

1. GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 23 13 – Subgrade Construction.
- .2 Section 31 24 13 – Roadway Excavation Embankment and Compaction.
- .3 Section 31 32 13 – Cement Stabilized Subgrade Construction.
- .4 Section 32 01 16 – Pavement Milling and Removals.
- .5 Section 32 11 23 – Granular Base.
- .6 Section 32 12 13 – Asphalt Prime and Tack Coats.
- .7 Section 32 12 16 – Hot Mix Asphalt Pavement.

1.2 DEFINITIONS

- .1 Full Depth Reclamation Using Foamed Asphalt:
 - .1 Full Depth Reclamation (FDR) is a full depth pavement recycling process, where the existing bituminous cover and the top portion of the underlying base material are reclaimed and transformed into a homogenous mixture by an in-place process using foamed asphalt, cementitious stabilizing agents and, if required, additional imported admixture aggregate with sufficient water to approximate the optimum moisture content. FDR shall be performed by utilizing a recycling machine to pulverise, to the required depth, the materials in the upper layers of the existing pavement structural section together with any imported admixture aggregate and to achieve the required gradation and consistency of mix in a single pass. The recycled material shall exit from the mixing chamber in a manner that prevents particle segregation. Spreading and placing to form the new structural section shall be by motor grader or screed mounted on the rear of the recycling machine. Pre-pulverizing may be done prior to the foamed asphalt application with no extra compensation. The material is then placed and compacted to achieve a new structural section.

1.3 BURIED SERVICES

- .1 The Contractor shall be responsible for locating and protecting all existing underground and surface structures, utility pipelines, overhead lines and poles, fences, water and sewer mains, building services, cables, culverts, sidewalks and any other works.
- .2 The size, depth and location of the existing utilities and facilities/structures shown on the Drawings are for illustrative and guidance purposes only; verification of completeness and accuracy are the responsibility of the Contractor.
- .3 Maintain and protect from damage, all water, sewer, gas, electric, telephone and other utility lines and fixtures and appurtenances that may be encountered. Any pipeline or utility line and their fixtures and appurtenances that may be damaged

shall be repaired at the Contractor's entire expense to the satisfaction of the Owner, the Engineer and the owner of the pipeline or utility.

1.4 COMPLIANCE REQUIREMENTS

- .1 Contractors are required to comply with applicable legislation, regulations, acts, codes, and policies, including, but not limited to the Alberta and Saskatchewan Occupational Health and Safety, Worker's Compensation Board Standards, industry standards, and municipal requirements while completing full depth reclamation using foamed asphalt operations.
- .2 In any case of conflict or discrepancy, the higher standard shall apply.

1.5 SAMPLES AND QUALITY CONTROL

- .1 Submit to the Engineer for review and approval a Foamed Bitumen Mix Design performed by a qualified laboratory at least fourteen (14) Days before commencing foamed bitumen recycling work. The mix design should be carried out in accordance with the mix design method detailed in the Wirtgen Cold Recycling Manual, current edition.
- .2 The design of the foamed asphalt shall be completed with a laboratory asphalt expanding plant. The half-life and extension ratio of the expanded asphalt bitumen shall be determined at a minimum of five (5) moisture contents. A minimum of two (2) trials shall be completed at each moisture content and the average values obtained shall be used in the final analysis. The moisture content of the expanded asphalt bitumen shall be established to provide a maximum expansion ratio and maximum half-life. The moisture content of the binder shall be selected to provide a minimum half-life of eight (8) seconds. The mix design sample shall be a representative sample of the roadway being rehabilitated and shall be obtained using the anticipated recycling equipment.
- .3 The Contractor, at its entire cost, shall be fully responsible for carrying out Quality Control testing on the foamed asphalt being produced, with the tests to minimally include the characteristics defined in these Specifications. Such test results shall be available to the Engineer.
- .4 The Contractor, at its entire cost, is fully responsible for ensuring that the quality of the Work meets the finish tolerances described in these Specifications.
- .5 The Contractor shall provide to the Engineer daily summaries of the quantities of bitumen and cement used per day, as well as the corresponding areas the bitumen and cement were applied to.

