise approved by the Consultant.

5.5.3.5 **Delivery**

Delivery of Portland Cement Concrete shall be regulated so as to enable continuous deposition until the placement of each concrete section is completed.

5.5.3.6 **Protection**

Concrete shall be protected against damage from rain, dust, rapid temperature change or other adverse weather effects. For at least 7 days after finishing, concrete shall be protected against freezing and against damage by any form of traffic. With the approval of the Consultant, the Contractor may block off areas containing fresh concrete to safeguard the work from traffic.

Methods and materials used for protecting concrete from damage shall be entirely the responsibility of the Contractor, and shall be subject to prior approval of the Consultant.

Concrete damaged by moisture loss, freezing, rain, traffic, construction operations, or any other cause, shall be repaired, or removed and replaced, to the satisfaction of the Consultant, at the Contractor's expense.

5.5.4 SAMPLING AND TESTING

5.5.4.1 **Quality Control Testing**

Quality control testing will be the responsibility of the Contractor. The Contractor shall determine the type and frequency of testing required and shall provide and pay for all equipment and personnel necessary to complete such testing. Results of all quality control testing shall be submitted to the Consultant as they become available.

5.5.4.2 **Acceptance Sampling and Testing**

Acceptance testing is the responsibility of the Consultant. The Consultant will take samples, carry out quality assurance testing and inspection of materials incorporated or being incorporated into the work. The Contractor shall cooperate with the Consultant during the sampling, testing and inspection. Such inspection shall not relieve the Contractor from any obligation to perform all the work strictly in accordance with the requirements of the Contract.

Locations for routine quality assurance testing shall be randomly selected as far as it is practical to do so. This will not limit the Consultant from testing at any additional locations as he deems necessary.

Results of the quality assurance tests will be made available to the Contractor for his information. The Contractor shall be responsible for interpretation of test results and alter his operation if necessary, so that the product meets the specifications.

5.5.4.3 **Test Methods**

Unless otherwise specified, the most recent editions of the following standard test methods and frequencies will be used to determine the material characteristics.

Test Description	Method No.	Frequency
Sampling Concrete	CSA A23.2-1C	Minimum of one per day
Slump	CSA-A23.2-5C	Minimum of one per day
Entrained Air	CSA-A23.2-4C	Minimum of one per day
Making and Curing Compressive Strength Specimens	CSA-A23.2-3C	[1.] Minimum of one per day
Compressive Strength	CSA-A23.2-9C	[1.] Minimum of one per day

For each compressive strength test a slump test will also be made and the amount of entrained air will be measured. A compressive strength test shall consist of four standard test specimens .One cylinder will be tested at seven days. The 28 day test result shall be the average of the remaining three specimens.

Note 1: On larger pours a strength test shall be taken on approximately each 30 m^3 portion of the concrete pour.

5.5.5 REQUIREMENTS FOR ACCEPTANCE

5.5.5.1 **General**

The Department reserves the right to reject any concrete whatsoever which does not meet all the requirements for that class of concrete. The Department may however, accept concrete the strength of which falls below the specified strength requirements.

In this case, payment will be made in accordance with 5.5.5.1. The bid price can either be unit price or lump sum.

5.5.5.2 **Payment Scales**

Strength Test Result	**Minimum Compressive Strength Requirement @ 28 Days MPa**			
	20	**25**	**30**	**35**
35 MPa and over	Full Payment	Full Payment	Full Payment	Full Payment
34 MPa to 35 MPa	Full Payment	Full Payment	Full Payment	$10 per cu.
33 MPa to 34 MPa	Full Payment	Full Payment	Full Payment	$20 per cu.
32 MPa to 33 MPa	Full Payment	Full Payment	Full Payment	$30 per cu.
31 MPa to 32 MPa	Full Payment	Full Payment	Full Payment	$40 per cu.
30 MPa to 31 MPa	Full Payment	Full Payment	Full Payment	$50 per cu.
29 MPa to 30 MPa	Full Payment	Full Payment	$10 per cu.	$60 per cu.
28 MPa to 29 MPa	Full Payment	Full Payment	$20 per cu.	$70 per cu.
27 MPa to 28 MPa	Full Payment	Full Payment	$30 per cu.	Reject
26 MPa to 27 MPa	Full Payment	Full Payment	$40 per cu.	Reject
25 MPa to 26 MPa	Full Payment	Full Payment	$50 per cu.	Reject
24 MPa to 25 MPa	Full Payment	$10 per cu.	Reject	Reject
23 MPa to 24 MPa	Full Payment	$20 per cu.	Reject	Reject
22 MPa to 23 MPa	Full Payment	$30 per cu.	Reject	Reject
21 MPa to 22 MPa	Full Payment	$40 per cu.	Reject	Reject
20 MPa to 21 MPa	Full Payment	$50 per cu.	Reject	Reject
19 MPa to 20 MPa	$10 per cu.	Reject	Reject	Reject
18 MPa to 19 MPa	$20 per cu.	Reject	Reject	Reject

Strength Test Result	**Minimum Compressive Strength Requirement @ 28 Days MPa**			
	20	**25**	**30**	**35**
17 MPa to 18 MPa	$30 per cu.	Reject	Reject	Reject
16 MPa to 17 MPa	$40 per cu.	Reject	Reject	Reject
15 MPa to 16 MPa	$50 per cu.	Reject	Reject	Reject
Less than 15 MPa	Reject	Reject	Reject	Reject

The reduced payment shall apply to the volume of concrete as determined by the Consultant.

Removing and replacing of rejected concrete construction shall be done at the Contractor's expense. Any work deemed by the Consultant as defective or damaged by weather, traffic or other causes, shall be repaired or removed and replaced at the Contractor's expense.

5.5.6 MEASUREMENT AND PAYMENT

5.5.6.1 **Portland Cement Concrete**

Payment for the production of accepted Portland Cement Concrete, including the supply of all constituent materials, will not be made separately, but will be included in the cost for the respective structure for which the concrete is being used.

TABLE OF CONTENTS

TABLES AND CHARTS

5.7 SUPPLY OF ASPHALT

5.7.1 GENERAL

The work consists of supplying asphalt materials including ordering, scheduling, delivering, supplying storage facilities, handling, storing, sampling, testing and other related work.

For purposes of this specification, the term "Asphalt Supplier" shall mean the party awarded an order by the Contractor for the supply of asphalt.

5.7.2 MATERIALS

5.7.2.1 **General**

The Contractor shall supply the types and grades of asphalt specified in the Contract. Asphalt suppliers' materials must be pre-qualified by the Department. Pre-qualified suppliers are listed in the Alberta Transportation Products List.

All asphalt binders shall be prepared from petroleum oils. They shall be free from impurities. Solvents used in the manufacture of cut-back asphalts shall be derived from petroleum oils. Emulsifiers used to stabilized asphalt emulsions shall not be harmful to the performance of the asphalt in service.

The Contractor shall ensure that the asphalt supplied meets all requirements for the types and grades specified. The Contractor may be required to use more than one type or grade of asphalt for a particular purpose. Any change in asphalt type or grade must be approved by the Consultant. The Contractor shall notify the Consultant of any changes in asphalt material suppliers.

The Department reserves the right to discontinue the use of any asphalt product that fails to handle or perform to expectation or satisfaction, regardless of its compliance with the specifications.

5.7.2.2 **Delivery, Handling and Storage**

The Contractor shall supply the Consultant with the asphalt suppliers' weigh-bills and records of all asphalt received and/or returned on a daily basis.

The Contractor shall provide, maintain and reclaim asphalt storage facilities.

Storage facilities for asphalt cement shall be capable of heating the material under effective and positive control at all times and shall contain provision for measuring and sampling.

For Performance Grade Asphalt Cements (PGAC) specified according to the Performance Grade System as developed under the Strategic Highway Research Program (SHRP), the Contractor shall follow the suppliers' specified handling and storage requirements for each grade of PGAC.

No asphalt type or grade shall be diluted or mixed with a different type or grade, or with any other material, without the specific approval of the Consultant.

The Contractor shall prevent contamination of the asphalt, by asphalt of another type or grade, by solvent, or by any other material. Asphalt storage tanks shall be emptied of one type or grade of asphalt, and cleaned as necessary to prevent detrimental contamination of the asphalt, before placing another type or grade of asphalt therein. Asphalt emulsions shall be protected from freezing.

5.7.3 SAMPLING AND TESTING

5.7.3.1 **General**

The Contractor shall obtain representative, uncontaminated samples of all asphalt materials delivered to the project for quality assurance testing in accordance with ATT-42, Sampling Asphalt and Table 5.7.3. The Consultant may require increases in the minimum frequencies specified for quality assurance sampling. In addition, all asphalt shall be subject to inspection, sampling and testing by the Department or its designated agents. The Contractor shall provide safe, convenient access, acceptable to the Consultant, for inspection and sampling of the asphalt, and shall cooperate in the inspection and sampling process when requested to do so.

The Contractor shall ensure that all asphalt delivery tanks are equipped with sampling valves maintained in good operating condition which are designed and located to enable safe, representative sampling into the appropriate one or two litre containers.

5.7.3.2 **Quality Control**

Quality control and quality control testing is the responsibility of the Contractor. Quality control testing shall be carried out by a qualified Supplier's laboratory or a qualified testing laboratory licensed to practice in the Province of Alberta.

5.7.3.2.1 Quality Control Plan - Performance Grade Asphalt Cements

The Contractor shall provide a Quality Control Plan jointly prepared with the asphalt supplier detailing the quality control activities related to the use of the Performance Grade Asphalt Cement. The Plan shall be submitted at least 14 calendar days prior to the use of any PGAC product in the Contract.

Hot mix production shall not commence until the Plan has been accepted, in writing, by the Department. The requirement for the Contractor to provide a Quality Control Plan may be waived if the current Quality Control Plan used by the asphalt supplier has been previously approved in writing by the Department.

As a minimum, the Plan shall provide the following information:

(i) The type of facility from which the material(s) will be supplied (refinery, terminal) and its location.

(ii) Name and telephone number of the person responsible for quality control at the facility.

(iii) The method and frequency for initial testing, specification compliance testing and any other testing employed to either guide the manufacturing process of the PGAC or to ensure the on-going compliance of the material to contract specifications.

(iv) Specification compliance testing shall be carried out prior to shipping the materials from the supplier’s facility to the hot mix plant. The Plan shall provide an outline of the procedures to be followed for checking transport vehicles before loading to prevent contamination of shipments. The outline shall include a statement that the transport vehicles inspection report, signed by the responsible inspector, shall be maintained in the Supplier’s records and shall be made available to the Department upon request.

(v) The Plan shall identify the QC laboratory and detail control charting or any such statistical procedures which will be used to track the quality of the material(s). The Plan shall indicate which accreditation programs, proficiency sample testing programs or other correlation programs that the QC laboratory has or is currently participating in. Proof of good standing in such programs is required.

(vi) The Plan shall detail the methods to be used to identify and provide for the exclusion of materials which do not conform to specifications, prior to incorporating them into the hot mix.

5.7.3.3 **Quality Assurance**

The Contractor shall deliver all quality assurance samples to the Consultant on the day they were sampled. The Consultant will forward the samples to the Department's designated quality assurance laboratory for testing and will accept or reject asphalt material based on the test results.

TABLE 5.7.3
SAMPLING FREQUENCY FOR QUALITY ASSURANCE

MATERIAL	MINIMUM FREQUENCY (1)(FOR EACH ASPHALT TYPE)
Asphalt Cement - Penetration grades	One per five Lots
Asphalt Cement - Performance Grade	One per three Lots
Liquid Asphalt (ASBC)	One per day
Prime, Tack, Curing Seal, and Fog Coat	One for each 100 tonnes
Seal Coats, Slurry Seals	One per day

Notes:
(1) Minimum of one sample for each asphalt type or as listed below, whichever is greater.

5.7.4 ACCEPTANCE

Asphalt materials supplied and incorporated into the Work will be considered for acceptance provided the specified quality assurance samples have been provided to the Consultant within the time frame specified and where both the Work and the asphalt material meet specifications.

In the event quality assurance test results are not available to the Consultant at the time he prepares the monthly progress payment estimates, the Consultant may request payment for asphalt material which has not been accepted. However, should the Contractor fail to supply the required samples or the asphalt material fails to meet the specification requirements, the Consultant may deduct such payments from the subsequent monthly progress payment estimates. In the case where the Contract does not contain a bid item for the particular asphalt material, the deducted payment will be determined by the Consultant and will be equal to the estimated value of the asphalt material that fails to meet the specification requirements.

5.7.5 MEASUREMENT AND PAYMENT

Where the Contract contains bid items for the supply of asphalt, measurement will be based on the suppliers' weigh bills however, the Consultant may check quantities delivered by weighing the delivery vehicles before and after unloading. Where the Contract does not otherwise require the installation of a weigh scale for weighing materials, the Consultant will determine quantities by measuring the liquid level in the tank truck or storage tank, at his discretion. When asphalt quantities are determined by this method, the Contractor shall calibrate the distributor trucks and storage tanks.

If there is a variance between quantities measured by the Consultant and the suppliers' weigh-bills, the Consultant will determine the quantity on which payment will be based.

Where the Contract contains bid items for the supply of asphalt, payment for accepted asphalt material will be made at the applicable unit price bid per tonne.

Where the Contract does not contain bid items for the supply of asphalt, accepted asphalt material will not be paid for separately. Payment will be considered included in the unit price bid for the Contract item for which the asphalt material is used.

Payment will be full compensation for supplying asphalt material to the project; storing the material; sampling and quality control.

SPECIFICATIONS FOR ASPHALT CEMENTS: Asphalt cements shall conform to the requirements specified in the following table:

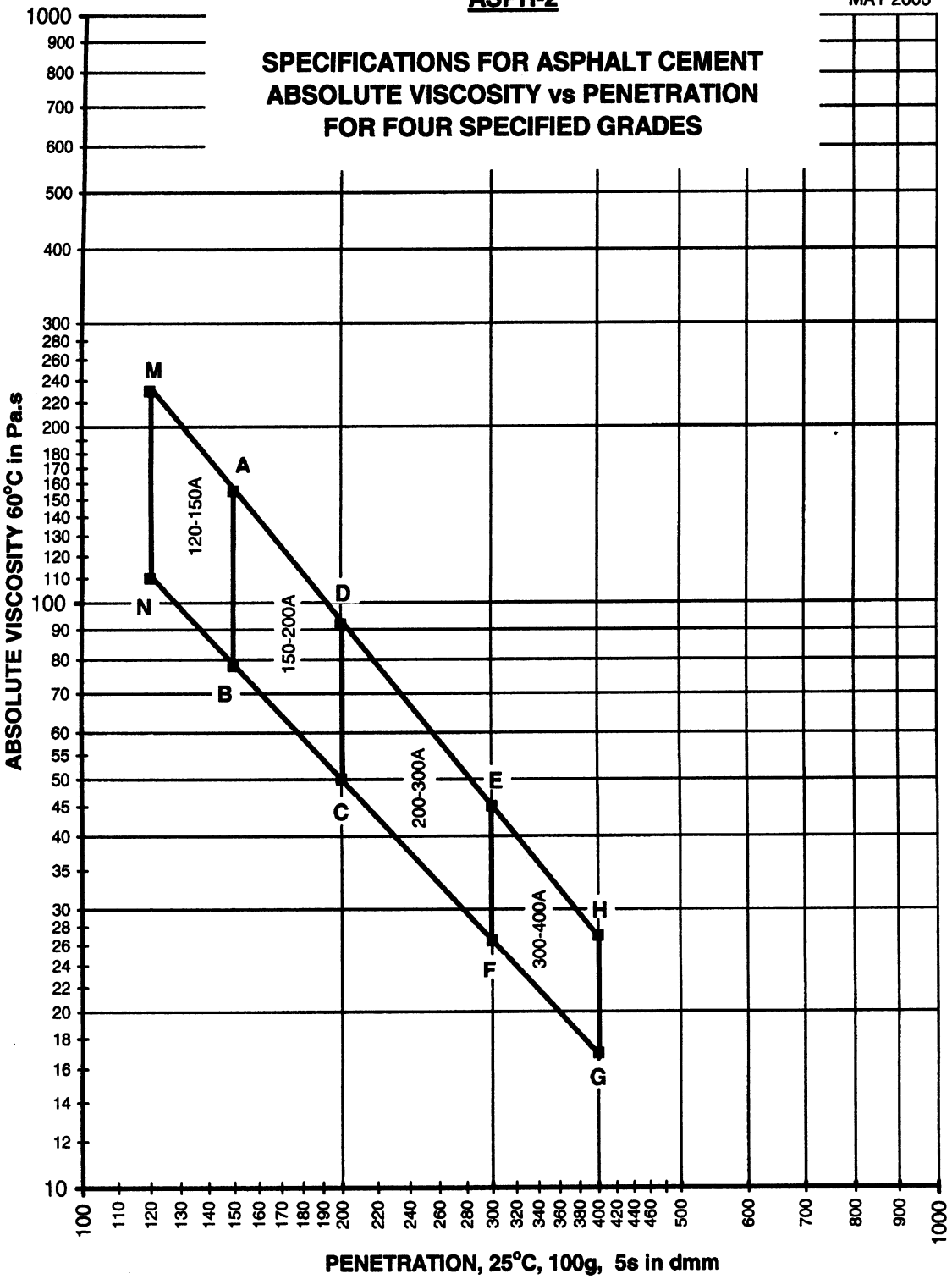
TEST CHARACTERISTICS	A.S.T.M. TEST METHODS	PREMIUM GRADES OF ASPHALT CEMENTS			
		120-150(A)	**150-200(A)**	**200-300(A)**	**300-400(A)**
Absolute Viscosity, 60°C, Pa.s Penetration, 25°C , 100 g, 5 s, dmm	D2171 D5	The viscosity and penetration values must fall within the area bounded by M - N - B - A - M, plotted as straight lines on a full logarithmic plot (log-log), with the co-ordinates of the points as follows: Pt. Abs. Visc. Pen. M 230 120 N 110 120 B 78 150 A 155 150	The viscosity and penetration values must fall within the area bounded by A - B - C - D - A, plotted as straight lines on a full logarithmic plot (log-log), with the co-ordinates of the points as follows: Pt. Abs. Visc. Pen. A 155 150 B 78 150 C 50 200 D 92 200	The viscosity and penetration values must fall within the area bounded by C - D - E - F - C, plotted as straight lines on a full logarithmic plot (log-log), with the co-ordinates of the points as follows: Pt. Abs.Visc. Pen. C 50 200 D 92 200 E 45 300 F 26.5 300	The viscosity and penetration values must fall within the area bounded by E - F - G - H - E, plotted as straight lines on a full logarithmic plot (log-log), with the co-ordinates of the points as follows: Pt. Abs. Visc. Pen. E 45 300 F 26.5 300 G 17 400 H 27 400
Kinematic Viscosity, 135°C, mm^2/s Penetration, 25°C, 100g, 5s, dmm	D2170 D5	The viscosity and penetration values must fall within the area bounded by M - N - B - A - M, plotted as straight lines on a full logarithmic plot (log-log), with the co-ordinates of the points as follows: Pt. Kin.Visc. Pen M 435 120 N 300 120 B 255 150 A 360 150	The viscosity and penetration values must fall within the area bounded by A - B - C - D - A, plotted as straight lines on a full logarithmic plot (log-log), with the co-ordinates of the points as follows: Pt. kin.Visc. Pen. A 360 150 B 255 150 C 205 200 D 285 200	The viscosity and penetration values must fall within the area bounded by C - D - E - F - C, plotted as straight lines on a full logarithmic plot (log-log), with the co-ordinates of the points as follows: Pt. Kin.Visc Pen. C 205 200 D 285 200 E 205 300 F 150 300	The viscosity and penetration values must fall within the area bounded by E - F - G - H - E, plotted as straight lines on a full logarithmic plot (log-log), with the co-ordinates of the points as follows: Pt. Kin.Visc. Pen. E 205 300 F 150 300 G 120 400 H 165 400
Flash Point, Cleveland Open Cup, °C minimum	D92	220	205	175	175
Solubility in Trichloroethylene, % minimum	D2042	99.5	99.5	99.5	99.5
Tests on Residue from Thin-Film Oven Test: Ratio of Absolute Viscosity of Residue from Thin-Film Oven Test to Original Absolute Viscosity, maximum	D1754 D2171	4.0	4.0	4.0	4.0
Ductility, 25°C, cm, minimum	D113	100	100	---	---
Ductility, 15.6°C, cm, min.		---	---	100	100

General Requirement - The asphalt shall be prepared by the refining of petroleum. It shall be uniform in character and shall not foam when heated to 175°C.
- The temperature at delivery to the site shall be between 135°C and 175°C.

ASPH-2

MAY 2003

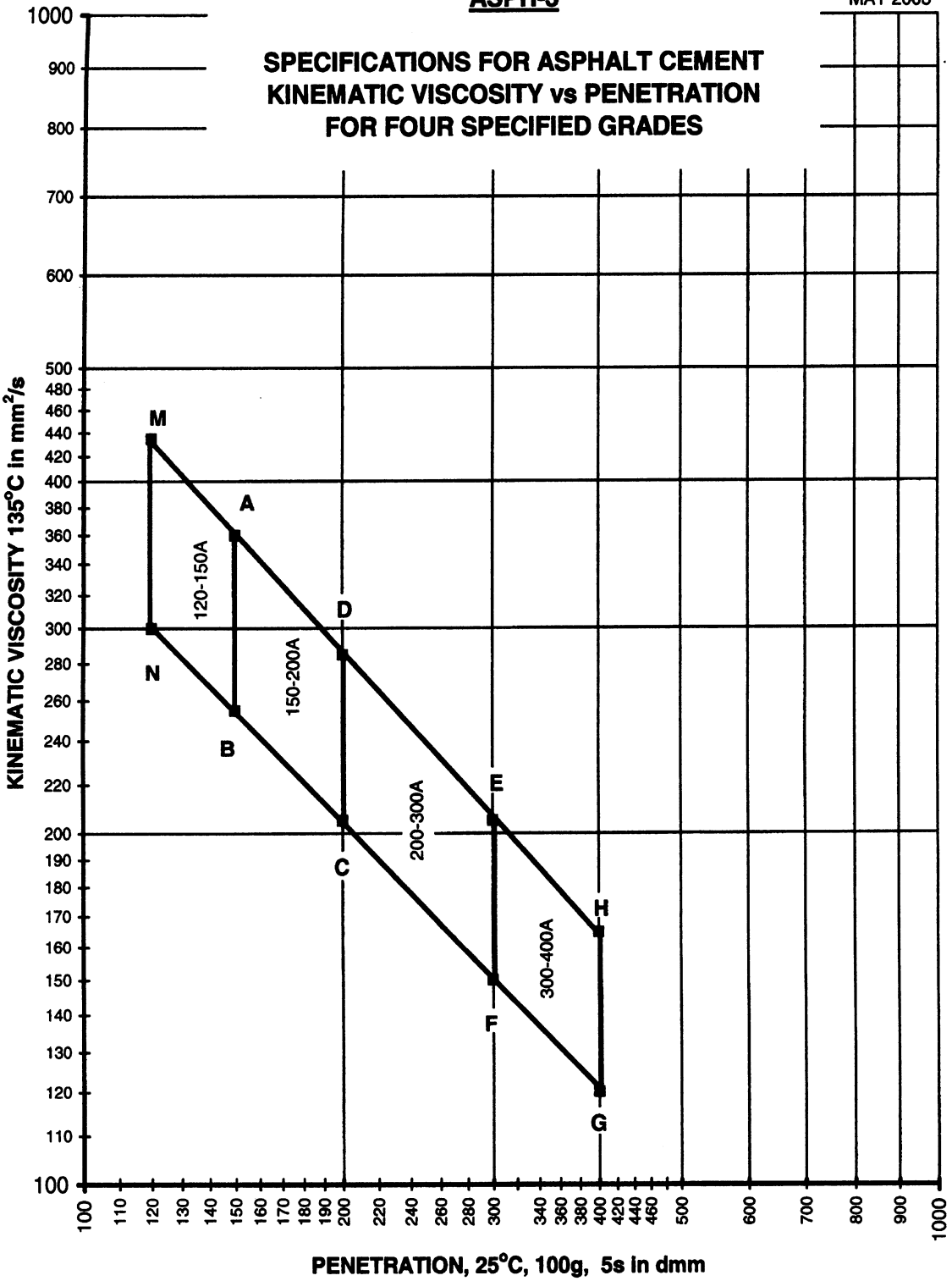
SPECIFICATIONS FOR ASPHALT CEMENT ABSOLUTE VISCOSITY vs PENETRATION FOR FOUR SPECIFIED GRADES



ASPH-3

MAY 2003

SPECIFICATIONS FOR ASPHALT CEMENT KINEMATIC VISCOSITY vs PENETRATION FOR FOUR SPECIFIED GRADES



SPECIFICATIONS FOR SLOW CURING LIQUID ASPHALTS: Slow curing liquid asphalts shall conform to the requirements specified in the following table, for the grade designated by the Engineer:

ASPHALT GRADE	SC-70		SC-250		SC-800		SC-3000		A.S.T.M. TEST METHOD
REQUIREMENTS	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	
Flash Point, Cleveland Open Cup, EC	65	-	80	-	90	-	105	-	D92
Kinematic Viscosity at 60EC, mm^2/s	70	180	250	500	800	1 600	3 000	6 000	D2170
Distillation Test: Total distillate to 360EC, % by volume	10	30	4	20	2	12	-	5	*TLT-214
Distillation Residue Kinematic Viscosity at 60EC, mm^2/s	400	7000	800	10 000	2 000	16 000	4 000	35 000	D2170
Asphalt Residue Residue of 100 penetration, % by mass	50	-	60	-	70	-	80	-	D243
Ductility of 100 penetration residue at 25EC, cm(1)	100	-	100	-	100	-	100	-	D113
Solubility of Distillation Residue to 360EC, in Trichloroethylene, % by mass	99.0	-	99.0	-	99.0	-	99.0	-	D2042
Water, % by mass or volume	-	0.5	-	0.5	-	0.5	-	0.5	D95
Delivery Temperature, EC	55	75	75	95	90	110	110	130	

NOTE:

* Alberta Transportation Laboratory Test

(1) If the ductility at 25EC is less than 100, the material will be acceptable if its ductility at 15EC is more than 100.

General Requirements: -The asphalt shall not foam when heated to the application temperature range recommended by the Asphalt Institute.
-The asphalt shall be uniform in character.

SPECIFICATIONS FOR MEDIUM-CURING LIQUID ASPHALTS: Medium curing liquid asphalts shall conform to the requirements specified in the following table, for the grade designated by the Engineer:

ASPHALT GRADE	MC-30		MC-70		MC-250		MC-800		A.S.T.M. TEST METHOD
REQUIREMENTS	min.	max.	min.	max.	min.	max.	min.	max.	
Flash Point, Open Tag, EC	38	-	38	-	65	-	65	-	D1310
Kinematic Viscosity at 60EC, mm^2/s	30	60	70	140	250	500	800	1 600	D2170
Distillation Test:									
% by volume of total distillate to 360EC,									*TLT-214
-to 225EC	-	25	-	20	-	10	-	-	
-to 260EC	40	70	20	60	15	55	-	35	
-to 315EC	75	93	65	90	60	87	45	80	
Residue from distillation to 360EC, Volume % by difference	50	-	55	-	67	-	75	-	
Test on Residue from Distillation:									
a) Penetration at 25EC, 100 g, 5 s, dmm	120	250	120	250	120	250	120	250	D5
b) Ductility at 25EC, cm(1)	100	-	100	-	100	-	100	-	D113
c) Solubility in Trichloroethylene, % by mass	99.5	-	99.5	-	99.5	-	99.5	-	D2042
Water, % by mass or volume	-	0.2	-	0.2	-	0.2	-	0.2	D95
Delivery Temperature, EC	35	55	55	75	75	95	90	110	

NOTE:

* Alberta Transportation Laboratory Test

(1) If the ductility at 25EC is less than 100, the material will be acceptable if its ductility at 15EC is more than 100.

General Requirements: -The asphalt shall not foam when heated to the application temperature range recommended by the Asphalt Institute.
-The asphalt shall be produced by the refining of petroleum and shall be uniform in character.

SPECIFICATIONS FOR RAPID-CURING LIQUID ASPHALTS: Rapid curing liquid asphalts shall conform to the requirements specified in the following table, for the grade designated by the Engineer:

ASPHALT GRADE	RC-30		RC-70		RC-250		A.S.T.M. TEST METHOD
REQUIREMENTS	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	
Flash Point, Open Tag, EC	-	-	-	-	27	-	D1310
Kinematic Viscosity at 60EC, mm^2/s	30	60	70	140	250	500	D2170
Distillation Test:							
% by volume of total distillate to 360EC,							*TLT-214
-to 190EC	15	-	10	-	-	-	
-to 225EC	55	-	50	-	35	-	
-to 260EC	75	-	70	-	60	-	
-to 315EC	90	-	85	-	80	-	
Residue from distillation to 360EC,							
Volume % by difference	50	-	55	-	65	-	
Tests on Residue from Distillation:							
a) Penetration at 25EC, 100 g, 5 s, dmm	80	120	80	120	80	120	D5
b) Ductility at 25EC, cm(1)	100	-	100	-	100	-	D113
c) Solubility in Trichloroethylene, % by mass	99.5	-	99.5	-	99.5	-	D2042
Water, % by mass or volume	-	0.2	-	0.2	-	0.2	D95
Delivery Temperature, EC	35	55	55	75	75	95	

NOTE:

* Alberta Transportation Laboratory Test

(1) If the ductility at 25EC is less than 100, the material will be acceptable if its ductility at 15EC is more than 100.

General Requirements: -The asphalt shall not foam when heated to the application temperature range recommended by the Asphalt Institute.
-The asphalt shall be produced by the refining of petroleum and shall be uniform in character.

SPECIFICATIONS FOR ANIONIC EMULSIFIED ASPHALTS: Anionic emulsified asphalts shall conform to the requirements specified in the following table, for the grade designated by the Engineer:

ASPHALT TYPE	RAPID SETTING (RS)				MEDIUM SETTING (MS)		SLOW SETTING (SS)				A.S.T.M. TEST METHOD
ASPHALT GRADE	RS-1		RS-2		MS-1		SS-1		SS-1H		
REQUIREMENTS	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	
Viscosity at 25EC, SF s	20	100	-	-	20	100	20	60	20	60	D244
Viscosity at 50EC, SF s	-	-	50	300	-	-	-	-	-	-	
Residue by Distillation, % by mass	55	(1)	60	(1)	55	(1)	55	(1)	55	(1)	D244
Settlement in 5 d, % difference by mass(2)	-	3	-	3	-	5	-	5	-	5	D244
Storage Stability Test, 24 h, % by mass(3)	-	1	-	1	-	1	-	1	-	1	D244
Sieve Test, % retained on a No. 1000 Sieve, % by mass(4)	-	0.10	-	0.10	-	0.10		0.10	-	0.10	D244
Demulsibility, 35 ml of 1.11 g/l $CaCl_2$, % by mass	60	-	60	-	-	-	-	-	-	-	D244
Cement Mixing Test, % by mass	-	-	-	-	-	-	-	2.0	-	2.0	D244
Particle Charge (5)	Negative		Negative		Negative		-		-		
Tests on Residue from Distillation:											
a) Penetration at 25EC, 100 g, 5 s, dmm	100	200	100	200	100	200	100	200	40	100	D5
b) Ductility at 25EC, and 5 cm/min., cm	60	-	60	-	60	-	60	-	60	-	D113
c) Solubility in Trichloroethylene, % by mass	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	D2042
Delivery Temperature, EC	35	65	45	70	40	70	40	70	40	70	

NOTES:

(1) Upper limit on % residue is governed by the consistency limits.

(2) The test requirement for settlement may be waived when the emulsified asphalt is used in less than 5 days time.

(3) The 24 hour storage stability test may be used instead of the 5 day settlement test, however in case of dispute the 5 day storage settlement test shall govern.

(4) CGSB 8-GP-2M, Sieves, Testing, Woven Wire, Metric

(5) Particle Charge Test (Qualitative) - The rapid setting grades will be tested for particle charge according to the procedure described in ASTM D 244, with the modification that the asphalt deposit will, for anionic emulsions, be found on the anode (positive electrode), and shall be continuous and opaque. In the event of dispute, the test will be repeated using freshly distilled water as the wash water for the electrodes, before evaluating the asphalt deposit.

General Requirements: -All tests shall be performed within 15 days of date of delivery.
-The asphalt shall be uniform in character, and shall have a refined petroleum base.

SPECIFICATIONS FOR CATIONIC EMULSIFIED ASPHALTS: Cationic emulsified asphalts shall conform to the requirements specified in the following table, for the grade designated by the Engineer:

ASPHALT TYPE AND GRADE	RS-1K		RS-2K		CRS-2		QS-Kh		A.S.T.M. TEST METHOD
REQUIREMENTS	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	
Viscosity at 25EC, SF s Viscosity at 50EC, SF s	- 75	- 200	- 150	- 400	- 100	- 400	20 -	100 -	D244
Residue by Distillation, % by mass	65	(1)	65	(1)	65	-	57	(1)	D244
Settlement in 5 d, % difference by mass(2)	-	5	-	5			-	5	D244
Storage Stability Test, 24 h, % by mass(3)	-	1	-	1	-	1.5 (8)	-	1	D244
Demulsibility. 35 ml of 0.5 % by weight solution of sodium dioctyl sulphosuccinate, % by mass					60				
Oil Portion of Distillate, % by volume of emulsion	-	3	-	3	-	3	-	-	D244
Sieve Test, % retained on No. 1 000 Sieve (4)(5), by mass	-	0.10	-	0.10	-	0.10(8)	-	0.10	D244
Particle Charge (6)	Positive		Positive		Positive		Positive		
Tests on Residue from Distillation:									
a) Penetration at 25EC, 100 g, 5 s, dmm	100	250	100	250	100	250	40	125	D5
b) Apparent Viscosity at 60° C, Pa.s					See Figure 1				
c) Ductility at 25EC,(4) and 5 cm/min., cm(7)	60	-	60	-	60	-	60	-	D113
d) Solubility in Trichloroethylene, % by mass	97.5	-	97.5	-	97.5	-	97.5	-	D2042
Delivery Temperature, EC	60	80	60	85			-		

NOTES:

(1) Upper limit on % residue is governed by the consistency limits.

(2) The test requirement for settlement may be waived when the emulsified asphalt is used in less than 5 days time.

(3) The 24 hour storage stability test may be used instead of the 5 day settlement test, however in case of dispute the 5 day storage settlement test shall govern.

(4) CGSB 8-GP-2M, Sieves, Testing, Woven Wire, Metric

(5) Replace sodium oleate solution (2%) with distilled water, use distilled water in all operations including wetting and subsequent washing of wire cloth sieves.

(6) Particle Charge Test (Qualitative)- The emulsion will be tested for particle charge according to the procedure described in ASTM D 244, and it is required that the layer of asphalt deposited be continuous and opaque. In the event of dispute, the test will be repeated using freshly distilled water as the wash water for the electrodes, before evaluating the asphalt deposit.

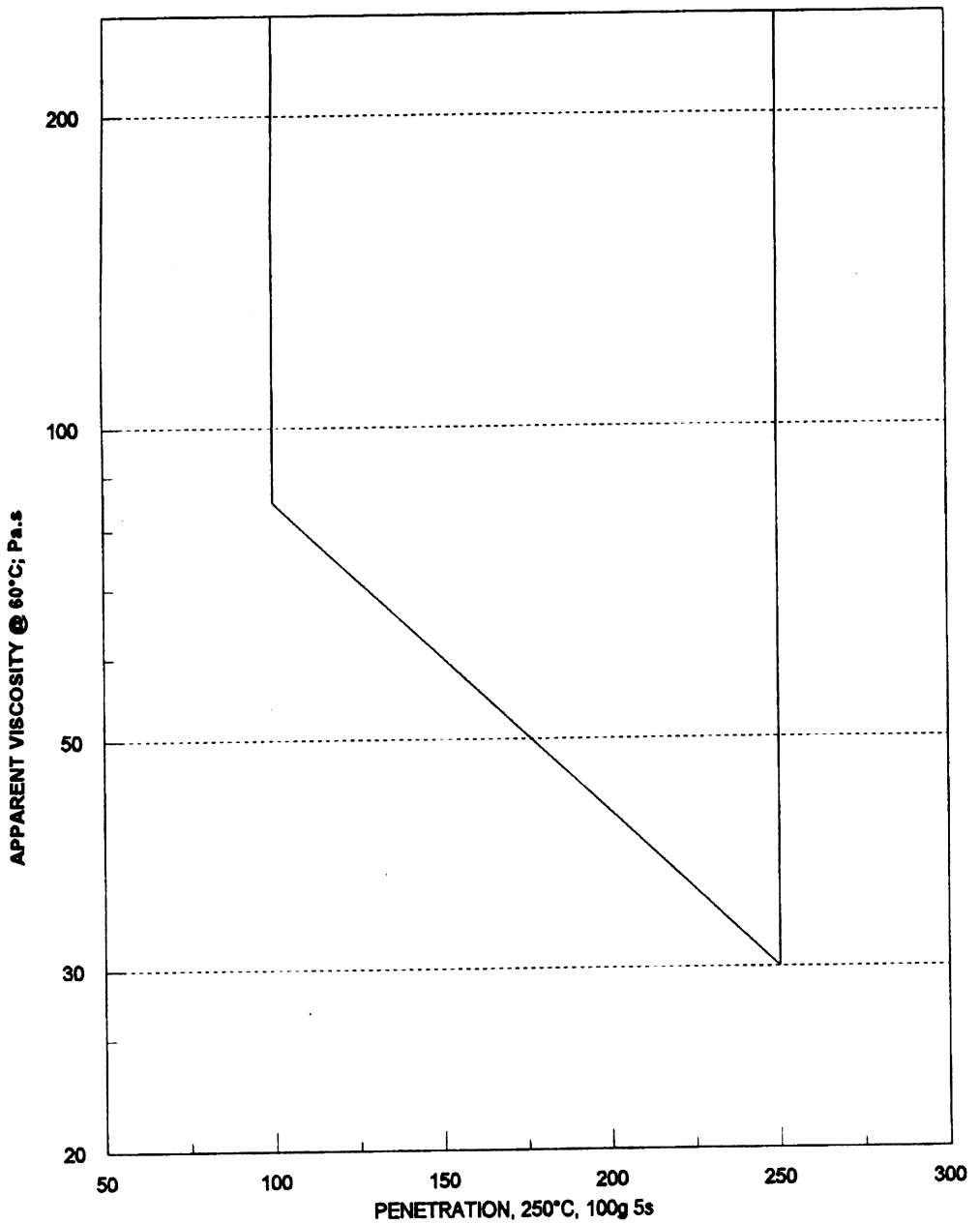
(7) Ductility - Ductility will be measured at 25EC for 100-200 penetration asphalts, and at 15EC for 200-250 penetration asphalts.

(8) Requirements for Storage Stability and Sieve Test are waived if emulsion per forms satisfactorily during application.

General Requirements: -All tests shall be performed within 15 days of date of delivery. -The asphalt shall be uniform in character, and shall have a refined petroleum base.