1.6 QUALITY ASSURANCE TESTING

- .1 Sampling and testing performed by the Engineer are Quality Assurance testing and shall not be in lieu of the Quality Control testing required to be performed by the Contractor.
- .2 Maximum Density: The dry unit mass of a sample at optimum moisture content as determined in the laboratory according to ASTM D1557.
3. Required Density: A minimum of 98% of the maximum density in accordance with ASTM D1557 for the full depth foam in-place recycled material.
4. Testing Frequency: The quality assurance laboratory will take a minimum of one (1) field density test for each 1,000m² of compacted full depth foam in-place recycled

material according to ASTM D2167 or ASTM D2922 for comparison with a maximum density determined according to ASTM D1557.

5. Proof-Rolling: a proof-roll of the compacted full depth foam in-place recycled material will be required to confirm adequate bearing capacity of the subgrade soils.
 - .1 For proof-rolling use a roller of 45,400kg gross mass with four (4) pneumatic tires each carrying 11,350kg and inflated to 620kPa. Four (4) tires arranged abreast with centre to centre spacing of 915mm maximum.
 - .2 The Engineer may authorize the use of other acceptable proof-rolling equipment. Alternately, use a single axle dual wheeled truck with a load of 9,100kg on the rear axle with tires inflated to a minimum of 27kPa.
 - .3 Proof-roll the top of the compacted full depth foam in-place recycled material upon completion of fine grading and compaction. Make sufficient passes to uniformly subject the surface to a loaded tire. Proof-rolling shall be carried out in the presence of the Engineer.

1.7 MEASUREMENT AND PAYMENT

- .1 Full depth foam in-place recycled material
 1. Full depth foam in-place recycled material will be measured in square metres in place, to the specified thickness, as specified within the Bid Forms.
 2. The bid price shall be full and complete compensation for all equipment, tools, labour and supervision, clean up and all other incidental work necessary to scarify, add Type I Base Course (20mm or ¾") gravel if required, pulverize the existing pavement structure as found onsite, mixing additional stabilizing mixtures, grade to designated elevation and cross section, blade and dry material as necessary, supply water as required to bring the material to optimum moisture, re-pulverize and remix where required, spread, shape and compact the material to 98% of the maximum density in accordance with ASTM D1557, and dispose of any surplus materials. Further, the bid price shall include all costs to temporarily lower and raise existing valves, manholes, catch basins and other appurtenances etc. necessary to allow clearance for cold in place recycling.
 3. The bid price for foamed asphalt shall be based on 2.6% bitumen and 1.0% Portland cement.
 4. The bid price shall also include loading, hauling, placing, compacting, and any other incidental work required to make use of any excess reclaimed material generated from one location to another within the scope of the contract.
 5. The time frame from the completion of the full depth reclamation to the placement of the asphaltic concrete shall be greater than two (2) Days and less than seven (7) Days unless directed otherwise by the Engineer.
 6. Under no circumstances shall the Contractor permit heavy equipment or trucks to be run over previously completed portions of the project.
 7. The Contractor shall maintain grade control of the full depth foam in-place recycled material with use of boning rods, string lines or other survey measures. The crown of the road will vary from location to location and will be determined in the field by the Engineer. The grade tolerances will be ±6mm as measured by a 3m straight edge, longitudinally and transversely. In instances where grades are given, areas 6mm high may be reworked to grade. Areas 6mm low must meet the final asphalt grade tolerances. Areas of 25mm low or greater will be pre-filled at the Contractor's expense.
 8. The road surface must be swept after the foamed application and prior to paving. Additional sweeping may be required where deemed necessary by the Engineer without extra compensation.