FIGURE 1

MINIMUM VISCOSITY FOR CRS-2 DISTILLATION RESIDUE



SPECIFICATIONS FOR HIGH FLOAT EMULSIFIED ASPHALTS: High Float emulsified asphalt shall conform to the requirements specified in the following table, for the grade designated by the Engineer:

GRADE	**HF-100S**		**HF-150S**		**HF-250S**		**HF-350S**		**HF-300M**		**HF-500M**		**HF-1000M**		**TEST METHODS**
REQUIREMENTS	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**Note(1)**
Residue by Distillation, % by mass	62	(2)	62	(2)	62	(2)	65	(2)	65	(2)	65	(2)	65	(2)	Par./A1.6.2.1
Oil Portion of Distillate, % by volume of emulsion	1	4	1	4	1	6	1.5	6	1	6	1	2	1	7	A.S.T.M. D244 & Par./A1.6.2.2
Viscosity at 50°C, SF s	30	150	30	150	35	150	75	400	50	---	50	---	50	---	ASTM D244
Sieve Test, % retained on No. 1000 sieve % by mass (3)	---	0.10	---	0.10	---	0.10	---	0.10	---	0.10	---	0.10	---	0.10	Par. 6.2.3
Coating Test (see Notes 4 & 5)	Note (4)		Note (4)		Note (4)		Note (5)		Note (5)		Note (5)		Note (5)		ASTM D244
Workability at -10°C	---	---	---	---	---	---	---	---	---	---	---	---	Pass		Par./A1.6.2.4
Storage Stability Test, 24h, % by mass	---	1.5	---	1.5	---	1.5	---	1.5	---	1.5	---	1.5	---	1.5	ASTM D244
Demulsibility, 50 ml, 5.55 g/l $CaCl_2$, % by mass	60	---	60	---	---	---	---	---	---	---	---	---	---	---	ASTM D244
Tests on Residue from Distillation: a) Penetration at 25°C, 100 g, 5 s, dmm	90	150	150	250	250	500	350	750	300	---	500	---	---	---	Par./A1.6.2.5
b) Apparent Viscosity at 60°C, Pa·s	Requirements outlined on the chart beneath Figure 1								10	40	8	20	2	8	Par./A1.6.2.6
c) Float Test at 60°C, s	1200	---	1200	---	1200	---	1200	---	1200	---	1200	---	1200	---	Par./A1.6.2.7
d) Solubility in Trichloroethylene, % by mass	97.5	---	97.5	---	97.5	---	97.5	---	97.5	---	97.5	---	97.5	---	ASTM D2042
Delivery Temperature, °C	40	70	40	70	40	70	40	70	40	70	40	70	40	70	

NOTES:

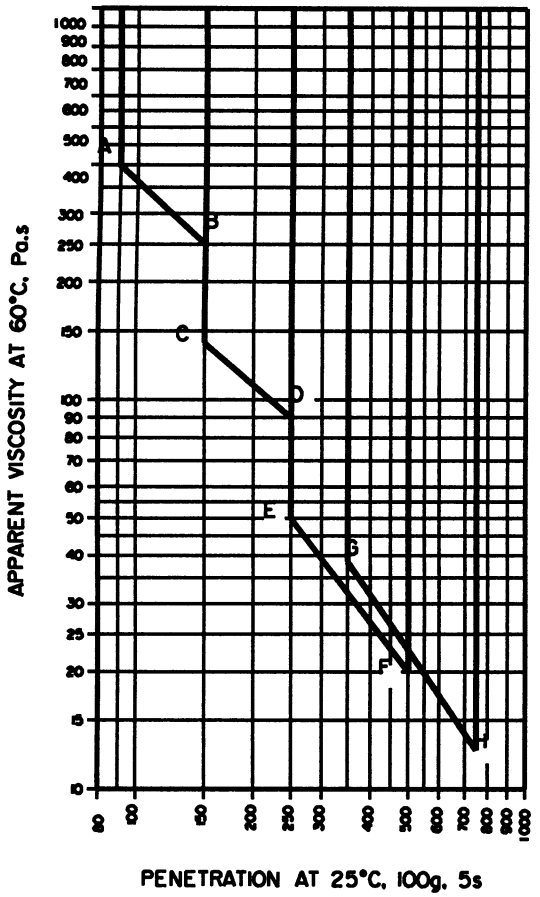
(1) Test methods are as outlined in CGSB CAN2-16.5-M84.

(2) Upper limit on % residue is governed by the viscosity limits.

(3) CGSB 8-GP-2M, Sieves, Testing, Woven Wire, Metric

(4) Follow ASTM D244, except that the mixture of limestone and emulsified asphalt shall be capable of being mixed vigorously for 5 min., at the end of which period the stone shall be thoroughly and uniformly coated. The mixture shall then be completely immersed in tap water and the water poured off. The stone shall then not be less than 90% coated.

(5) Follow ASTM D244, except that the mixture of limestone and emulsified asphalt shall be mixed vigorously for 5 min., then allowed to stand for 3h, after which the mixture shall be capable of being mixed an additional 5 min. The mixture shall then be rinsed twice with approximately its own volume of tap water, without showing appreciable loss of bituminous film. After the second mixing the aggregate shall be at least 90% coated.



Viscosity shall be within the graphic regions above the line designated by specific letters, and between penetration limits contained in vertical lines extending upwards from these points.

Viscosity value shall be reported at $0.5s^{-1}$ for grades HF-100S and HF-150S and at $1.0s^{-1}$ for grades HF-250S and HF-350S.

Grade of HF Emulsified Asphalt	HF-100S	HF-150S	HF-250S	HF-350S
	A, B	C, D	E, F	G, H

FIGURE 1

Viscosity Requirements for Distallation Residues from High-Float Emulsified Asphalts

SPECIFICATIONS FOR EMULSIFIED ASPHALT PRIMER: Emulsified asphalt primers shall conform to the requirements specified in the following table, for the grade designated by the Engineer:

ASPHALT GRADE	SEP-1		SEP-2		A.S.T.M. TEST METHOD
REQUIREMENTS	**min.**	**max.**	**min.**	**max.**	
Viscosity at 25EC, SF s	-	-	15	100	D88
Viscosity at 50EC, SF s	35	200	-	-	D244
Flash point, open Tag, EC	45	-	90	-	D3143
Residue by Distillation, % by mass	40	(1)	40	(1)	D244
Oil Portion of Distillate, % by volume of emulsion	12	29	12	29	D244
Settlement in 5 d	no visible separation		-	2	D244
Miscibility with Water (2)	is not miscible with water		pass		D244
Tests on Residue from Distillation: a) Penetration at 25EC, 100 g, 5 s, dmm b) Solubility in Trichloroethylene, % by mass	 100 97.5	 300 -	 100 97.5	 300 -	 D5 D2042

NOTES:

(1) Upper limit on % residue is governed by the consistency limits.

(2) Follow ASTM D244 except add the emulsified primer to the water. After two hours the water should be clear.

SPECIFICATION FOR EMULSIFIED DUST SUPPRESSANTS: Emulsified Dust Suppressants shall conform to the requirements specified in the following table:

GRADE	**EDS-1**		**EDS-2**		
REQUIREMENTS	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Test Method**
Viscosity - 25°C, SFs - 50°C, SFs	10	35	 35	 100	ASTM D244
Residue by distillation to 260°C, % by mass	40	-	40	-	ASTM D244
Oil portion of distillate, % by volume of emulsion	-	5	-	10	ASTM D244
Settlement, 5 days	-		No visible separation		ASTM D244
Storage Stability, 24 hours	No visible separation (1)		-		ASTM D244
Workability(2)	Pass		Pass		-
Flash Point, Open Tag, °C	-	-	45	-	ASTM D3143
Miscibility with water	Pass		Pass(3)		ASTM D244
Kinematic viscosity of residue from distillation, 60°C, mm^2/s	25	100	25	300	ASTM D2170

Notes:

1) If EDS-1 is retained in storage for an extended period of time, it should be circulated prior to use.

2) When 500 grams of sand and 50 g of emulsion are mixed for 5 minutes at ambient temperature, the sand shall be 100% coated. The mixture shall be oven dried at 120°C to remove all the moisture. After cooling to room temperature, the mix shall be easily workable for the next 24 hours.

3) Follow ASTM D244 except add the EDS-2 to water. After 2 hours the water should be clear.

SPECIFICATION FOR COLD POUR RUBBER FILLED EMULSIFIED BITUMINOUS CRACK SEALANT: Cold Pour Rubber Filled Emulsified Bituminous Crack Sealants shall conform to the requirements specified in the following table:

TYPE	**EC-101**			
REQUIREMENTS	**Minimum**		**Maximum**	**Test Method**
Uniformity, 24 hours	Pass			*TLT-226
Stormer viscosity at 25°C, Krebs	70		90	*TLT-227
Solids content, %	59		-	ASTM D244 (Residue by Evaporation Procedure A)
Ash content, %	-		2.0	*TLT-229
Rate of curing, % loss	50% 24 hrs.	80% 6 days	-	*TLT-230
Low temperature flexibility, -4°C, 30s	Pass (no cracks)			*TLT-231
Elastic recovery, % recovered	40		-	*TLT-232

* Alberta Transportation Laboratory Test

SPECIFICATION FOR HOT POUR BITUMINOUS CRACK SEALANT: Hot Pour Bituminous Crack Sealants shall conform to the requirements specified in the following table:

TYPE	**HC-200**		
REQUIREMENTS	**Minimum**	**Maximum**	**Test Method**
Softening Point, °C	80	95	ASTM D36
Flash Point, Cleveland Open Cup, °C	230	-	ASTM D92
Penetration			ASTM D5
0°C, 200g, 60s, dmm	30		
25°C, 100g, 5s, dmm	55	65	
46°C, 50g, 5s, dmm		150	
Ductility, 25°C, cm	45	-	ASTM D113
Solubility in Trichloroethylene, %	98	-	ASTM D2042
Kinematic viscosity at 177°C, mm^2/s	-	1500	ASTM D2170

TABLE OF CONTENTS

5.11 SUPPLY OF PORTLAND CEMENT

5.11.1 GENERAL

This specification covers the supply of portland cement.

5.11.2 MATERIALS

The Contractor shall supply cement meeting the requirements of the latest version of Canadian Standards Association CAN 3-A5, Portland Cement, for the type of cement specified.

Unless otherwise approved by the Consultant, the specification requirements shall apply to the cement in the delivery vehicle at the cement storage site.

The Contractor shall, at his expense and to the satisfaction of the Consultant; prevent contamination of the cement, by cement of another type or by any other material; maintain records of times of receipt of cement delivery orders, cement departure from the source, arrival at the cement storage site, and start and completion of unloading, and provide this information to the Consultant upon request.

The Contractor shall provide the Consultant with a "Certificate of Compliance" acceptable to the Consultant, for the Portland Cement to be used in the Work.

The Consultant may verify the quality of the material at any time. Sampling and testing for verification purposes will be in accordance with the latest version of Canadian Standards Association CAN 3-A5, Portland Cement.

5.11.3 MEASUREMENT AND PAYMENT

Where the Contract contains bid items for the supply of portland cement, measurement will be based on the suppliers' weigh bills however, the Consultant may check quantities delivered by weighing the delivery vehicles before and after unloading. If there is a variance between quantities measured by the Consultant and the suppliers' weigh-bills, the Consultant will determine the quantity on which payment will be based.

Where the Contract contains bid items for the supply of portland cement, payment for accepted portland cement material will be made at the applicable unit price bid per tonne.

Where the Contract does not contain bid items for the supply of portland cement, accepted cement material will not be paid for separately. Payment will be considered included in the unit price bid for the Contract item for which the portland cement is used.

TABLE OF CONTENTS

5.14 SUPPLY OF FENCE MATERIAL

5.14.1 GENERAL

5.14.1.1 **Description**

The Work consists of supplying all required materials for the construction of fence including but not limited to:

(a) Split Cedar Posts
(b) Pressure Treated Wood Posts and Braces
(c) Two Strand Barbed Wire
(d) Single Strand Barbed Wire
(e) Woven Wire (Paige Wire)
(f) Brace Wire
(g) Staples
(h) Metal Stays

5.14.1.2 **Abbreviations and Definitions**

Wherever in these Specifications the following abbreviations are used, the intent and meaning shall be as follows:

A.S.T.M.: The American Society for Testing Materials

C.S.A.: The Canadian Standards Association

5.14.2 MATERIALS

5.14.2.1 **General for Posts**

Posts shall be of sound quality, free from all decay, shakes, splits, multiple crooks or any other defects which would render them structurally unsuitable for the purpose intended. All posts shall comply with the minimum-maximum top diameter as specified. The top of the post shall mean the small end of the post. The ends of the posts shall be cut square and the length of individual posts shall not vary by more than plus or minus 25 mm from the length required for the applicable installation.

5.14.2.2 **Split Cedar Posts**

Untreated split cedar posts shall be cut from sound timber and shall have an allowable taper from end to end not exceeding 114 mm in perimeter.

5.14.2.3 **Pressure Treated Wood Posts and Braces**

Pressure treated wood posts and braces shall be fir or pine timber, as specified. Knots that are sound, well spaced, smoothly trimmed and which do not impair the strength of the posts or braces will be permitted providing they do not exceed 38 mm in diameter on any face. Posts shall be naturally round and shall have all bark peeled or otherwise removed. Allowable taper from end to end of posts shall not exceed 38 mm in diameter.

Braces shall be sawn square or rectangular to the standard nominal dimensions as specified.

Posts and braces shall be treated by pressure methods with 50/50 creosote-petroleum solution or a chromated copper arsenate solution. The preservative agent shall conform to the requirements of the current edition of C.S.A. Standard 080. The minimum retention of preservative in the wood, as determined by assay, shall be as specified in the following table:

	Round Posts	**Sawn Braces**
Sample Zone for Assay (mm from surface)	0-19	0-16
Minimum Net Retention (kg/m^3) Creosote - Petroleum	96	96
Chromated Copper Arsenate (CCA)	6.4	6.4

Requirements for the preservative treatment of round posts and sawn braces shall conform to the current requirements of C.S.A. Standard 080 with specific attention to 080.1, 080.2 and 080.5.

5.14.2.4 **Metal Stays and Keeper Wire**

5.14.2.4.1 Metal Stays

Metal stays shall be fabricated from high tensile steel sheet conforming to the requirements of the current "Standard Specification for Weight (mass) of Coating on Iron and Steel Articles with Zinc or Zinc Alloy Coatings, " A.S.T.M. Designation A90, with additions as described in this specification.

Metal stays shall conform to the following minimum requirements:

Length 860 mm
Yield Strength 22 727 kg
High Tensile Steel Breaking Strength 29 545 kg
Barbed Wire Slot Sized 4.75 mm x 15.90 mm

Reflective sheeting for metal stays shall meet or exceed the requirements as specified in ASTM-D4956, Performance Requirements Type III, High Intensity Retro-reflective Sheeting.

5.14.2.4.2 Keeper Wire

High Tensile Galvanized Keeper Wire shall conform to the requirements of the current "Standard Specification for Steel Wire, Cold-Drawn for Mechanical Springs," A.S.T.M. Designation A227, with additions as described in this specification.

Keeper wire shall conform to the following minimum requirements:

Length 860 mm
Yield Strength 35 909 kg
High Tensile Wire Breaking Strength 41 818 kg

5.14.2.5 **Two Strand Barbed Wire**

Two strand barbed wire shall conform to the requirements of the current "Standard Specifications for Zinc-Coated (Galvanized) Steel Barbed Wire", A.S.T.M. Designation A121, (Class 1 or better) and shall consist

of two strands of 2.5 mm thickness wire, twisted with four-point, 2.0 mm thickness round barbs spaced not more than 152 mm apart.

Each spool delivered to the job site shall be legibly marked showing the mass, linear measure, thickness and name or mark and address of the Manufacturer.

5.14.2.6 **Single Strand Barbed Wire**

Single strand barbed wire shall conform to the requirements of the current edition A.S.T.M. Designation A121, "Standard Specifications for Zinc-Coated (Galvanized) Steel Barbed Wire". The requirements regarding uniform twisting of strands will be waived.

Single strand barbed wire shall conform to the following minimum requirements:

Measure of wire per spool	402 m
Minimum mass per spool	24 kg
Wire thickness	2.64 mm
Minimum tensile breaking strength of wire	500 kg
Barb spacing	125 mm
Number of points per barb	4

The barbs shall be firmly and securely fixed in position.

5.14.2.7 **Woven Wire (Paige Wire)**

Woven wire shall conform to the requirements of the current "Standard Specification for Zinc-Coated (Galvanized) Iron or Steel Farm-Field and Railroad Right-of-Way Wire Fencing", A.S.T.M. Designation A116, (Class 1 or better), except that Section 5 of the A.S.T.M. Specification shall be deleted and replaced with the requirements pertaining to size and style of the woven wire mesh as hereinafter provided.

Each roll delivered to the job site shall be legibly marked showing the length, name or mark and address of the Manufacturer.

All wire of a specified class for use on a particular project shall be of identical design unless otherwise specified by the Consultant.

The woven wire mesh design shall conform with one of the following Classes as specified:

5.14.2.7.1 Class "C" Woven Wire

812 mm overall height with not lighter than 3.35 mm thickness top and bottom wires, and not lighter than 2.34 mm thickness filler wires. Vertical stay wires shall be spaced at intervals not greater than 152 mm. There shall be a minimum of eight (8) horizontal line wires forming vertical spaces graduated from 76 mm at the bottom of the mesh to 152 mm at the top. Joints or knots between vertical stay wires and horizontal line wires shall be of a rigid, hinge-locking design which will prevent slippage of the wires. The minimum weight of Class "C" woven wire shall be 0.60 kg per metre.

5.14.2.7.2 Class "D" Woven Wire

978 mm overall height with not lighter than 3.35 mm thickness top and bottom wires, and not lighter than 2.64 mm thickness filler wires. Vertical stay wires shall be spaced at intervals not greater than 152 mm. There shall be a minimum of nine (9) horizontal line wires forming vertical spaces graduated from 76 mm at the bottom of the mesh and 178 mm at the top. Joints or knots between vertical stay wires and horizontal line wires shall be of a rigid, hinge-locking design which will prevent slippage of the wires. The minimum weight of Class "D" woven wire shall be 0.66 kg per metre.

5.14.2.7.3 Class "E" Woven Wire

1064 mm overall height with not lighter than 3.35 mm thickness wire throughout. Vertical stay wires shall be spaced at 420 mm intervals. Horizontal wires shall be spaced at 152 mm intervals, top to bottom. Joints or knots between vertical stay wires and horizontal line wires shall be of a rigid, tight-lock design which will prevent slippage of the wires. The minimum weight of Class "E" woven wire shall be 0.84 kg per metre.

5.14.2.7.4 Class "F" Woven Wire

2134 mm overall height with not lighter than 3.66 mm thickness wire throughout. Vertical stay wires shall be spaced at 152 mm intervals. Horizontal wires shall be spaced at 152 mm intervals, top to bottom. Joints or knots between vertical stay wires and horizontal line wires shall be of a rigid, tight-lock design which will prevent slippage of the wires. The minimum weight of Class "F" woven wire shall be 2.84 kg per metre.

5.14.2.8 **Brace Wire**

Brace wire shall be 3.66 mm thickness soft galvanized wire and the weight of 30.5 m of wire shall not be less than 2.5 kg.

5.14.2.9 **Staples**

Wire staples shall be standard 40 mm long staples, manufactured from 3.66 mm thick galvanized wire. There shall be approximately 140 staples per kilogram.

5.14.3 INSPECTION, SAMPLING AND TESTING

At the time of shipment, the Contractor shall provide certification indicating the specification number according to which the material being supplied was produced and tested.

All materials shall be subject to inspection, sampling and quality assurance testing by the Consultant and the Contractor shall provide safe, convenient access, acceptable to the Consultant, for inspection and sampling of the materials, and shall co-operate in the inspection and sampling process when requested to do so. The Contractor shall be responsible for any costs resulting from such inspections, including the cost of replacing any fence materials damaged by such inspection, sampling or testing.

Any material found unacceptable by the Consultant shall be immediately removed and replaced with acceptable material by the Contractor, at the Contractor's expense.

5.14.4 MEASUREMENT AND PAYMENT

No separate payment will be made for the supply of fencing materials. The costs of supplying and delivering fence materials to the job site will be included in the unit price bid for the applicable fence installation.

TABLE OF CONTENTS

5.16 SUPPLY OF REINFORCED CONCRETE PIPE AND RELATED JUNCTIONS, FITTINGS AND MATERIALS

5.16.1 GENERAL

This specification covers the supply and fabrication of the following material by the Contractor:

(1) Reinforced Concrete Pipe
(2) Joints and Fittings utilizing Reinforced Concrete Pipe
(3) Precast Reinforced Concrete Manhole Risers and Tops
(4) Concrete Masonry Units for Construction of Catch Basins and Manhole
(5) Rubber Gasket Joints, and
(6) Cement Mortar

All references to "Standards" or "Specifications" refer to the latest edition at the time of tender.

5.16.2 MATERIALS

5.16.2.1 **Reinforced Concrete Pipe**

5.16.2.1.1 Round and Elliptical Pipe

Reinforced Concrete Pipe shall conform to the material and fabrication requirements of the A.S.T.M. Specification C 76M.

The following information shall be clearly marked on each section of pipe:

(1) The pipe class
(2) The date of manufacture, and
(3) The name or trade-mark of the manufacturer.

This information shall be marked on the outside for pipe sizes up to and including 900 mm diameter and on the inside for pipe sizes over 900 mm diameter.

End sections shall be supplied with either square or sloped ends as required by the order. The dimensions of the sloped ends shall conform to details shown on the plans herein.

5.16.2.1.2 Curved Pipe Sections

Curved pipe sections shall conform to all the specification requirements of Round and Elliptical Pipe as described in Section 5.16.2.1.1.

The ends of the pipe sections shall be bevelled to the degree corresponding to the desired radius of curvature and shall be so formed that when the pipe sections are laid together they will form a continuous and uniform curved line.

5.16.2.1.3 Joints, Fittings and Bends

Joints and fittings shall include special sections fabricated for the purpose of connecting manholes and branch lines to the main conduit. The pipe sections utilized in forming the joint, fitting or bend shall

conform to all the specification requirements of Round and Elliptical Pipe as specified in Section 5.16.2.1.1. The Sections shall be fabricated to form an integral unit, and the class of pipe shall be not less than specified on the detail drawing for the unit. The connection at the joint shall permit the utilization and development of the same degree of beam and circumferential strength as the main section of the conduit adjacent thereto.

Manhole fittings shall be provided with ladder rungs of the size and at the spacing shown on the detail drawing.

5.16.2.2 **Precast Reinforced Concrete Manhole Risers and Tops**

Precast Reinforced Concrete Manhole Risers and Tops shall conform to all the material and fabrication requirements of the A.S.T.M. Specification C 478.

5.16.2.3 **Concrete Masonry Units for Construction of Catch Basins and Manholes**

Concrete masonry units for construction of catch basins and manholes shall conform to all the material and fabrication requirements of the A.S.T.M. Specification C 139.

5.16.2.4 **Rubber Gasket Joints**

Joints for circular concrete sewer and culvert pipe using flexible watertight rubber-type gaskets shall conform to all the material and fabrication requirements of A.S.T.M. Specification C 443.

5.16.2.5 **Cement Mortar**

The cement mortar mixture shall be composed of one part Portland Cement and two parts sand by volume. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. The sand shall conform to the requirements of A.A.S.H.T.O. Specification M 45-83I, or shall be an equivalent, subject to approval by the Consultant. The cement shall conform to the requirements of A.A.S.H.T.O. Specification M85-84I.

5.16.3 INSPECTION, SAMPLING AND TESTING

All materials shall be subject to inspection, sampling and quality assurance testing by the Consultant and the Contractor shall provide safe, convenient access, acceptable to the Consultant, for inspection and sampling of the materials, and shall co-operate in the inspection and sampling process when requested to do so. Inspection, sampling and testing of Reinforced Concrete Pipe and related joints and fittings shall be in accordance with the methods prescribed in A.S.T.M. Specification C 76M. In particular, acceptance shall be on the basis of load bearing tests, material tests and inspection of the completed product.

Inspection, sampling and testing of Precast Reinforced Concrete Manhole Risers and Tops shall be in accordance with the methods prescribed in A.S.T.M. Specification C 478.

Inspection, sampling and testing of Concrete Masonry Units for Construction of Catch Basins and Manholes shall be in accordance with the methods prescribed in A.S.T.M. Specification C 139.

All materials which do not meet requirements of the specifications shall be rejected. No rejected material, the defects of which have subsequently been corrected, shall be used unless approval in writing has been

given by the Consultant. Stocked materials, even though accepted in delivery, shall be subject to test and shall meet requirements of the specifications at the time they are to be used in the work.

5.16.4 MEASUREMENT AND PAYMENT

Payment for the supply of reinforced concrete pipe including couplers, related junctions, fittings and appurtenances will be included in the unit price bid per metre for the applicable types and sizes of pipe specified.

TABLE OF CONTENTS

5.17 SUPPLY OF POLYVINYL CHLORIDE PIPE

5.17.1 GENERAL

The Work consists of supplying Polyvinyl Chloride Pipe of the following types:

- Type PSM Polyvinyl Chloride Drainage Pipe
- Ribbed Polyvinyl Chloride Drainage Pipe
- Polyvinyl Chloride (PVC) Pipe for Culvert Liners

Nominal sizes include:

- 100, 150, 200, 250, 300, 375, 450, 525, 600, 675, 750 and 900 mm diameter.

5.17.2 APPLICABLE SPECIFICATIONS

All references to "Standards" or "Specifications" refer to the latest edition at the time of tender.

CSA B182.2	Large-diameter, Type PSM PVC Sewer Pipe and Fittings
CSA B182.4	Large-diameter, Ribbed PVC Sewer Pipe and Fittings
ASTM D883	Definition of Terms Relating to Plastics
ASTM D1784	Standard Specification for PVC and CPVC Compounds
ASTM D2122	Standard Method of Determining Dimensions of Thermoplastic Pipe and Fittings
ASTM D2152	Standard Test Method for Quality of Extruded PVC Pipe by Acetone Immersion
ASTM D2412	Test for External Loading Properties of Plastic Pipe by Parallel-Plate Loading
ASTM D2444	Standard Test Method for Impact Resistance of Thermo-plastic Pipe and Fittings by Means of a Tup (Falling Weight)
ASTM D3034	Standard Specification for Type PSM PVC Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F412	Definition of Terms Relating to Plastic Piping Systems
ASTM F477	Standard Specification for Elastomeric Seals for Joining Plastic Pipe
ASTM F794	Standard Specification for PVC Large-diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter

5.17.3 MATERIALS

All pipe and fittings shall be made of virgin PVC plastic as defined in ASTM Standard D1784.

Elastomeric Seals (gaskets) shall conform to the requirements of ASTM Standard F477.

5.17.4 REQUIREMENTS

5.17.4.1 **Length**

Standard pipe length shall be 4 m or as requested by the Consultant. A tolerance of ± 25 mm on the nominal laying length will be permitted.

5.17.4.2 **Dimensions for Type PSM, PVC Drainage Pipe**

Nominal Pipe Size (mm)	Average Inside Diameter (mm)	Average Outside Diameter (mm)	Minimum Wall Thickness (mm)
100	100.94	107.06	3.06
150	150.29	159.39	4.55
200	201.16	213.36	6.10
250	251.46	266.70	7.62
300	299.36	317.50	9.07
375	366.42	388.62	11.10
450	447.87	475.01	13.57
525	527.99	559.99	16.0
600	594.00	630.00	18.0
675	669.42	710.00	20.29
750	766.36	812.80	23.22
900	917.22	972.80	27.79

5.17.4.3 **Dimensions for Ribbed PVC Drainage Pipe**

Nominal Pipe Size (mm)	Average Inside Diameter (mm)	Average Outside Diameter (mm) (over RIBS)	Minimum Wall Thickness (mm)
200	200	224	2.03
250	251	280	2.16
300	298	333	2.54
375	374.40	399.80	3.05
450	448.31	448.44	3.05
525	527.05	570.73	3.65
600	596.90	648.20	4.34
675	673.10	728.98	4.8
750	749.30	811.28	5.35
900	901.70	976.90	6.38

5.17.5 JOINTS

All sizes of pipe shall be supplied with Elastomeric gasket joints providing a watertight seal meeting the requirements of the latest version of CSA B182.2 and ASTM F477. The joints shall be able to withstand 345 kPa hydrostatic pressure.

5.17.6 HYDRAULICS

The manufacturer will provide the tested Manning's "n" value that will be used to calculate pipe flow capacity.

5.17.7 MARKINGS

All pipe supplied shall be clearly marked with the following information at intervals of not more than 1.5 m with 5 mm or larger letters.

- Manufacturer's name or trademark
- Nominal diameter
- Material designation and cell class
- The applicable specification designation
- Date of manufacture and plant designation

5.17.8 INSPECTION, SAMPLING AND TESTING

All materials shall be subject to inspection, sampling and quality assurance testing by the Consultant and the Contractor shall provide safe, convenient access, acceptable to the Consultant, for inspection and sampling of the materials, and shall co-operate in the inspection and sampling process when requested to do so.

The Contractor shall contact the Consultant at least 72 hours prior to shipping the materials to coordinate any inspection, sampling or testing at the manufacturing location and the delivery site that the Consultant deems necessary.

Any material found unacceptable by the Consultant shall be replaced with acceptable material by the Contractor at his expense.

5.17.9 MEASUREMENT AND PAYMENT

No separate payment will be made for the supply of polyvinyl chloride pipe. The cost for the supply and delivery of all materials, including gaskets and appurtenances, to the job site will be included in the unit price bid for the applicable installation.

TABLE OF CONTENTS

5.18 SUPPLY OF PERMANENT HIGHWAY SIGNS, POSTS AND BASES

5.18.1 GENERAL

The Work consists of supplying concrete bases, steel breakaway posts as applicable, cluster frames, wooden posts and designated highway signs as indicated in the special provisions, as shown on the plans or as directed by the Consultant.

5.18.2 MATERIALS

5.18.2.1 **General**

All materials shall be supplied by the Contractor.

The Contractor shall supply the Consultant with certification from the supplier that the signs conform with the specifications and shall only purchase signs that are certified by the supplier to meet the specifications of the sheeting manufacturer.

5.18.2.2 **Signs**

Sign patterns shall conform to the Uniform Traffic Control Devices of Canada Sign Pattern Manual or to the Alberta Transportation Sign Pattern Manual. All other signs shall be as specified by the Consultant.

All lettering on signs shall conform to the series Type Highway Font from the Standard Alphabet for Highway Signs, available from the Federal Highway Administration (CHTO-20), Washington, D.C., 20590, unless otherwise specified by the Uniform Traffic Control Devices of Canada Sign Pattern Manual or the Alberta Transportation Sign Pattern Manual.

When signs not included in the Schedule of Signs are required, the Consultant will provide the following information:

Dimensions of the sign
Dimensions of the lettering
Colours of the sign
Material specifications

5.18.2.3 **Wooden Posts**

Posts shall be pine or spruce structural framing no. 2 or better, as per NLGA 1980 Rules Par. 123 C. Posts are to be CCA (Copper, Chromate, Arsenate) pressure treated in accordance with CSA 080.14 and CSA 081.1. Material supplied shall be free from wane and shall be clean and dry.

Post sizes to be supplied shall be 100 mm x 100 mm, 100 mm x 150 mm and 150 mm x 200 mm dimension lumber, in lengths ranging from 365 cm to 610 cm.

5.18.2.4 **Cluster Frames**

The Contractor shall supply cluster frames suitable for the installation of multiple signs of up to 1.5 m^2 in accordance with diagram TEB 1.71A, C-Cluster Frame. The frames shall be painted with rust resistant aluminum paint or a metal primer and aluminum paint suitable to the Consultant.

5.18.2.5 **Concrete Bases**

The Contractor shall supply bases in accordance with drawing TEB 1.83. The Contractor shall provide the Consultant with the manufacturer's certification indicating that the base has been manufactured to specified requirements.

The Contractor shall supply all material necessary to install the base, including suitable backfill material. Cementitious and organic materials are not acceptable backfill.

5.18.2.6 **Breakaway Steel Sign Posts**

The Contractor shall supply steel posts as shown on drawing TEB 1.82.

The Contractor shall provide the Consultant with the material manufacturer's certification that the material meets the Department's specifications.

The Contractor shall supply zinc-rich paint (i.e. galvicon or equivalent) for repairs to any damaged galvanized surfaces.

5.18.2.7 **Mounting Hardware**

The Contractor shall supply all bolts and other hardware required to mount signs to posts or to frames and the frames to the posts. All bolts and hardware shall be galvanized.

5.18.2.8 **Material Specifications**

5.18.2.8.1 Reflective Sheeting

Reflective Sheeting shall meet or exceed the minimum requirements as specified in ASTM-D4956, Performance Requirements Type III, High Intensity Retroreflective Sheeting.

5.18.2.8.2 Reflective Sheeting for Select Permanent Highway Signs

For installations of the following signs:

RA-1 "Stop",
RA-2 "Yield",
RB-22 "Wrong Way" and
RB-23 "Do Not Enter",

the Contractor shall supply reflective sheeting complying with the minimum coefficient of retro-reflectivity (RA (cd/lux/m2)) as shown in the following table:

Observation Angle	Entrance Angle	White	Red
0.2º	-4º	370	98
0.2º	+30º	225	65
0.5º	-4º	275	70
0.5º	+30º	125	32

At the time of publication of this manual, 3M's Diamond Grade (VIP), Series 3990, reflective sheeting material is the only acceptable material for use on these signs, however, future products shown to meet these requirements will be posted on the Alberta Transportation Recognized Products list on the Department's web site.

5.18.2.8.3 Backing

- Plywood - Sanded one side

  ½" 100/100 or 120/120 Hi-Density
  ¾" 100/100 or 120/120 Hi-Density

- Aluminum

Extruded aluminum panels for major signs, shall be Alcan Shape #73247 with anodize treatment and shall conform to ASTM B221M, "Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes", Alloys 6061-T6 or 6063-T5.

Aluminum for standard signs shall be a minimum of 2 mm flat sheet tension levelled, sign grade aluminum and shall conform to the requirements of ASTM B209M, "Specification for Aluminum and Aluminum-Alloy Sheet and Plate", Alloys 6061-T6 or 5052-H38.

5.18.3 MEASUREMENT AND PAYMENT

5.18.3.1 **Wooden Posts**

No separate payment will be made for the supply of Sign Posts. The cost of supplying and delivering sign posts to the jobsite will be included in the applicable unit price bid for the sign post installation.

5.18.3.2 **Cluster Frames**

No separate payment will be made for the supply of Cluster Frames. The cost of supplying and delivering cluster frames to the jobsite will be included in the unit price bid for the cluster frame installation.

5.18.3.3 **Concrete Bases**

No separate payment will be made for the supply of Concrete Bases. The cost of supplying and delivering concrete bases to the jobsite will be included in the unit price bid for the concrete base installation.

5.18.3.4 **Breakaway Steel Posts**

No separate payment will be made for the supply of Breakaway Steel Posts.

The cost of supplying and delivering breakaway steel posts to the jobsite will be included in the applicable unit price bid for the steel post installation.

5.18.3.5 **Mounting Hardware**

No separate payment will be made for the supply of bolts, nuts washers or any other hardware required for breakaway post assembly or the mounting of signs, cluster frames or other assemblies necessary to complete the Work.

5.18.3.6 **Signs**

Measurement will be in square metres for the specific reflective sheeting and backing required.

Payment for signs will be made at the applicable unit price bid per square metre for "Supply of Signs, ½" Plywood ", "Supply of Signs, ¾" Plywood", "Supply of Signs, Aluminum", or "Supply of Signs, Extruded Aluminum". This payment will be full compensation for the manufacture and supply of the signs to the worksite and all labour, materials, equipment, tools and incidentals necessary to complete the Work.

TABLE OF CONTENTS

5.20 SUPPLY OF LINE PAINTING MATERIALS

5.20.1 GENERAL

This specification applies to contracts that require the Contractor to supply line painting materials.

5.20.2 MATERIALS

The Contractor shall choose the paint and glass bead materials to be supplied from the list of approved products shown in the special provisions or specification amendments. The Contractor shall be responsible for ensuring that the quality of the paint and beads supplied meets the requirements specified.

The Contractor shall advise the Consultant of any change in paint formulation.

The Contractor shall provide the Consultant with the following information prior to commencing the Work:

- Names and mailing addresses of the suppliers and manufacturers;
- Formulation to be supplied;
- Written confirmation from the manufacturer that the materials to be supplied meet all specified requirements.

The Contractor shall verify that all materials delivered and used in the Work are the type ordered.

5.20.3 SAMPLING AND TESTING

The Contractor shall supply the Consultant with quality assurance samples and the manufacturer's quality control test results. Quality control results shall include a minimum of Specific Gravity, Hiding Power, Dry to Traffic and Viscosity results. A minimum of one quality assurance sample per batch shall be taken for glass beads as per TLT-601, Sampling Glass Beads. A minimum of one quality assurance sample per colour per batch shall be taken for paint as per TLT-636, Sampling Traffic Paint. The Consultant will forward the samples to the Department's designated quality assurance testing firm.

All materials shall be subject to further inspection and sampling by the Consultant, and the Contractor shall provide safe, convenient access, acceptable to the Consultant, for inspection and sampling of the materials, and shall co-operate in the inspection and sampling process when requested to do so.

Paint products shall be tested and shall meet the requirements as specified in the Special Provisions.

5.20.4 SUPPLY, HANDLING AND STORAGE

The Contractor shall make all arrangements for the supply and delivery of paint and glass beads and shall provide the Consultant with records of all materials received and/or returned, on a daily basis.

The Contractor shall provide, maintain and reclaim all material storage sites. Storage of materials at Department facilities will not be permitted.

No paint formulation shall be diluted or mixed with a different formulation or with any other material, without the specific approval of the Consultant.

The Contractor shall take all necessary steps to prevent contamination of the materials. Paint shall be protected from freezing.

The Contractor shall be responsible for the proper clean up of waste or spilled material, and the proper disposition of containers.

5.20.5 MEASUREMENT AND PAYMENT

Payment for the supply of all required materials including paint, glass beads and any cleaning solvents will be included in the applicable unit price bid for "Roadway Lines-Supplying Paint and Painting", "Intersection Lines-Supplying Paint and Painting" or "Interchange Lines-Supplying Paint and Painting".

TABLE OF CONTENTS

5.21 SUPPLY OF LIVESTOCK GUARDS

5.21.1 GENERAL

5.21.1.1 **Description**

The Work consists of supplying livestock guards designed for safe passage of motor vehicles while safely prohibiting the passage of livestock.

5.21.1.2 **Design Standards**

The Contractor shall provide full shop drawings showing all materials, including specification and grade of steel, all material sizes and/or dimensions, and all connections, including grades and sizes of bolts and sizes of weld. Drawings shall be fully dimensioned in metric units.

Designs shall be certified by a Professional Engineer registered in the Province of Alberta, that they meet the specified load capacity for each type of livestock guard outlined herein.

In cases in which standards are quoted, such as the Canadian Standards Association (CSA) or the Canadian Welding Bureau (CWB), the latest edition shall be used.

The Contractor shall indicate patent information and ownership, if applicable. Ownership of the registered design will remain with the vendor.

CB-6 drawings referred to in this specification are found in the latest edition of the manual entitled "CB-6 Highway Standard Plates".

5.21.2 MATERIALS

5.21.2.1 **General**

The Contractor shall supply all materials required to complete the Work to the standards shown on the drawings. Livestock guards shall be fabricated using new or used quality material as specified, be painted with one coat of oil alkyd type primer, and shall meet the requirements of the Canadian General Standards Board (CGSB) Spec. 1-GP-166M. Weathering steel which does not require paint, is also acceptable.

Finished products shall be identified with a trademark and the date of manufacture stamped or welded in an area of the guard that can be easily read after installation.

Fencing detail shown on the drawings is for information only, and with the exception of the applicable fence post sleeves, shall not apply to this specification.