9. In areas where the foaming operation is unable to access (corner cuts, cul-de-sac corners) the Contractor shall pre-pulverize and blend the material with the foaming operation with no additional payment.
 10. No additional payment will be made for the movement of materials in areas the foaming operation is unable to access due to overhanging trees.
- .2 Add or Delete 0.2% Oil / 0.5% Cement
1. Payment for this item is by the square metre, as specified in the Bid Forms.
 2. The Contractor is required to provide a square metre unit price for addition or deletion of 0.2% oil and addition or deletion of 0.5% cement (material only), which will be applicable to the foamed asphalt unit rates.
 3. If, during the mix design process, it is determined that these percentages are required to be increased to achieve the optimum mix design, payment shall be made for materials only at the unit prices submitted. If the mix design process indicates a reduction in either the oil content or the cement content, a credit shall be applied based on the unit price submitted. The price for increase or decrease of these materials shall not be unbalanced with overhead and profit in the event that they may not be required. No additional compensation will be made if these items are not utilized.

2. PRODUCTS

2.1 MATERIALS

- .1 Cementitious Stabilizing Agent: Portland Cement to CAN/CSA-A3000, A3001-03 Type GU, general use hydraulic cement shall be the only cementitious stabilizing agent employed in the full depth foam in-place recycling process.
- .2 In-Situ Materials: The existing pavement structure to be pulverized has been investigated and the results are included in the Contract. If additional coring or sampling is desired, the coring or sampling shall be at the expense of the Contractor, upon approval of the Engineer.
- .3 Bituminous Stabilizing Agents: Foamed bitumen shall be the only bituminous stabilizing agent employed in the full depth foam in-place recycling process. Foamed bitumen shall be produced from premium grade 150-200 (A) asphalt cement, the specifications are outlined in Table 1.
- .4 Water: The Contractor is responsible for providing all necessary water required to complete the full depth reclamation process.
- .5 Admixture Aggregate: Type I Base Course (20mm or ¾") aggregate to be incorporated into the existing road structure to ensure adequate fines for stabilization shall meet the following gradation:
 - .1 Crushed stone or gravel shall consist of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material, and other deleterious materials.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117 and to have a smooth curve without sharp breaks when plotted on a semi-logarithmic grading chart.
 - .3 Type I Base Course (20mm or ¾") gradation as specified in Section 32 11 23 - Granular Base course.

2.2 FOAMED BITUMEN MIX DESIGN CRITERIA

- .1 Aggregate Gradation: The combined/pulverized material should meet the following gradation:

Sieve Size	Percent Passing (%)
38mm	100
20mm	70-100
12.5mm	60-85
5mm	45-70
2.5mm	33-60
0.;400mm	15-35
0.160	10-25
0.080mm	5-20

- .2 Portland Cement Content: minimum 1.0% by mass of dry aggregate
- .3 Bitumen: Minimum 2.6% by mass of dry aggregate
- .4 The mix design should be performed at various bitumen contents using Marshall criteria of seventy-five (75) blows per face. The Indirect Tensile Strength of the specimens should be determined. The samples should be tested dry and after one (1) hour of vacuum saturation in water. The ratio of Dry to Saturated Tensile Strength (TSR) must be a minimum of 50%.
- .5 The final design shall be based on a foamed bitumen content that provides: optimum bulk density, optimum dry strength properties, optimum wet strength properties, and optimum resistance to moisture penetration.

3. EXECUTION

3.1 EQUIPMENT

- .1 Reclaimer/Stabilizer: a roadway structure pulverizing machine with the following characteristics:
1. A minimum power capacity of 600 horsepower;
 2. A milling drum that rotates upward into the direction of advance with a minimum cut width of 2.0m;
 3. The capability of pulverizing asphalt, soil cement and gravel roadway structures to depths of at least 400mm in a single pass, and accurately maintaining a pre-set depth of cut;
 4. Due to the cut depths as detailed in the Contract documents, there is no requirement for the effective volume of the mixing chamber to be increased in relation to the depth of cut;
 5. Two (2) microprocessor-controlled systems, complete with two independent pumping systems and spray bars, one to regulate the application of foamed bitumen stabilizing agent and a separate system to regulate the water (for increasing the moisture content of the recycled material), both in relation to the forward speed and mass of the material being recycled;
 6. Two (2) spray bars shall each be fitted at a maximum spacing of one nozzle for each 155mm width of mixing chamber; the Contractor shall ensure that all nozzles utilized in the foamed asphalt process shall be maintained in working order for the duration of the process;
 7. The foamed bitumen shall be produced at the spray bars in individual expansion chambers, or one (1) large expansion chamber, into which hot bitumen and water are injected under pressure through orifices that promote atomization. The rate of addition of water into hot bitumen shall