5.21.2.2 **Types of Livestock Guard**

The various types of livestock guards are as follows:

5.21.2.2.1 Standard Highway Type

Standard highway livestock guards are used on all paved and unpaved roads and are designed to carry legal highway vehicles at various speeds. Details are shown on drawings CB6 2.13 M5, M6, M7 and M11.

5.21.2.2.2 Range Type

Range type livestock guards are designed to be used on lightly or seldom travelled roads with no more than standard farm or ranch vehicles. Details are shown on drawing CB6 2.13 M4.

5.21.2.2.3 Off-Highway Type

Off-highway type guards are used on logging or mining access roads where the load of the vehicles can exceed the legal highway limit. There may also be frequent light or average truck/car traffic. These guards shall be constructed in accordance with the applicable drawing for the required size with the increased load ratings detailed herein.

5.21.2.3 **Load Requirements**

In all load applications, the load shall be placed on the livestock guard in a location causing the greatest stress to the member in question.

5.21.2.3.1 Live Load Requirements

Range type and standard highway type livestock guards shall meet the live load capacity requirements of CSA bridge design code S6 for design truck: normal loading CS-600 truck (180 kN axle).

Off-highway livestock guards shall meet the live load capacity requirements of CSA bridge design code S6 for design truck: log haul loading CS-750 truck (225 kN axle).

5.21.2.3.2 Impact Loading

An impact load shall be applied concurrently with the live load. The impact load for all livestock guard types shall be:

a vertical load equal to 40% of the live load, or
a vertical load equal to 20% of the live load combined with a horizontal load equal to 20% of the live load.

5.21.3 EQUIPMENT

The Contractor shall supply all equipment necessary to complete the Work.

5.21.4 CONSTRUCTION

5.21.4.1 **General**

All livestock guards shall be constructed in accordance with the applicable drawings.

Welding shall be performed by a company approved by the Canadian Welding Bureau to CSA Standard W47.1 with Work performed to CSA Standard W59.

5.21.4.2 **Sill and Frame Construction**

The frame shall be designed to allow even distribution of live loads to the sills. The ends of the frame which contact the road surfaces shall include a fill guard to prevent road material from falling between the deck and sills. The fill guard shall be welded to the side of the livestock guard.

No splices are permitted in supporting members.

5.21.4.3 **Deck Construction**

Deck construction shall consist of round structural tubing with dimensions as shown on the drawings arranged perpendicular to traffic. A gusset reinforcement shall be used between each member. This reinforcement shall not permit the build-up of gravel or snow which may allow livestock to cross.

Fence post sleeves designed to accept a 60 mm outside diameter (O.D.) post shall be connected through the deck and attached to the frame at an outward 115-degree slant. The top of the sleeve shall not protrude above the deck.

Deck members shall be continuous over the length of the guard. Any splices shall develop the full strength of the member and shall be detailed on the drawings.

5.21.5 INSPECTION, SAMPLING AND TESTING

The Contractor shall contact the Consultant for coordination of inspection during production. Inspection, sampling and testing of livestock guard materials may be carried out by the Consultant, in accordance with the latest editions of the applicable specifications and standards. In particular, acceptance shall be on the basis of load bearing tests, material tests and inspection of the completed product.

Where shop or plant inspections are made, the Contractor shall ensure the Consultant has free access to all parts of the shop or plant as involved in the manufacture or production of the material ordered, and shall furnish all such facilities as to provide a safe and adequate inspection of the production of the material. All materials which do not meet the specifications shall be rejected. No rejected material, the defects of which have subsequently been corrected, shall be used unless approval in writing has been given by the Consultant. Stocked materials, even though accepted in delivery, shall be subject to testing and shall meet the specifications at the time they are to be used in the Work.

The Contractor shall supply to the Consultant the material manufacturer's certification that the material meets the Department's specifications.

5.21.6 MEASUREMENT AND PAYMENT

Payment for the supply of livestock guards will be included in the unit price bid per livestock guard for the applicable type and size as supplied and installed.

TABLE OF CONTENTS

5.22 SUPPLY AND INSTALL SMOOTH WALL STEEL PIPES

5.22.1 GENERAL

The Contractor shall supply and install smooth wall steel pipe culvert through the existing highway as shown on the mosaic/plan-profile sheets and as directed by the Consultant.

Centerline steel pipe culvert installation shall consist of augering of the steel pipe through the existing highway embankment and installing the remainder of the steel pipe culvert by the trenched or open cut method as shown on the drawings (CB6-2.4M19).

The abbreviation for Smooth Wall Steel Pipe when indicated on the plans or used in the specifications is S.W.S.P.

5.22.2 MATERIALS

5.22.2.1 **Culvert Material**

Smooth Wall Steel Pipe (9.5 mm wall thickness) shall be supplied by the Contractor and shall meet ASTM Specification A252 Grade2. Any variation from the specified requirements for the Smooth Wall Steel Pipe shall be subject to the approval of the Consultant. The Consultant has the sole right to reject material that in his opinion will not adequately meet the expected longevity of this new culvert installation. The Contractor shall have no claim against the Department for all or part of material rejected and shall remove and dispose of rejected material at his own expense.

5.22.2.2 **Material for Bedding, Backfill and Sealing**

The Contractor shall either use approved native material or produce granular material for bedding and backfill in trenched areas in accordance with Specification 3.2, Aggregate Production and Stockpiling for the designation and class of materials specified. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate.

The Contractor shall also supply the required clay material for the clay seals at both ends of the installation.

5.22.3 CONSTRUCTION

5.22.3.1 **Length of Pipe Required for Installation**

The Contractor shall determine the total length of Smooth Wall Steel Pipe required for both the coring and trenched or open cut installations based on the design cross-sections available from the Consultant.

Prior to commencing the installation, the Contractor shall liaise with the Consultant to determine the exact length of pipe required, depending on landowner requirements and onsite inspection.

5.22.3.2 **Coring and Pushing**

The installation shall be carried out by coring and pushing a steel pipe through the highway embankment without disturbing the existing pavement structure and in a manner approved by the Consultant. The invert elevations, pipe length and pipe diameter shall be as shown on the mosaic plan-profile drawings or as determined in consultation with the project Consultant. The Contractor shall cut sections and join sections with a continuous butt weld to provide the necessary overall length as part of the coring and pushing operations.

The Contractor shall be responsible for correcting and repairing, at his own expense, any roadway slides or failures that occur as a result of activities associated with the coring operations.

The coring machine shall be capable of excavating to a diameter not greater than 25 mm of the outside diameter of the pipe.

In the event that adverse soil conditions are encountered during coring operations which necessitate a change in construction methods, the method of construction for the affected portion shall be approved by the Consultant prior to proceeding with further construction.

5.22.3.3 **Coring**

The Consultant will provide line and grade at each end of the pipe from which the Contractor shall accurately control the coring.

The Contractor shall block, shim or construct rails as required to ensure that the finished pipe meets the tolerance requirements for alignment and grade.

Line and grade shall be continuously checked by the Contractor using a laser. The laser must be sufficiently capable of shooting the entire length of each operation and have a beam deviation not greater than 6 mm. If the laser does not meet the requirements of the project, the Contractor shall replace it with a unit approved by the Consultant, at the expense of the Contractor.

The Consultant may also monitor the installation by performing quality assurance testing of the line and grade. The Contractor shall co-operate by making the workings available for checking at suitable intervals during regular working hours as required by the Consultant.

Discrepancies found by the Consultant shall be corrected by the Contractor immediately. The return to established line or grade shall be at a rate not exceeding 50 mm per 10 m.

Such checks or lack of them shall not relieve the Contractor of full responsibility for constructing the pipe to the line and grade as specified by the Consultant.

5.22.3.4 **Installation by Trench or Open Cut Method**

The pipe shall be installed on the prepared base, true to the designed lines and grades unless otherwise established by the Consultant. Separate sections shall be securely joined together with a continuous butt weld. The Contractor shall cut bevelled end sections (3:1 or 4:1 slope as applicable) as directed by the Consultant.

The Contractor shall use due care when installing pipe to avoid damaging the pipe. Damaged pipe shall be removed and replaced by the Contractor at his expense.

5.22.3.4.1 Bedding and Backfill

Bedding and backfill material shall be placed as shown on the plans and shall consist of approved suitable native material or imported select gravel or soil material as directed by the Consultant. All bedding and backfill material shall be free from frozen lumps and organic material. Backfill within 300 mm of the pipe wall shall be free from stones of diameter larger than 80 mm.

5.22.3.5 **Hand-Laid Riprap**

Immediately following completion of the pipe installation, hand-laid riprap shall be placed in accordance with Specification 2.5, Riprap.

5.22.3.6 **Cleanup**

After the installation has been completed, the Contractor shall cleanup the site to a condition similar to the surrounding area or as directed by the Consultant. This includes but is not limited to, removal and disposal of all discarded utility lines, tracks, coring equipment, and unused construction materials and debris from the pipe and construction area.

The Contractor shall leave the pipe in a clean reasonably dry condition suitable for inspection by the Consultant.

5.22.3.7 **Final Acceptance Inspection**

The final installation shall be subject to the Consultant's inspection. All damages such as bent or deformed edges or undulations of the pipe shall be corrected at the Contractor's expense.

The finished pipe culvert installation shall not deviate from grade and alignment by more than 50 mm.

Any pipe placed which does not comply with these requirements shall be corrected to the satisfaction of the Consultant, at the Contractor's expense.

5.22.4 MEASUREMENT AND PAYMENT

Measurement for the supply and installation of smooth wall steel pipes will be made in metres based on the total invert length of pipe installed including sloped end sections. The Contractor shall have no claim for extra payment over the tendered unit price resulting from any difference between the estimated quantity as shown in the unit price schedule and the final length of pipe required.

Payment will be made at the unit price bid per metre for "Smooth Wall Steel Pipe - Supply and Install" for the applicable size of pipe specified. This payment will be full compensation for excavation required to facilitate the coring operation, supplying and installing the requisite smooth wall steel pipe materials, preparing the culvert bed in the trenched sections, supplying and placing of bedding and backfill materials, supply and construction of clay seals and the supply and placement of hand-laid riprap.

When the Contract contains a bid item for "Channel Excavation," excavation for the open cut of the trenched portion of the culvert installation as determined by the Consultant, will be paid for as "Channel Excavation" in accordance with Specification 2.3, Grading. When the Contract does not contain a bid item for "Channel Excavation", all excavation will be considered included in the unit price bid for "Smooth Wall Steel Pipe - Supply and Install."

TABLE OF CONTENTS

5.23 SUPPLY OF CORRUGATED METAL PIPE AND PIPE ARCHES

5.23.1 GENERAL

This Specification covers the requirements for the supply of corrugated metal pipe and pipe arches up to 1400 mm equivalent diameter by the Contractor.

Abbreviations for the various types of metal pipe are as follows:

C.S.P.	Corrugated Steel Pipe
C.S.P. Arch	Corrugated Steel Pipe Arch
C.A.P.	Corrugated Aluminum Pipe
C.A.P. Arch	Corrugated Aluminum Pipe Arch

5.23.2 MATERIALS

The Contractor shall ensure that the supply and fabrication of all galvanized, polymer coated and aluminum coated corrugated steel pipe (CSP) and pipe arches including couplers and appurtenances are in accordance with the latest edition of Canadian Standards Association (CSA) G401 Specification, and the supply and fabrication of corrugated aluminum pipe (CAP) and pipe arches including couplers and appurtenances are in accordance with the latest edition of AASHTO Designation M196 and M197, with the following modifications:

Previously installed pipe shall not be used. All pipe supplied shall be clearly marked with the following information at intervals of not more than 3 m.

Manufacturer's Name or Trade Mark
Nominal Thickness and Type of Metal
Plate/Metal Coating (for non-standard coating)
Specification Designation
Plant Designation Code
Date of Manufacture

5.23.2.1 **Sloped End Sections**

Sloped end sections are required for each culvert. When 4:1 and 3:1 sloped end sections are specified, templates CB6-5.15 M1 and CB6-5.15 M2 will apply.

5.23.2.2 **Cut Ends**

All cut edges of a sloped or square end section shall be made smooth by grinding so that all of the burrs are removed and the damaged zinc coating shall be recoated with appropriate material in accordance with CSA G401.

5.23.2.3 **Couplers**

Annular corrugated couplers for pipe greater than 300 mm in diameter shall be of sufficient width to cover at least two outside crest corrugations on each recorrugated end.

5.23.2.4 **Coupler Bands**

Coupler bands for pipe greater than 800 mm in diameter shall have a minimum of three bolts.

5.23.2.5 **Termination of Lock Seams**

On pipes 1000 mm diameter or larger, lock seams terminating at the cut edges of sloped or square ended sections shall have a 75 mm length fillet weld run along the lock seam at each cut edge. The weld and surrounding area shall be recoated with the appropriate material in accordance with CSA G401.

5.23.2.6 **Recorrugated Ends**

Spirally corrugated metal pipe shall have ends recorrugated to provide annular corrugations for couplers.

5.23.2.7 **Perforated Pipe**

Perforated corrugated steel pipe shall be fabricated in accordance with the latest edition of CSA G401 (Currently Section 4.1.6).

5.23.2.8 **Double Zinc C.S.P.**

When Double Zinc C.S.P. is specified, the zinc coating mass (total on both sides) shall be not less than 1220 g/m^2 when tested by the triple spot test, or 1100 g/m^2 when tested by the single spot test.

5.23.2.9 **Polymer Coated C.S.P.**

When Polymer Coated C.S.P. is specified, the polymer coating shall be applied to both sides of the galvanized sheet prior to corrugating in accordance with classification grade 250/250 as specified in CSA G401 section 3.5.4.

Any pinholes, blisters, cracks or lack of bond shall be cause for rejection.

5.23.3 INSPECTION, SAMPLING AND TESTING

All materials shall be subject to inspection, sampling and quality assurance testing by the Consultant and the Contractor shall provide safe, convenient access, acceptable to the Consultant, for inspection and sampling of the materials, and shall co-operate in the inspection and sampling process when requested to do so.

The Contractor shall contact the Consultant at least 72 hours prior to shipping the materials to coordinate any inspection, sampling or testing at the manufacturing location and the delivery site that the Consultant deems necessary.

Any material found unacceptable by the Consultant shall be replaced with acceptable material by the Contractor at his expense.

5.23.4 MEASUREMENT AND PAYMENT

Payment for the supply of corrugated metal pipe and pipe arches including couplers and appurtenances will be included in the unit price bid per metre for "Culverts - Supply and Install" for the various types and sizes of culvert specified.

TABLE OF CONTENTS

5.24 SUPPLY OF POLYETHYLENE PIPE

5.24.1 GENERAL

This specification covers the requirements for the supply of polyethylene pipe by the Contractor.

The work consists of supplying polyethylene pipe of the following types:

- Closed Profile Pipe: a pipe product that has an essentially smooth waterway braced circumferentially or spirally with corrugations that are joined integrally by an essentially smooth outer wall.
- Corrugated Pipe: a single walled pipe where the wall is formed into a series of alternating ridges and grooves.
- Open Profile Pipe: a pipe product that has an essentially smooth waterway braced circumferentially or spirally with outside corrugations.

5.24.2 APPLICABLE SPECIFICATIONS

All references to Standards or Specifications refer to the latest edition at the time of tender.

CAN/CSA B182.6 Profile Polyethylene Sewer Pipe and Fittings

ASTM F405 Corrugated Polyethylene (PE) Tubing and Fittings

ASTM F667 Large Diameter Corrugated Polyethylene Tubing and Fittings

ASTM F894 Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.

ASTM D3350 Specification for Polyethylene Plastic Pipe and Fittings Materials

ASTM D4976 Specification for Polyethylene Plastics Moulding and Extrusion Materials

AASHTO M252 Corrugated Polyethylene Drainage Tubing

AASHTO M294 Corrugated Polyethylene Plastic Pipe

5.24.3 DEFINITIONS

Polyethylene Plastic: - plastic based on polymers made with ethylene as essentially the sole monomer.

Profile: - pipe wall construction that presents an essentially smooth surface in the waterway but includes ribs or other shapes, which can be either solid or hollow, that help brace the pipe against diametrical deformation.

5.24.4 MATERIALS

The moulding and extrusion material shall be polyethylene plastic according to the requirements of CAN/CSA B182.6, ASTM F405, ASTM F667, ASTM F894, ASTM D3350, ASTM D4976, AASHTO M252 or AASHTO M294 for the appropriate type of polyethylene plastic pipe.

Previously installed pipe shall not be used.

5.24.4.1 **Markings**

Markings for corrugated, and open-end, closed-profile, polyethylene plastic pipe, tubing and fittings shall be in accordance with the appropriate standard. All pipe supplied shall be clearly marked with the following information at intervals of not more than 3 m.

Pipe Diameter
Pipe Stiffness
Standard Designation
Manufacturer

5.24.4.2 **Certificate**

Upon request, the Contractor shall provide a certificate of compliance from the supplier indicating that the product was produced, tested and conforms to all of the requirements of the appropriate specification.

5.24.5 REQUIREMENTS

The pipe stiffness for all polyethylene plastic pipe or fittings shall be no less than 210 kPa.

The requirements for corrugated polyethylene plastic pipe, tubing and fittings shall be according to ASTM F405, ASTM F667, AASHTO M252 or AASHTO M294.

The requirements for open and closed profile polyethylene plastic pipe and fittings shall be according to CAN/CSA B182.6 or ASTM F894.

5.24.6 JOINTS

Joining systems shall be Bell and Spigot (Gasketed Type), Bell and Spigot (Extrusion Weld Type), Heat Fusion, Plain End Extrusion Weld, Integral Connectors and shall meet the requirements of the latest version of ASTM F894 and CSA B182.6.

5.24.7 PERFORATED PIPE

Perforated corrugated polyethylene pipe shall be fabricated in accordance with the latest edition of ASTM F405 (currently Section 6.2.4).

5.24.8 HYDRAULICS

The manufacturer will provide the tested Mannings “n” value that will be used to calculate pipe flow capacity.

5.24.9 INSPECTION, SAMPLING AND TESTING

All materials shall be subject to inspection, sampling and quality assurance testing by the Consultant and the Contractor shall provide safe, convenient access, acceptable to the Consultant, for inspection and sampling of the materials, and shall co-operate in the inspection and sampling process when requested to do so.

The Contractor shall contact the Consultant at least 72 hours prior to shipping the materials to co-ordinate any inspection, sampling or testing at the manufacturing location and the delivery site that the Consultant deems necessary.

Any material found unacceptable by the Consultant shall be replaced with acceptable material by the Contractor at his expense.

5.24.10 MEASUREMENT AND PAYMENT

Payment for the supply of polyethylene pipe including joining systems and appurtenances will be included in the unit price bid per metre for "Culverts – Supply and Install" for the applicable type and sizes of pipe specified.

TABLE OF CONTENTS

5.25 SUPPLY OF W-BEAM GUARDRAIL AND POSTS

5.25.1 GENERAL

The Work consists of supplying W-Beam guardrail and posts for use as hazard avoidance barriers.

5.25.2 STANDARDS OF REFERENCE

Alberta Transportation Drawings:

TEB 3.01	Wood Spacer Block and Post
TEB 3.02	Rail Detail
TEB 3.03	Wing End Section
TEB 3.04	Buried End Section
TEB 3.06	Bolt, Nut and Washer
TEB 3.53	Flex Guard Bracket

All materials supplied by the Contractor shall be in accordance with the following standards, specifications or publications. Previously installed materials may not be used.

Canadian Standards Association(CSA):

CSA G40.20 and G40.21-M87 - Structural Quality Steels
CSA G164-M - Hot Dip Galvanizing of Irregularly Shaped Articles
CSA W59-M - Welded Steel Construction (Metal Arc Welding)
CSA 080-M - Wood Preservation

American Society for Testing and Materials(ASTM):

ASTM A307 - Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
ASTM E316.3 - Magnetic gauge testing of galvanizing coating

American Association of State Highway and Transportation Officials(AASHTO):

AASHTO Standard Designation M-180-841 "Corrugated Sheet Steel Beams for Highway Guardrail"

American Road and Transportation Builders Association(ARTBA):

ARTBA Technical Bulletin No. 268-B

National Lumber Grades Authority(NLGA):

NLGA Standard Grading Rules for Canadian Lumber

Alberta Transportation

References made to TEB drawings in this Specification refer to drawings found in the manual titled "Typical Barrier Drawings" which is available from Alberta Transportation.

5.25.3 MATERIALS

The Contractor shall supply all materials necessary to complete the Work.

5.25.3.1 **Rails and Terminal Elements**

W-beam guardrail shall consist of rail sections fabricated to develop a continuous beam strength with the necessary safety end feature components.

All rail sections and other components shall match the design profiles and dimensions of the AASHTO/ARTBA hardware requirements for full interchangeability of similar components regardless of the manufacturer.

The name or trademark of the manufacturer, the metal thickness and the year of production shall be clearly and permanently stamped on each component clear of the splicing overlap and on the face opposite the traffic side.

The rails and terminal elements shall be manufactured from open hearth, electric furnace or basic oxygen semi-spring steel sheet and hot dip galvanized after fabrication, all in general accordance with the AASHTO Standard Designation M180-841 and shall conform to the relevant TEB drawings.

Rails shall be punched for splice and post bolts in strict conformity with the AASHTO Standard to the designated number and centre-to-centre spacing of posts. No punching, cutting or welding will be permitted on site except for special details in unforeseen and exceptional cases with the prior approval of the Consultant.

If any guardrail installation requires curved W-beam rails, the Contractor shall form these to the radius specified by the Consultant.

The rails and terminal elements shall be manufactured according to the following standards:

- Metal properties of the base metal for the rails shall conform to the following requirements:
  - Minimum Yield Point: 345 MPa
  - Minimum Tensile Strength: 483 MPa
  - Minimum Elongation: 12% in 50 mm length
- Sheet thickness shall be in accordance with Table 1 (Class A, Type 2) of AASHTO Standard M180-841 with a nominal base metal thickness of 2.8 mm (2.67 mm minimum).
- Sheet width for the W-beam rail shall be 483 mm, with a permissible tolerance of minus 3.2 mm.

Welding for the fabrication of terminal elements shall conform to the requirements of CSA-W59M.

Rails and terminal elements shall be hot dip galvanized after fabrication, in accordance with CSA-G164M.

5.25.3.2 **Bolts, Nuts and Washers**

Bolts, nuts and washers shall conform to ASTM-A307, and shall be hot dip galvanized in accordance with CSA-G164M (Drawing TEB 3.06).

5.25.3.3 **Wooden Posts**

Posts and offset blocks shall be either douglas fir, hemlock, lodgepole pine or better and shall meet the requirement of the National Lumber Grades Authority (NLGA) for No. 1 Structural Posts and Timbers graded conforming to the NLGA Standard Grading Rules for Canadian Lumber.

Posts and blocks shall be rough sawn with holes drilled to the finished dimensions shown in drawing TEB 3.01. The standard length of posts shall be 1.52 m, except at locations specified in the special provisions where 2.13 m posts, or other length, is specified for use.

Posts shall be date stamped at the top of either side of the post not used for rail attachment with the last two digits of the year of fabrication. The stamp shall be 50 mm x 50 mm and have an indentation of 3 mm.

Stamping and drilling shall be completed prior to treating posts. Blocks shall be pressure treated in accordance with the current requirements of CSA Standard 080, with a water borne preservative of chromated copper arsenate (CCA) or ammoniacal copper arsenate (ACA) to 8 kilograms per cubic metre.

The penetration and retention of preservatives shall conform to the requirements of CSA Standard 080.14, Table 1, Minimum Retention of Preservatives in Pressure Treated Wood for Highway Construction, under the headings "Post-Guardrail, Guide, Sign and Sight" for posts, and "Bridge Hand Rails, Guard Rails and Posts" (not in contact with ground or water).

5.25.4 ACCEPTANCE AND INSPECTION OF MATERIAL

5.25.4.1 **General**

Prior to installing any guardrail, the Contractor shall provide the Consultant with a copy of the manufacturer's certificate verifying that materials supplied conform to Section 16 of CSA G40.20M, for each of the mechanical and chemical tests.

5.25.4.2 **Inspection of W-Beam Guardrail Material**

Hot dip galvanized coating shall be smooth, free of beading or sharp projections at edges. Coating adherence shall prevent the peeling of any portion of the zinc coating so as to expose the base metal by cutting or prying with a stout knife under considerable pressure (bond check). A magnetic gauge will be used for checking thickness in accordance with ASTM Standard E316.3(c).

Warped or otherwise deformed rails and terminal elements will be rejected, as will those with injurious defects or excessive roughness of the zinc coating. When the rail is laid on a flat surface, the warpage shall not be greater than 5 cm.

5.25.4.3 **Inspection of Wooden Posts and Blocks**

The Consultant may verify the penetration and retention of the preservative by the assay method.

Posts and blocks shall be subject to inspection by the Consultant when the bundles are opened immediately prior to use.

5.25.5 MEASUREMENT AND PAYMENT

Payment for the supply of w-beam guardrail including all required hardware and posts will be included in the applicable unit price bid per metre for "W-Beam Guardrail - Supply and Install" or "Strong Post W-Beam Guardrail - Supply and Install" in accordance with Specification 2.19, Guardrail and Guide Posts. No separate consideration will be given, regardless of the length of post required in accordance with Section 5.25.3.3, Wooden Posts.

TABLE OF CONTENTS

5.26 SUPPLY BOX BEAM GUARDRAIL AND POSTS

5.26.1 GENERAL

The Work consists of supplying standard box beam or median box beam guardrail and posts for use as hazard avoidance barriers.

5.26.2 STANDARDS OF REFERENCE

All material supplied shall refer to the following standards, specifications or publications:

Society of Automotive Engineers:

SAE J403 - Sept. 80 - Chemical Composition of SAE Carbon Steels

Canadian Standard Association:

CAN/CSA G40.20-M87 - General Requirements for Rolled or Welded Structural Quality Steel
CAN/CSA G40.21-M87 - Structural Quality Steel
CSA W47.1-1983 - Certification of Companies for Fusion Welding of Steel Structures.
CSA W59-M1984 - Welded Steel Construction (Metal Arc Welding).
CSA G164-M1981 - Hot Dip Galvanizing of Irregularly Shaped Articles.

American Society for Testing and Materials:

ASTM A307-86a - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A325M-86 - High-Strength Bolts for Structural Steel Joints (Metric).

References made to TEB drawings in this Specification refer to drawings found in the manual entitled "Typical Barrier Drawings" which is available from Alberta Transportation.

5.26.3 MATERIALS

The Contractor shall supply all materials necessary to complete the Work. Previously installed material may not be used.

Prior to installing any guardrail, the Contractor shall supply the Consultant with the manufacturer's certification that the material conforms with the specifications.

All materials for standard box beam installations shall be supplied in accordance with drawings TEB 3.27, TEB 3.28, TEB 3.33, TEB 3.34, TEB 3.35, TEB 3.36, TEB 3.37, TEB 3.38, TEB 3.39, TEB 3.40, TEB 3.41, TEB 3.46 and TEB 3.47.

All materials for median box beam installations shall be supplied in accordance with drawings TEB 3.22, TEB 3.23, TEB 3.24, TEB 3.25, TEB 3.26, TEB 3.27A, TEB 3.28A, TEB 3.29 and TEB 3.30.

5.26.3.1 **Steel Box Beam Barriers**

5.26.3.1.1 Rails

Rails shall be welded or seamless structural tubing (350 WT grade) and either class C or H conforming to CAN/CSA G40.21M.

The steel shall conform to a minimum standard impact energy requirement of 14 Joules (10.5 ft-lbs) for a half-size test specimen tested at 0E C and shall contain a manganese/carbon ratio, computed based on heat analysis values, of at least 4.5.

The above requirements and the mechanical and chemical properties shall be verified by test results, certified as outlined in CAN/CSA G40.20M, and verified as outlined in the Quality Assurance Section of the Road Authority specification.

5.26.3.1.2 Posts, Ground Plates, Paddles, Brackets, Base Plates and Splice Plates.

Posts shall be American standard beam section. Posts, ground plates, paddles, brackets, and splice plates shall conform to CSA/CAN G40.21M, grade 230G.

5.26.3.1.3 Bolts, Nuts and Washers.

Bolts, Nuts and Washers shall conform to ASTM A307-86A. Self-drilling, self-tapping fasteners shall be #12-24-1.50 indented hex washer head, cadmium plated.

Bolts, nuts and washers used for terminal end anchorage treatment shall conform to ASTM A325M-86.

5.26.3.2 **Production**

5.26.3.2.1 General Requirements

Welding shall conform to CSA W59M and W47.1. No transverse welds are permitted on the rail sections.

All components and associated hardware except for self-drilling, self-tapping fasteners shall be hot dip galvanized after fabrication and shall conform to CSA G164M.

All dimensions are subject to manufacturing tolerances unless otherwise indicated. The individual components shall be capable of being assembled to conform to the finished structure as indicated on the drawings.

5.26.3.2.2 Fabrication

Flame-cutting shall not be used to create the rounded ends of the slots for the post paddles. The slots may be fabricated in one of the following ways:

- Two holes each 40 mm in diameter shall be drilled at the two ends of the slot, and the material between may then be removed either by flame-cutting or saw-cutting; or
- The entire slot may be punched.

The distance from the end of the slot to the outside face of the nearest vertical side wall shall be no less than 13 mm, and cuts shall not extend past these rounded ends. Failure to comply with these requirements shall constitute grounds for rejection of the product. All slots are to be fabricated before hot dip galvanizing.

When indicated in the material requirements, an expansion joint shall be provided for at one end of the rails in accordance with drawings TEB 3.30 and TEB 3.40.

5.26.3.2.3 Marking

The name, brand or trademark of the steel producer, the year of production, and the heat number shall be stamped so as to remain legible after galvanizing.

The stamped information shall appear on the underside of each rail.

5.26.4 EQUIPMENT

The Contractor shall supply all equipment necessary to complete the Work.

5.26.5 MEASUREMENT AND PAYMENT

Payment for the supply of box beam guardrail including all required hardware and posts will be included in the unit price bid per metre for “Box Beam Guardrail - Supply and Install” in accordance with Specification 2.19, Guardrail and Guide Posts.

TABLE OF CONTENTS

5.27 SUPPLY OF CABLE BARRIER AND METAL POSTS

5.27.1 GENERAL

The Work consists of supplying cable barrier and metal posts for use as hazard avoidance barriers.

5.27.2 STANDARDS OF REFERENCE

All material supplied shall refer to the following standards, specifications or publications:

Alberta Transportation, Traffic Control Standards Manual

TEB drawings referenced in this specification are found in the manual entitled "Typical Barrier Drawings" as published by Alberta Transportation.

Society of Automotive Engineers:

SAE J403 - Sept. 80 - Chemical Composition of SAE Carbon Steels

Canadian Standards Association:

CAN/CSA G40.20-M87 - General Requirements for Rolled or Welded Structural Quality Steel
CAN/CSA G40.21-M87 - Structural Quality Steel
CSA/CAN 3-G12-M78 - Zinc-Coated Steel Wire Strand
CSA W47.1-1983 - Certification of Companies for Fusion Welding of Steel Structures.
CSA W59-M1984 - Welded Steel Construction (Metal Arc Welding).
CSA G164-M1981 - Hot Dip Galvanizing of Irregularly Shaped Articles.

American National Standards Institute/American Society for Testing and Materials:

ASTM A307-86a - Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength
ASTM A325M-86 - High-Strength Bolts for Structural Steel Joints (Metric).
ANSI/ASTM A536-84 - Ductile Iron Castings
ASTM A47-M84 - Ferritic Malleable Iron Castings (Metric)
ASTM B30-85a - Copper-Base Alloys in Ingot Form

5.27.3 MATERIALS

The Contractor shall supply all materials necessary to complete the Work. Previously installed material may not be used.

Prior to installing any cable barrier, the Contractor shall supply the Consultant with the material manufacturer's certification that the material conforms with the specifications.

The Contractor shall supply the following major components in accordance with the applicable drawings:

Posts c/w ground plates	TEB 3.42
Hook bolts c/w double hex nuts	TEB 3.43
Galvanized steel cables (305 m rolls)	TEB 3.43
Tension bolts and ferrous castings	TEB 3.44
End fittings	TEB 3.44

Slicers and wedges	TEB 3.44
Pressed ferrules and cable fittings	TEB 3.44
Fabricated steel sections for anchor blocks	TEB 3.45

5.27.3.1 **Cables**

The barrier cable and the cable used for pressed ferrule and cable fittings shall conform to CSA/CAN 3-G12M for grade 110 steel wire strand, hot zinc coated (galvanized) or Class A electro-zinc-coated and shall be supplied in a continuous length of 305 metres on expendable reels.

The cable shall be a 13 mm diameter, 7-wire strand weighing approximately 228 kg per 300 m with a minimum breaking strength of 70 kN.

5.27.3.2 **Fittings**

Ferrous castings for the end fitting and splicer shall conform to ASTM A47M for malleable iron, grade 32510 or ASTM Designation A536 for ductile iron, type 60-45-10.

The tension bolt for the end fitting shall be SAE 1035 hot rolled fine grained steel, and the ferrule shall be SAE 1020 rolled steel, conforming to SAE J403. As an option, the tension bolt may contain a square or hex nut welded as shown in drawing TEB 3.44, conforming to low hydrocarbon classification CSA W59M.

The ferrous castings, tension bolt and ferrule shall be hot dip galvanized conforming to CSA G164M. The ferrule shall be galvanized after it has been pressed onto the cable.

Wedges shall be bronze conforming to ASTM B30 for alloy suitable for sand casting.

All fittings shall be so designed and be of such section as to develop the full strength of a single cable or cable assemblies, as the case may be.

Single cable assembly (minimum tensile strength of 100 kN)
Three cable assembly (minimum tensile strength of 300 kN)

5.27.3.3 **Posts and Fabricated Steel Sections for Anchor Blocks**

Posts shall be American Standard Beam Section. Posts, ground plates, brackets, and splice plates shall conform to CSA/CAN G40.21M, grade 230G.

5.27.3.4 **Hook Bolts and Nuts**

Hook bolts and nuts shall conform to ASTM A307-86a.

Self-drilling, self-tapping fasteners shall be #12-24-1.50 indented hex washer head, cadmium plated.

5.27.3.5 **Production**

5.27.3.5.1 General Requirements

Welding shall conform to CSA W59M and W47.1.

All components and associated hardware except for self-drilling, self-tapping fasteners shall be hot dip galvanized after fabrication and shall conform to CSA G164M.

All dimensions are subject to manufacturing tolerances unless otherwise indicated. The individual components shall be capable of being assembled to conform to the finished structure as indicated on the drawings.

5.27.3.5.2 Pressed Ferrule and Cable Fitting

The ferrules supplied are for use at the end of the fitting cable and shall be pressed onto the end of the fitting cable.

The ferrule shall not slip from the cable when tested under a tensile static load to the limit of cable breakage.

5.27.3.5.3 Marking

Coils and reels of the guardrail cable shall be identified by an attached, durable tag on which the following information is indelibly recorded:

Galvanized steel wire strand
Manufacturer's name
Nominal diameter of strand
Grade
Length of strand in metres
Weight of strand in kilograms per coil

5.27.4 EQUIPMENT

The Contractor shall supply all equipment necessary to complete the Work.

5.27.5 MEASUREMENT AND PAYMENT

Payment for the supply of cable barrier including all required hardware and posts will be included in the unit price bid per metre for "Cable Barrier - Supply and Install" in accordance with Specification 2.19, Guardrail and Guide Posts.

TABLE OF CONTENTS

5.28 SUPPLY FLEXIBLE GUIDE POST TRAFFIC DELINEATORS

5.28.1 GENERAL

The Work consists of the supply of flexible guide post traffic delineators.

5.28.2 MATERIALS

The Contractor shall supply flexible guide posts which return to upright positions following repeated impacts and passages of vehicles over them. Such collisions shall not cause serious damage to the post or vehicle. Failure to conform to the requirements specified herein shall be cause for rejection.

5.28.2.1 **General**

The posts shall be of uniform high quality and workmanship and be free from defects.

Prior to installation, the Contractor shall provide a complete report of the physical properties of the post to the Consultant. This report shall include properties such as low temperature impact resistance, after-impact recoverability and weather resistance.

5.28.2.2 **Specifications - Dimensions, Colour and Construction**

The round posts shall have a minimum outer diameter of 90 mm and an overall length of 1.67 metres. The semi flat fibreglass posts shall have a minimum width of 90 mm and an overall length of 1.67 metre.

The top 250 mm of the post length shall be black and the remainder shall be white.

The post shall be straight. Straight is defined as having no point along the length of the post any more than 6 mm removed from a perfectly straight edge placed parallel to any side of the post.

Round posts shall be open at the top and bottom.

The surface of the post shall be smooth and free from irregularities or defects. The surface of the post shall not be affected by cleaning using scrapers, detergent and water, or solvent.

The black portion of the post shall accept and hold securely high-intensity reflectorized sheeting applied to its surface area with heavy-duty stainless steel staples, glue or other adhesives deemed suitable by the manufacturer.

If one piece construction is not used, then the connections between the pieces shall be at least as strong as if constructed of a single piece. The strength shall exist at temperatures ranging from -50ºC to 50ºC.

The reflective portion of round posts shall be visible from all directions and shall be of sufficient size so as to be recognizable in the dark as a guide post reflector. The reflective portion of semi flat posts shall be visible to traffic.

5.28.2.3 **Weather Resistance and Durability**

The post shall not be seriously affected by ozone, exhaust fumes, asphalt or road oils, dirt, vegetation, deicing salts or any other types of air contamination or materials likely to be encountered after installation.

The post shall withstand without serious damage all elements likely to be encountered after installation including hot (50ºC) or cold (-50ºC) temperatures, rain, snow, hail, abrasion and physical abuse.

5.28.2.4 **Strength And Flexibility**

The posts shall resist, without breaking, tearing, shattering or other serious damage, one highway vehicle impact at a speed of 100 km/h at a test temperature of -33ºC.

The post shall not bend, warp or distort when installed at temperatures up to 50ºC or installed in wind velocities up to 120 km/h.

5.28.2.5 **High-Intensity Reflectorized Sheeting**

Each post shall have a 50 mm wide high-intensity reflectorized sheeting material (3M#9880 Scotchlite or equivalent) installed between 100 mm and 150 mm from the top of the post.

5.28.3 MEASUREMENT AND PAYMENT

Payment for the supply of guide posts will be included in the unit price bid per post for “Flexible Guide Post/Delineators - Round - Supply and Install" or "Flexible Guide Post/Delineators -Semi Flat - Supply and Install", in accordance with Specification 2.19, Guardrail and Guide Posts.

TABLE OF CONTENTS

5.29 SUPPLY OF REINFORCEMENT

5.29.1 GENERAL

This specification is for the supply, fabrication, handling and placing of reinforcing steel. Reinforcement bars shall be supplied in the lengths and shapes, and installed as indicated on the drawings.

5.29.2 MATERIALS

All materials shall be supplied by the Contractor. Reinforcing steel shall conform to the requirements of the CSA Standard G30.18M Grade 400. All hooks and bends shall be bent using the pin diameters and dimensions as recommended in The Reinforcing Steel Institute of Canada, (RSIC), Manual of Standard Practice, 1 Sparks Ave, Willowdale, Ontario M2H 2W1, Phone: 416-499-4000, unless specified otherwise. Reinforcing bars shall conform accurately to the dimensions shown on the drawings and within the fabricating tolerance as shown in the RSIC, Manual of Standard Practice.