- be kept at a constant (percentage by mass of bitumen) by the same microprocessor;
8. An inspection (or test) nozzle shall be fitted at one end of the spray bar that produces a representative sample of foamed bitumen;
 9. An electrical heating system capable of maintaining the temperature of all bitumen flow components above 150°C; and
 10. A single bitumen feed pipe installed between the modified milling or recycling machine and the supply tanker can be used. A system that incorporates a return pipe to the supply tanker may be used providing the overall temperature of the bitumen can be maintained.
- .2 Compaction Equipment: self-propelled vibratory steel drum, sheepsfoot/padfoot rollers and pneumatic-tired rollers capable of achieving the required compaction of the cold foam in-place recycled material, and providing a surface suitable for the placement of hot-mix asphalt concrete. The frequency and amplitude of vibrating rollers shall exceed a static mass of 13,600kg and shall be adjustable.
- .3 Supply Tankers for Bituminous Stabilizing Agent: Only tankers with a capacity exceeding 10,000L shall be used to supply the recycling machine with bitumen. Each tanker shall be fitted with two (2) recessed pin-type hitches, one in front and the other in the rear, thereby allowing the tanker to be pushed from behind by the recycling machine, and to push a water tanker in front. No leaking tanker will be permitted on the job site. In addition, each tanker shall be equipped with the following:
1. A thermometer to show the temperature of the bottom third of the tank;
 2. A rear feed valve, with a minimum internal diameter of 75mm, capable of draining the contents of the tank when fully opened;
 3. All-round cladding to retain heat; and
 4. A calibrated dipstick marked at intervals of no more than 100L, for measuring the contents of the tank.

3.2 PREPARATION

- .1 Roadway areas to be reclaimed will be indicated on the Plans and Drawings or designated by the Engineer.
- .2 Ensure that any conflicts with underground utilities in the zone of reclamation are resolved prior to pulverization.
- .3 Clearing all foreign matter from the entire roadway width, including any adjacent lanes or shoulders that are not to be recycled.
- .4 Remove all standing water.

3.3 UNSUITABLE WEATHER CONDITIONS

- .1 Wet Weather: No full depth foam reclamation work shall be reformed during wet conditions, nor started without completing before wet conditions set in.
- .2 Cold Weather: No cold foam in-place recycling work shall be performed if the pulverized roadway material temperature is below 5°C, other than finishing and compaction operations.
- .3 Windy Weather: Spreading of cementitious stabilizing agents on the roadway ahead of the recycling machine will not be allowed when windy conditions adversely affect the operations. The Engineer, in conjunction with the Contractor is to determine whether the conditions are appropriate for the spreading of cement. If determined by the Engineer that the conditions are not appropriate, the Contractor shall cease all cement spreading operations until authorization to do so has been provided by the Engineer.

- .4 The maximum time period between mixing the recycled material with a stabilizing agent and compacting the placed material shall be determined by the type of stabilizing agent applied. Where a combination of two (2) or more different stabilizing agents are used, the stabilizing agent that predominates shall dictate the time limitation. Where Portland Cement is added in conjunction with a bituminous stabilizing agent at an application rate of less than 2%, the time limit of the bituminous stabilizing agent shall apply. The maximum time periods shall be as follows:

Stabilizing Agent	Time Limit
Portland Cement	3 Hours
Bitumen Emulsion	Before the emulsion breaks
Foamed Bitumen	24 Hours if kept moist