Epoxy coated reinforcing steel shall be prepared and coated according to the requirements of ASTM A775 and the Ontario Provincial Standard Specification OPSS 1442, Material Specification for Epoxy Coated Steel Reinforcement for Concrete. Film thickness of the coating, after curing, shall be 175 µm to 300 µm (7 to 12 mils). The epoxy coating material shall conform to the requirements of OPSS 1443, Material Specification for Organic Coatings for Steel Reinforcement.

Mesh reinforcement shall be supplied in flat sheets only.

5.29.3 HANDLING AND STORAGE

The Contractor shall handle and store the reinforcement in a manner that ensures it is not damaged or contaminated with dirt or other materials.

Special care shall be taken when handling epoxy-coated reinforcing steel so that damage to the coating is minimized. Epoxy-coated reinforcing bars shall not be dropped or dragged, and shall be lifted with non-metallic slings. Bar-to-bar abrasion and excessive sagging of bundles must be prevented, and bundles shall be handled with spreaders and non-metallic slings.

On site storage of the epoxy coated reinforcing steel shall not exceed 120 days, and exposure to daylight shall not exceed 30 days. If the exposure time exceeds or is expected to exceed 30 days, the reinforcing steel shall be protected by covering with opaque polyethylene sheeting or equivalent protective material.

The Contractor shall repair all damages to the epoxy coating using epoxy patching material. If damaged areas rust before being repaired, the rust shall be completely removed before the areas are repaired.

5.29.4 PLACING AND FASTENING

All steel reinforcement shall be accurately placed in the positions shown on the plans, and firmly tied and chaired before placing the concrete. When placed in the work it shall be free from dirt, detrimental rust, loose scale, paint, oil or other foreign material. Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections shall be tied.

Distances from the forms shall be maintained by means of stays, spacers, ties, hangers, or other approved supports. Spacers for holding reinforcement from contact with the forms shall be precast mortar blocks, or chairs of plastic or galvanized metal, of approved shape and dimensions. Any metal chairs protruding through the surface of the hardened concrete shall be cut back at least 25 mm, and the holes filled in accordance with Section 4.26(1), unless otherwise approved by the Consultant. Metal chairs shall not be used to support reinforcement on surfaces which are to be exposed or are to be finished; where possible, this reinforcement is to be supported entirely from above. Layers of bars shall be separated by precast mortar blocks or by other equally suitable devices. The use of pebbles, pieces of broken stone or brick, metal pipe, and wooden blocks, will not be permitted. Unless otherwise shown on the plans, the minimum distance between bars shall be 40 mm.

All chairs or bar supports for epoxy-coated reinforcement shall be non-metallic, or epoxy coated and be approved by the Consultant. Tie-wire for the coated reinforcement shall be plastic-coated.

Where field cutting of epoxy-coated reinforcing steel is necessary, and is approved by the Consultant, it shall be cut by methods other than torch-cutting. All cut ends shall be patched with epoxy patching material.

5.29.5 SPLICING

Splicing of bars, unless shown on the plans, is prohibited except with the written approval of the Consultant. Splices, where possible, shall be staggered.

For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths will be achieved by the placing of bars of the lengths as detailed. Where the lap length cannot be determined, a minimum of 35 bar diameters lap length shall be provided.

Sheets of mesh or bar mat reinforcement shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at the ends and edges. The edge lap shall not be less than one mesh in width.

5.29.6 MEASUREMENT AND PAYMENT

The supply of plain reinforcing steel, the supply of epoxy coated reinforcing steel and the supply of mesh reinforcement will not be paid for separately but will be included in the unit price bid for the applicable structure containing the reinforcing materials.

TABLE OF CONTENTS

5.30 SUPPLY OF METAL BIN RETAINING WALL

5.30.1 GENERAL

This specification covers the supply of galvanized Metal (cellular) Bin Retaining Wall of various sizes depending on the retaining wall design.

5.30.2 APPLICABLE SPECIFICATIONS

CSA G164	Hot Dip Galvanizing of Irregularly Shaped Articles.
ASTM A525M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip process.
ASTM B695	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
ASTM A568M	Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot Rolled and Cold-Rolled, General Requirements.
ASTM A780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
ASTM A526M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

5.30.3 MATERIALS

Metal Bin Retaining Wall shall be fabricated from steel galvanized sheets to the requirements of the latest edition of American Society for Testing and Materials (ASTM) A525M and A526M Specification. The steel components shall be manufactured in accordance with the latest edition of ASTM A568M specification and hot dipped galvanized to the latest edition of Canadian Standards Association (CSA) G164 with a minimum zinc coating designation of Z600.

Fasteners (bolts & nuts) shall be manufactured in accordance with ASTM A325M and shall be mechanically galvanized to ASTM B695 GR 50 or hot dipped galvanized to CSA G164 Class 5.

Vertical Connectors shall be fabricated from a minimum 5.0 mm thick grade 250W steel and hot-dip galvanized after fabrication to CSA G164 specification.

5.30.4 REQUIREMENTS

All steel members shall be carefully formed to the required structural shape and punched accurately in the manufacturer's plant, and shall be straight and true. All members of the same type, thickness and length shall be interchangeable.

Minor damage to the galvanized coating shall be repaired as specified in the latest edition ASTM A780 specification.

The manufacturer shall provide drawings (shop drawings) that complement the Consultant's drawings. Any exclusions to the Consultant's drawings shall be noted and made very clear on the manufacturer's shop drawings. The manufacturer's drawings shall clearly show the height and depth of all bins, thickness of all stringers and spacers and any special details.

5.30.5 MARKING

Each sheet, or each 600-1500 mm length of steel coil or strip, shall be mill-stencilled with the following information with 5 mm or larger letters.

- Manufacturer's name or trademark.
- Material designation and cell class.
- Nominal thickness of steel sheet in millimetres.
- The applicable specification designation.
- Date of manufacture and plant designation.

5.30.6 INSPECTION, SAMPLING AND TESTING

All materials shall be subject to inspection, sampling and quality assurance testing by the Consultant and the Contractor shall provide safe, convenient access, acceptable to the Consultant, for inspection and sampling of the materials, and shall cooperate in the inspection and sampling process when requested to do so.

The Contractor shall contact the Consultant at least 72 hours prior to shipping the materials to coordinate any inspection, sampling or testing at the manufacturing location and the delivery site that the Consultant deems necessary.

Any material found unacceptable by the Consultant shall be replaced with acceptable material by the Contractor at his expense.

5.30.7 METHOD OF MEASUREMENT AND PAYMENT

Payment for the supply of metal bin retaining wall including all necessary hardware and appurtenances will be included in the unit price bid per square metre for metal retaining wall installation for the various design types of retaining wall installed.

When more than one design of retaining wall is specified, the designs will be shown by letter suffixes following the pay item.

TABLE OF CONTENTS

7.1 TEMPORARY CONSTRUCTION SIGNING

7.1.1 GENERAL

This specification covers the installation, maintenance and removal of temporary signing and traffic control devices which are specifically related to construction, repair or emergency situations and which are generally removed when the Work is completed or the situation returns to normal. Permanent signing for normal use of the roadway is covered in Specification 7.7, Permanent Highway Signing.

7.1.2 TYPICAL DRAWINGS

Drawings detailing minimum requirements for temporary signing and other traffic control devices for typical rural highway situations are contained in Section II of the Department manual entitled Traffic Acommodation in Work Zones. Any drawings necessary to address non-typical rural highway situations or any urban highway situations shall be developed by the Contractor and included in the Traffic Accommodation Strategy.

7.1.3 MATERIALS

The Contractor shall supply all signing materials including sign posts, weighted stands, brackets and any required mounting hardware and miscellaneous materials required for the erection of temporary construction signs.

All signs, barricades and other traffic control devices shall conform to the requirements for shape, colour and size specified in Section IV of the Department manual entitled "Traffic Accommodation in Work Zones. The orange portion of all signs, barricades and other traffic control devices shall be fully reflectorized using High Brightness, Retroreflective, Non-Metallized, Prismatic Sheeting Material which incorporates durable, transparent, flourescent pigment and meets the following requirements.

BRIGHTNESS REQUIREMENTS (90º Rotation Angle)		
Observation Angle (º)	**Entrance Angle (º)**	**Orange**
0.2	-4	200
0.2	+30	92
0.5	-4	80
0.5	+30	50
A Minimum Coefficient of Retroreflection (R_A) cd/fc/ft^2 (cd . lx^{-1} . m^{-2})		

All other colours of sheeting material shall be Type III, High Intensity retroreflective sheeting meeting the requirements of ASTM D4956.

Larger construction signs or oversized signs may be used where conditions require greater visibility in order to be effective. They shall be used in special circumstances where more than average attention value is required from the sign.

7.1.4 EQUIPMENT

The Contractor shall supply all equipment required to complete the Work.

7.1.5 TRAFFIC ACCOMMODATION STRATEGY

The Contractor shall prepare a Traffic Accommodation Strategy detailing the measures he proposes for accommodating traffic throughout the project.

The Traffic Accommodation Strategy shall consist of drawings detailing the configuration of temporary construction signs and other traffic control devices in the work zone(s) and, written confirmation of the methods or procedures being used by the Contractor to address specific traffic safety related issues or situations at the work zone. Additional details concerning the requirements of the traffic accommodation strategy are contained in the Department manual "Traffic Accommodation in Work Zones".

The Contractor shall submit the Traffic Accommodation Strategy to the Consultant 14 days prior to the pre-construction meeting for the project or to a schedule as agreed upon by the Consultant. The Consultant will review the Traffic Accommodation Strategy and communicate any concerns to the Contractor within 7 days of the pre-construction meeting. Any issues or concerns regarding the Contractor's proposed Traffic Accommodation Strategy shall be addressed to the mutual satisfaction of the Contractor and the Consultant prior to the commencement of the Work.

7.1.6 MONITORING TRAFFIC ACCOMMODATION AT THE WORK ZONE

To ensure the traffic accommodation strategy is performing as intended, the Contractor shall monitor and maintain traffic accommodation at the work zone on a regular basis. The Contractor shall designate a specific individual to perform this function to ensure any issues arising are addressed in a consistent and timely manner. Such individuals must be knowledgeable in the process and procedures for accommodating traffic including the use of all types of devices. The Contractor shall identify the individual to the Consultant and Department at the pre-construction meeting.

7.1.7 ERECTION OF SIGNS

Work on the project shall not commence until all necessary temporary construction signs and all other traffic control devices as proposed in the traffic accommodation strategy are in place.

When signs require frequent moves, portable type signs, mounted on weighted stands, may be used. Portable signs shall be placed on the shoulder of the road such that the face of the sign is fully visible to oncoming traffic and the bottom of the sign is not less than 0.3 m above the road surface. The stands shall be securely weighted and erected to ensure against being blown over by prevailing winds or gusts from passing vehicles.

Non-portable signs shall be conspicuously posted, and erected at right angles to the roadway, with the bottom of the sign at a height of 1.5 m above the roadway surface, and not less than 2 m nor more than 6.0 m from the nearest traffic lane.

Traffic signs and devices shall be moved and kept as close to the work area as practical, as construction proceeds.

Objects within or immediately adjacent to the roadway which constitute a hazard to traffic shall be marked with alternating black and orange stripes attached directly to the object or erected immediately in front of it.

The use of signs shall be held to a minimum to prevent confusion.

"STOP" signs shall be installed on all subsidiary roads (local, district, municipal, service or approach) intersecting a primary highway detour route.

Speed zones, where required, shall be posted as indicated on the applicable drawing contained in the Traffic Accommodation in Work Zones manual.

7.1.8 MAINTENANCE AND REMOVAL OF SIGNS

Poorly maintained, defaced, damaged or dirty construction signs shall be replaced, repaired or cleaned without delay. Special care must be taken to ensure that construction materials and dust are not allowed to obscure the face of a sign.

Signs not in effect shall be covered or removed and all construction signs shall be removed after the project is completed.

7.1.9 MODIFICATIONS TO TEMPORARY CONSTRUCTION SIGNING

The Contractor shall be totally responsible for the supply and proper placement of temporary construction signs. However, in the case of potential danger to the travelling public or other circumstances where the Consultant determines that signing is inadequate, the Consultant will require changes to the Contractor's operations to remedy the situation. These changes may involve the use of different types and/or sizes of signs, modifying the number or locations of signs, and any other modifications or additions required to protect the safety of the travelling public.

7.1.10 DAILY RECORDING OF TEMPORARY CONSTRUCTION SIGNING

Each day and as the work area changes, the Contractor shall record the location of all temporary construction signs and any other traffic control devices used at the work areas. The Contractor shall record this information on a form suitable to the Consultant and shall submit it to the Consultant on a weekly basis or when requested.

7.1.11 COMPLIANCE

In cases where the Contractor is not in compliance with the specifications and, in the opinion of the Consultant there is imminent danger to the travelling public, the Consultant has the authority toorderthe immediate suspension of Work. Such orders must be made in writing.

In other cases where the Contractor is not in compliance with the specifications but, in the opinion of the Consultant the infraction is not causing imminent danger to the travelling public, the Consultant will use the following escalating process to address the situation:

(i) Issue verbal instructions requiring the Contractor to correct the infraction
(ii) Issue a written warning instructing the Contractor to correct the infraction
(iii) Issue a written order instructing the Contractor to suspend Work until the infraction is corrected to the satisfaction of the Consultant.

7.1.12 MEASUREMENT AND PAYMENT

7.1.12.1 **General**

The supply, installation, maintenance and removal of temporary construction signing or other traffic control devices, including any modifications requested by the Consultant, will be considered incidental to the Work and will not be paid for separately.

The preparation of the Traffic Accommodation Strategy and the daily recording of temporary construction signing will also be considered incidental to the Work and will not be paid for separately.

7.1.12.2 **Bonus and Penalty Assessment**

The Contractor will be assessed a $ 250 penalty for each written warning to correct an infraction issued by the Consultant. (Stage 2 of escalation process)

The Contractor will be assessed a $ 1000 penalty for each written order to suspend Work issued by the Consultant. (Stage 3 of escalation process or in cases of immediate suspension of Work due to imminent danger)

If neither of the following has occurred prior to the issuance of the Construction Completion Certificate:

- written orders to suspend Work or written warnings issued by the Consultant or
- written orders to suspend Work issued by the Department,

the Contractor will receive a lump sum $ 2000 payment.

Bonus and penalty assessments and written orders will not be administered separately for separate and distinct projects within the Contract or for distinct work phases on any given project within the Contract, but will be administered as a single process for the entire Work regardless of the number of separate and distinct projects or the number of distinct work phases on any given project.

TABLE OF CONTENTS

7.2 PAINTED ROADWAY LINES

7.2.1 GENERAL

7.2.1.1 **Description**

This specification covers the painting and removal of roadway lines including edge lines, lane lines, continuity lines and directional dividing lines as shown on the drawings.

7.2.1.2 **Contractor Quality Control Inspection Plan**

The Contractor shall be totally responsible for quality control inspection throughout every stage of the work to ensure that materials and workmanship comply with the requirements of this specification.

The Contractor shall develop and submit in writing to the Consultant a Quality Control Inspection Program (QCIP) that addresses all the elements which will effect the quality of the line painting including but not limited to:

- **Paint Application Rates**
- **Glass Bead Application Rates**
- **Pavement Surface and Atmospheric Conditions**
- **Line Widths, Line Lengths and Space Lengths**

The Contractor shall maintain records of QCIP data, complaints from the public, and other details relevant to the Work and provide these records to the Consultant daily.

7.2.2 MATERIALS

The Contractor shall supply all paint and glass beads in accordance with Specification 5.20, Supply of Line Painting Materials.

7.2.3 EQUIPMENT

7.2.3.1 **General**

The Contractor shall provide all equipment necessary for completion of the Work including but not limited to the painting truck, a pilot truck, a crash attenuator vehicle and all ancillary equipment such as fork lifts, hoists, pumps and transport vehicles required to load, unload and transport the paint and glass beads.

7.2.3.2 **Painting Truck**

The painting truck shall be self-propelled and equipped to meet or exceed the following requirements:

(a) Two paint tanks each having a minimum capacity of 270 litres feeding three lines for a simultaneous two-colour application (two yellow directional dividing lines and one white edgeline).

(b) Painting controls capable of adjusting the paint application for the length of dashed line required. Each spray gun shall have independent controls and adjustment mechanisms and shall be operated from the operator's compartment.

(c) The compressor shall have a minimum rated capacity of 4.25 cubic metres per minute.

(d) Bead dispensers shall be electrically controlled, air operated, gravity fed with controls to adjust the bead flow. The bead dispensers shall be fed from tanks capable of holding a minimum of 45 kilograms of beads.

(e) A television vehicle guidance or a vehicle guidance system mounted on a retractable A-frame with a guide wheel and pointer system, to assist the truck driver in maintaining alignment on the existing lines.

(f) A minimum of five spray guns and five bead dispensers mounted in the following configuration:

(i) Three spray guns and three bead dispensers mounted on an independently-controlled boom located on the left side of the truck to paint the directional dividing lines. The outer two spray guns and bead dispensers shall be in a configuration that will produce two lines of equal width with the distance between the two lines equal to the width of one line (100 mm). The inner spray gun and bead dispenser shall operate independently and shall be used to apply the directional dividing line where only a single directional dividing line is required. When a 200 mm wide line is required, 2 guns shall be used simultaneously.

(ii) Two spray guns and two bead dispensers mounted on an independently controlled boom on the right side of the truck to apply the right edge line. When a 200 mm wide line is required, 2 guns shall be used simultaneously.

(g) Equipped to apply white or yellow paint from the three spray guns mounted on the left hand side of the paint truck and to switch from one colour to the other during operation.

(h) Control of both independent booms, all spray guns, bead dispensers and painting controls from the operator's compartment(s).

7.2.3.3 **Companion Vehicles**

The painting vehicle shall be immediately followed by a vehicle equipped with a crash attenuator which meets National Cooperative Highway Research Program, Report 350 Test Criteria, Test Level 3 for 100 km/hour work zones. The weight of the crash attenuator vehicle including ballast, flashing arrow board and truck mounted crash attenuator shall be 6 300 to 12 000 kg.

The crash attenuator vehicle shall be followed by a ½ ton or larger truck acting as a pilot vehicle.

7.2.3.4 **Safety Equipment**

The painting truck and both companion vehicles shall be equipped with the following:

(a) A two-way radio for voice communication.

(b) An overhead revolving beacon with an amber lens a minimum of 180 mm high and 180 mm wide. The beacon shall be mounted on the top of the vehicle fully visible to traffic approaching from both front and rear.

(c) A sequential arrowboard meeting the requirements as shown in Specification 1.2, General.

(i) The arrowboard shall be controlled from a console located in the vehicle cab.

(ii) The arrowboard display shall be visible to traffic approaching the rear of the trucks.

(d) A "slow moving vehicle" sign. The sign shall be mounted at the rear of the vehicle and be visible to the public only when the painting truck is applying paint.

(e) A warning sign, mounted at the rear of the truck, stating "wet paint keep off". The sign shall have standard warning colours with letters having a minimum height of 150 mm and shall be visible to the public only when the truck is applying paint.

7.2.4 HIGHWAY OPERATIONS

7.2.4.1 **General**

All painting shall be carried out during hours of daylight between ½ hour after sunrise and ½ hour before sunset. Generally the Contractor may paint lines during any day of the week but is cautioned that traffic volumes are usually higher on all highways on Friday, Saturday and Sunday. Line painting on highways with relatively high traffic volumes shall be performed between Monday and Thursday inclusive if so directed by the Consultant.

Operation of the painting truck against the flow of traffic shall not be permitted.

Loading glass beads or paint onto the painting truck is not permitted on a roadway surface.

7.2.4.2 **Operation of Companion Vehicles**

The Contractor shall operate both companion vehicles in conjunction with the painting truck during the painting of all longitudinal lines. Companion vehicle operators shall not attempt to control traffic from inside the vehicle.

The actual operating parameters of the companion vehicles will be determined by the Contractor to safely accommodate traffic and will be based on site specific conditions such as sight distances, highway geometrics and traffic patterns and volumes. Typical operating parameters are as follows:

7.2.4.2.1 Crash Attenuator Vehicle

The crash attenuator vehicle shall follow behind the painting truck at a distance of 50 to 400 metres. Typically, on 4 Lane highways the crash attenuator vehicle should closely follow the paint truck to encourage traffic to maintain the passing lane and not pull in behind the paint vehicle. On 2 Lane roadways, traffic should still be encouraged to pass both vehicles in one pass, however actual conditions may dictate that the crash attenuator vehicle give way to allow safe passing.

On Single Lane Roads (for example on interchange ramps) the crash attenuator vehicle shall be driven in the travel lane to keep traffic from passing the painting truck.

7.2.4.2.2 Pilot Vehicle

On 2 lane and 4 Lane Highways the pilot vehicle shall be operated as follows:

(i) On a 4 Lane Highway, the pilot truck shall be driven in the same travel lane as the paint machine, following it at a constant distance of approximately two kilometres.

(ii) On a 2 Lane Highway with a minimum 3 metre shoulder, the pilot truck shall be driven along the right shoulder, not straddling the right edge line and following the painting truck at a constant distance of approximately two kilometres.

(iii) On a 2 Lane Highway with less than a 3 metre shoulder, the pilot truck shall travel from approach road to approach road and stop until the paint machine has cleared the next approach road. Approach road in this context includes local roads, farm entrances, field entrances, etc. The pilot truck, when stopped in an approach road, shall sit parallel to the highway in order that the signs and arrowboard are fully visible to traffic approaching from the rear.

7.2.4.3 **Arrowboard Message**

The crash attenuator vehicle, pilot truck and the painting truck are to display the same message at all times. The message shall be one of the following:

(a) On 2 Lane Highway - a bar (6 horizontal lights flashing) is preferred but if a bar cannot be shown on the type of arrowboard used, the 4 corner lights flashing is an acceptable alternative.

(b) On a 4 Lane Highway - a right arrow when operating in the left lane and a left arrow when operating in the right lane.

(c) On a Single Lane Road (for example the exit leg of an interchange) - four flashing corner lights or a bar.

7.2.5 PAINTING ROADWAY LINES

7.2.5.1 **Areas to be Painted**

The Contractor shall paint lane lines, continuity lines, edge lines and directional dividing lines on the highway sections, interchanges or intersections specified, as well as the lines through towns, at truck turnouts, rest areas, points of interest and weigh scale turnouts. At intersections, edge lines shall be painted to the right-of-way limit or the point where the pavement ends whichever occurs first.

On pavement overlay projects, the Contractor shall ensure that the start and finish of "No-Passing Zones" are consistent with those on the underlying pavement, unless otherwise directed by the Consultant.

On new construction, the start and finish of "No-Passing Zones" will be determined and laid out by the Consultant.

7.2.5.2 **Pavement Surface and Atmospheric Conditions**

Painting shall not be performed during the following conditions:

(i) When the temperature is below 0ºC for alkyd paints and 10ºC for waterborne paints.
(ii) When wind conditions cause overspray.
(iii) When the visibility is less than 700 metres.
(iv) During periods of rainfall.

Areas to be painted shall be clean and dry during the application of paint.

Areas to be painted shall be inspected by the Contractor to ensure they are clean, free of sand and debris, and suitable for painting. Sweeping, when required, shall be completed by the Contractor.

7.2.5.3 **Paint and Bead Application**

All painted lines shall be uniformly applied at a minimum rate of not less than 38 ℓ/km of solid 100 mm wide line. Glass beads shall be applied immediately following the paint application at a uniform minimum application rate of not less than 600 g/ℓ of paint.

The Contractor may heat alkyd paint to a maximum temperature of 65EC prior to application to the roadway surface to reduce drying time. The Contractor shall use due care in heating the paint because of its volatile nature. Waterborne paints shall not be heated.

7.2.5.4 **Acceptance Criteria**

All painted lines shall not exceed a dimensional width of 110 mm for specified 100 mm wide line. No tolerance below 100 mm is allowed for the specified 100 mm wide line.

All painted lines shall not exceed a dimensional width of 210 mm for specified 200 mm wide line. No tolerance below 200 mm is allowed for the specified 200 mm wide line.

All painted direction dividing, lane dividing or continuity lines shall not exceed a maximum dimensional length deviation of +/- 100 mm for specified 3.0 m length of line.

All spaces between painted direction dividing, lane dividing or continuity lines shall not exceed a maximum dimensional length deviation of +/- 100 mm for specified 6.0 m or 3.0 m length of space.

All paint shall be applied at the proper locations in accordance with the drawings or as directed by the Consultant.

All paint and glass beads shall be uniformly applied.

All painted lines shall be uniform in thickness and free of tire tracking, with no splatter, excessive overspray or other defects.

7.2.5.5 **Removal, Repair or Replacement of Unacceptable Painted Lines**

All painted lines that do not meet the requirements of this specification shall be removed and correctly applied or repaired by the Contractor.

In cases where the paint is "tracked" by vehicles tires, the lines may be repaired by reapplying paint and glass beads to the damaged areas.

In cases where incorrectly painted lines need to be removed, the Contractor shall use methods and equipment that will totally eliminate the pattern of the lines without significantly damaging the integrity of the pavement surface. The methods and equipment used for such work shall be subject to the prior approval of the Department. Obliterating incorrectly painted lines through the sole use of paint, liquid asphalt, slurry seal or other similar materials will not be permitted.

7.2.5.6 **Painting of Temporary Roadway Lines for Seasonal Shutdown**

When the Contract is carried over from one season to the next, all newly constructed asphalt pavement or asphalt stabilized surfaces shall be provided with temporary roadway lines as directed by the Consultant. All temporary roadway lines shall be painted in conformance with all of the requirements of this specification.

7.2.5.7 **Removal of Existing Painted Lines**

Removal of existing painted lines shall be done as described in Section 7.2.5.5 for incorrectly painted lines.

7.2.6 MEASUREMENT AND PAYMENT

7.2.6.1 **Painting Roadway Lines**

Measurement of painted roadway lines will be made in kilometres along the centreline of the roadway for the length of road painted including the length of road through intersections. Intersections and interchanges will be counted separately and will include all roadway lines which would not be covered by the standard painting operation. Only those intersections or interchanges specified in the Contract or identified by the Consultant will be counted separately for payment. At locations such as truck turnouts and points of interest turnouts, where additional lines are required beyond normal limits, individual lines will be measured separately and paid for under the applicable bid item.

Payment for painted roadway lines will be made at the applicable unit price bid per kilometre for:

"Roadway Lines – Supplying Paint and Painting (Directional Dividing and 2 Edge Lines)"
"Roadway Lines – Supplying Paint and Painting (Lane Dividing and 2 Edge Lines)"
"Roadway Lines – Supplying Paint and Painting (Lane Dividing Lines)"

Payment for painted intersections or interchange lines will be made at the unit price bid per intersection or interchange for "Intersection Lines - Supplying Paint and Painting" or "Interchange Lines - Supplying Paint and Painting", as applicable.

These payments will be full compensation for inspecting the areas to be painted, sweeping and cleaning the surface to be painted, supplying and applying the paint and glass beads and traffic accommodation.

No payment will be made for the repairing or removing of incorrectly painted roadway lines.

7.2.6.2 **Temporary Roadway Line Painting**

When the Contractor is required to paint roadway, intersection and/or interchange lines as a temporary measure at the end of a construction season, payment will be made in accordance with this section.

7.2.6.3 **Removal of Existing Painted Lines**

Measurement for removal of existing painted lines will be made in either lineal metres or lineal kilometres of line removed, whichever is specified.

Payment will be made at the unit price bid per metre or kilometre, whichever is specified, for “Removal of Existing Painted Lines”. This payment will be full compensation for all labour, materials, equipment, tools and incidentals necessary to complete the Work.

7.2.7 WARRANTY

Contrary to Section 1.2.54, Contractor's Warranty and Final Acceptance, the warranty period for painted roadway lines will be 60 days.

TABLE OF CONTENTS

7.3 PAINTED PAVEMENT MESSAGES

7.3.1 GENERAL

The Work shall consist of painting pavement messages such as crosswalk, stop ahead, turning arrows and stop bar lines, at the locations shown on the plans and to the dimensions specified.

7.3.2 MATERIALS

7.3.2.1 **Templates**

The Contractor shall supply templates to the dimensions as shown on the applicable figures and drawings. The dimensions shown on the figures are in millimetres unless otherwise indicated.

7.3.2.2 **Paint and Glass Beads**

The Contractor shall supply the paint and glass bead materials in accordance with Specification 5.20, Supply of Line Painting Materials.

7.3.3 SCHEDULING OF THE WORK

All painting shall be carried out during hours of daylight between ½ hour after sunrise and ½ hour before sunset. Generally the Contractor may paint messages during any day of the week but is cautioned that traffic volumes are usually higher on all highways on Friday, Saturday and Sunday. Message painting on highways with relatively high traffic volumes shall be performed between Monday and Thursday inclusive if so directed by the Consultant.

Scheduling of the work shall be subject to the approval of the Consultant. Prior to commencement of the work, the Contractor shall submit his schedule to the Consultant for consideration.

7.3.4 PAINTING PAVEMENT MESSAGES

7.3.4.1 **Pavement Surface and Atmospheric Conditions**

Painting shall not be performed during the following conditions:

- When the temperature is below 0ºC.
- When wind conditions cause overspray.
- When the visibility is less than 700 metres.
- During periods of rainfall.

Areas to be painted shall be clean and dry during the application of paint.

Areas to be painted shall be inspected by the Contractor to ensure they are clean, free of sand and debris, and suitable for painting and any required sweeping or otherwise cleaning shall be undertaken by the Contractor.

7.3.4.2 **Paint and Bead Application**

Messages shall be painted using the templates. Each message shall be painted once unless otherwise specified in the special provisions or directed by the Consultant.

All painted messages shall be applied at the rate of 0.4 ℓ/m^2 of actual painted area. Glass beads shall be applied immediately following the paint application at a uniform application rate of 600 g/ℓ of paint. Aircraft Patrol Zone markings do not require glass bead application. Messages initially applied at less than the specified rate, as determined by the Consultant, shall be repainted at the expense of the Contractor.

All painted messages shall be uniform in thickness with no splatter, excessive overspray or other defects.

Traffic shall be kept off painted messages until the paint has dried to traffic and will not track.

7.3.4.3 **Removal, Repair or Replacement of Unacceptable Painted Messages**

All painted messages that do not meet the requirements of this specification shall be removed and correctly applied or repaired by the Contractor.

In cases where the paint is "tracked" by vehicles tires, the messages may be repaired by reapplying paint and glass beads to the damaged areas.

In cases where incorrectly painted messages need to be removed, the Contractor shall use methods and equipment that will totally eliminate the pattern of the messages without significantly damaging the integrity of the pavement surface. The methods and equipment used for such work shall be subject to the prior approval of the Department. Obliterating incorrectly painted messages through the sole use of paint, liquid asphalt, slurry seal or other similar materials will not be permitted.

7.3.5 MEASUREMENT AND PAYMENT

Measurement will be made of the number of times each type of message is painted.

Payment will be made at the applicable unit price bid per message for "Pavement Messages". When painting a message more than once is required, payment will be made for each painting. This payment will be full compensation for inspecting the areas to be painted, sweeping if required, supplying the templates, paint and glass beads, painting the pavement messages and traffic accommodation.

No payment will be made for repairing or removing incorrectly painted messages.

TABLE OF CONTENTS

7.7 PERMANENT HIGHWAY SIGNING

7.7.1 GENERAL

The Work consists of the removal and reinstallation or disposal of existing signs and the installation of new signs, and includes traffic control signing, guide signing and facility signing for the normal use of the roadway. Signing for construction, repair or emergency situations is specified in Specification 7.1, Temporary Construction Signing.

7.7.2 MATERIALS

The Contractor shall supply all materials required for the installation of permanent signs including frames for cluster signs, concrete bases, steel breakaway posts, wooden posts and all bolts and required mounting hardware, in accordance with Specification 5.18, Supply of Permanent Highway Signs, Posts and Bases.

When the Work necessitates the removal, salvage and reinstallation of signs, only materials from the existing installations shall be used. Contractor stockpiles of used material from other sources will not be considered acceptable.

7.7.3 CONSTRUCTION

7.7.3.1 **Removal of Existing Signs**

Existing signs which must be removed in the prosecution of the Work shall be carefully salvaged and reinstalled. New wooden posts shall be used if the existing posts cannot be salvaged. Critical signs necessary for the protection of traffic such as railroad crossing signs or stop signs shall be maintained.

Existing signs designated for removal and disposal shall become the property of the Contractor.

7.7.3.2 **Removal of Concrete Bases and Breakaway Posts**

The Contractor shall remove the sign and breakaway posts from the existing concrete base and salvage for reinstallation or dispose of as directed by the Consultant.

When required, the existing base shall be removed, salvaged, and moved to the new installation site.

Where a base cannot be totally removed, the tops of the base shall be removed to below ground level and the excavation backfilled to the adjacent ground level. This will be considered incidental to the Work and will not be paid for separately.

7.7.3.3 **General Installation and Layout**

The Consultant will provide plan layout information in the form of a base line for the installation of the permanent signs. The Contractor shall establish the height and elevation of the sign and install it in accordance with the plans or as directed by the Consultant.

It is the Contractor's responsibility to have all sign locations checked for utilities prior to digging holes for posts. Any adjustments to the locations of signs will be subject to the approval of the Consultant.

The soil at the bottom of holes shall be thoroughly compacted to provide a firm bearing. Posts shall be set vertically and backfilled with material free of organics. All backfill shall be placed in thin layers and thoroughly compacted for the full depth. Cementitious materials shall not be used as backfill.

The disturbed area around installations shall be restored to the original contours.

The signs shall be fixed securely to the post(s) in accordance with the plans.

7.7.3.4 **Installation of Concrete Bases**

Concrete bases shall be installed as shown on drawings TEB 1.82 and TEB 1.83. The Contractor shall excavate holes to a minimum of 300 mm larger than the base and the base shall be installed in the centre of the excavation. The backfill around the base shall be placed in thin layers and shall be thoroughly compacted for the full depth.

7.7.3.5 **Installation of Breakaway Steel Posts**

All installations shall conform to drawing TEB 1.82. The installed post shall be within 1.5 degrees of vertical.

When salvaged materials are used, the sign and breakaway steel posts shall be reassembled and installed on the base at the new site. When new posts are required, the size of steel I-Beam post will be as shown on the drawing or specified by the Consultant or in the case of a replacement, it will be the same size as the post being replaced.

The Contractor shall saw cut the flange and web; and cut, drill, weld and shim the flanges for the base joint as required to ensure an unstressed installation.

Damage to galvanized surfaces shall be repaired by treating the damaged areas with zinc rich paint.

7.7.3.6 **Installation of Wooden Posts**

Posts shall be installed in accordance with drawing TEB 1.70 and shall be within 1.5 degree of vertical.

When a post is removed and replacement is not requested, the Contractor shall backfill the hole in thin compacted lifts.

7.7.3.7 **Installation of Cluster Frames**

The new frames shall be installed perpendicular to and facing the approaching traffic lane and shall be securely fastened to the post in accordance with drawing TEB 1.69.

7.7.3.8 **Installation of Signs**

Signs shall be mounted in accordance with drawings TEB 1.69, TEB 1.71, TEB 1.72, TEB 1.75, TEB 1.82 and TEB 1.95.

The installed sign shall be clean and not bent or twisted. The reflectorized surface shall be free of scratches and marks and must be securely fastened to the post or frame.

Signs on utility posts shall be mounted by a procedure approved by the utility owner.

7.7.4 ACCEPTANCE OF WORK AND WARRANTY

Prior to the final acceptance of the Work, all damage or deficiencies from any cause in signs and posts installed under this Contract shall be rectified by the Contractor at his expense.

In addition to the warranty requirements specified in Specification 1.2 General, the Contractor shall, during the warranty period, straighten and recompact or reinstall as required, all posts which are more than 50 mm from vertical in a 2 m length of post.

7.7.5 MEASUREMENT AND PAYMENT

7.7.5.1 **General**

All unit prices shall include traffic accommodation and temporary, construction signing; and all labour, materials, equipment, tools and incidentals necessary to complete the Work.

Because the condition of subsurface materials designed for salvage and reuse is unknown, this Contract may contain contingency bid items for units of work which may not be required. The Contractor shall have no claim against the Department for the deletion of any bid items during construction.

7.7.5.2 **Removal of Existing Signs**

Measurement will be made of the number of sign installations removed.

Payment will be made at the applicable unit price bid per sign for "Removal and Reinstallation or Disposal of Existing Signs - One Post", or "Removal and Reinstallation or Disposal of Existing Signs - Two Posts". Payment will be full compensation for removing, salvaging and reinstalling the wooden posts and signs, or removing and disposing of the existing wooden posts and signs.

If the Consultant determines that the removed post is not suitable for reinstallation and the existing sign is reinstalled, payment will be made for “Removal and Reinstallation or Disposal of Existing Signs” plus “Supply and Install - Wooden Post” for the applicable cross section of post installed.

7.7.5.3 **Breakaway Steel Posts**

Measurement will be made of the number of steel posts removed and disposed of, and the number of steel posts removed, salvaged and reinstalled.

Measurement will be in metres of new post installed.

Payment for supplying and installing new post will be made at the applicable unit price bid per metre for:

"Supply and Install Breakaway Steel Posts - W150 x 14"
"Supply and Install Breakaway Steel Posts - W200 x 15"
"Supply and Install Breakaway Steel Posts - W150 x 22"
"Supply and Install Breakaway Steel Posts - W200 x 27"

This payment will be full compensation for supplying and installing the applicable post.

Payment for removal and reinstallation of existing breakaway posts will be made at the unit price bid per steel post for "Remove and Reinstall Breakaway Steel Posts". This payment will be full compensation for removing and salvaging the steel post and sign; hauling salvaged material to the new site; and reassembling and installing the steel post and sign.

Payment for removal and disposal of existing breakaway posts will be made at the unit price bid per steel post for "Remove and Dispose - Breakaway Steel Posts". This payment will be full compensation for removing and disposing of the steel post and sign.

7.7.5.4 **Concrete Bases**

Measurement will be made separately of the number of bases supplied and installed; bases removed, salvaged and reinstalled; and bases removed and disposed of.

Payment for removing, salvaging and installing existing bases will be made at the unit price bid per concrete base for "Concrete Base - Remove and Reinstall". This payment will be full compensation for removing and salvaging of the existing base, moving the salvaged concrete base to the new site and installing the salvaged concrete base.

Payment for removing and disposing of concrete bases will be made at the unit price bid per base for "Concrete Base - Remove and Dispose". This payment will be full compensation for removing and disposing of the base; and placing and compacting backfill material in the hole.

Payment for supplying and installing new concrete bases will be made at the unit price bid per base for "Concrete Base - Supply and Install". This payment will be full compensation for supplying the base to the installation location, excavating, installing the new concrete base and backfilling and compacting around the base.

7.7.5.5 **Wooden Posts**

Measurement will be made of the number of posts of a particular cross-section supplied and installed.

Payment will be made at the unit price bid per post for “Supply and Install - 100 mm x 100 mm” or “Supply and Install Post - 100 mm x 150 mm” or “Supply and Install Post - 150 mm x 200 mm”, regardless of the length of the post. This payment will be full compensation for supplying and installing and maintaining the post.

7.7.5.6 **Cluster Frames**

Measurement will be made of the number of cluster frames supplied and installed.

Payment will be made at the unit price bid per frame for " Cluster Frames - Supply and Install". This payment will be full compensation for the supply and installation of the new cluster frames.

7.7.5.7 **Signs**

Measurement will be made of the number of signs within a particular size range, based on surface area.

Payment will be made at the applicable unit price bid per sign for "Install Sign - less than 1 m^2" or "Install Sign - 1 m^2 to 3 m^2" or "Install Sign - over 3 m^2". Separate payment will be made for each sign on a single post. This payment will be full compensation for installing and maintaining the signs.