3.4 PRODUCTION PLAN

- .1 Prior to beginning the recycling work each day, the Contractor shall prepare a production plan detailing the forthcoming day's work. The production plan shall contain, at a minimum, the following information:
1. A sketch showing the overall layout of the length and width of roadway intended for recycling during the day, broken into the number of parallel cuts required to achieve the stated width, and the overlap dimensions at each joint between cuts;
 2. The sequence and length of each cut to be recycled before starting on the adjacent or following cut;
 3. An estimate of the time required for pulverizing, mixing and compacting the cut. The sketch shall also show the time when completion of each is expected;
 4. The proposed water addition for each cut;
 5. The quantity and location where admixture aggregate is to be imported;
 6. The amount and type of stabilizing agent, or agents, to be applied to each cut;
 7. The proposed Quality Control testing program; and
 8. Any other information that is relevant for the intended work.

3.5 PULVERIZATION

- .1 Pulverize the existing roadway structure into fragments no larger than 25mm maximum dimension, exclusive of existing aggregate. The forward speed of the recycling machine, rotation rate of the recycling drum, and the positioning of the gradation control beam shall be set to break down the in-situ material to an acceptable gradation.
- .2 The Contractor shall take all the necessary steps to ensure that the gradation of the recycled material conforms to the requirements specified in Clause 3.12 Test Sections of this Specification.
- .3 In the event that the roadway is pre-pulverized, shaped and recompacted prior to the addition of stabilizing admixtures, the pre-pulverized material shall be compacted to a minimum of 95% of the maximum density in accordance with ASTM D1557 prior to the addition of the stabilizing admixtures.

3.6 ADDITION OF WATER AND STABILIZING ADMIXTURES

- .1 Add stabilizing admixtures to the reclaimed base course as specified or as directed by the Engineer.
1. Portland Cement
 2. Bituminous Stabilizers

- .2 Ensure that the stabilizing admixtures are uniformly distributed and mixed with the pulverized material. The microprocessor control system for the addition of water and foamed bitumen shall be set and carefully monitored to meet the required compaction moisture and stabilizer content. Bulk bitumen tankers shall be dipped at the end of each cut in order to determine the actual usage against the calculated theoretical demand.

3.7 OVERLAP OF LONGITUDINAL JOINTS

- .1 The Contractor shall pre-mark the cut lines on the road surface, designating the width of each cut in a section of the roadway.
- .2 To ensure complete recycling across the full width of the roadway, longitudinal joints between successive cuts shall overlap a minimum of 150mm.
- .3 Pre-marked cut lines on the road surface shall be checked to ensure that the width of the first cut is equal to that of the milling drum, and that the width of all successive cuts shall be narrower than the drum width by at least 150mm. The milling/recycling machine shall be steered so as to accurately follow the pre-marked lines. Any deviation in excess of 50mm shall be rectified immediately by reversing to where the deviation commenced and reprocessing along the correct line, without the addition of any further water or stabilizing agent.
- .4 Before starting each new cut sequence, the overlap width shall be confirmed, and any adjustments made to ensure that the amount of water and fluid stabilizing agents to be added is reduced proportionately by the width of the overlap.

3.8 CONTINUITY OF STABILIZED WATER

- .1 The Contractor shall ensure that there is no gap of unrecycled material created between successive cuts (along the same longitudinal cut line), nor any untreated wedges create by the entry of the milling drum into existing material by:
 1. Carefully marking the exact location at which each cut terminates. This mark shall coincide with the position of the centre of the pulverizing drum at the point at which the supply of stabilizing agent ceased.
 2. Start the next successive cut at least 0.5m behind this mark to ensure continuity.

3.9 SUB-GRADE INSTABILITY

- .1 Where sub-grade instability is encountered during the recycling process, the sub-grade shall be:
 1. Excavated and removed to a depth of 600mm; and
 2. Replaced and backfilled with Type I Base Course (20mm or ¾") placed in lifts not exceeding 150mm thickness when compacted and followed by successive layers until the level of the existing roadway is reached. The Type I Base Course (20mm or ¾") shall be compacted to a minimum of 100% of the maximum density in accordance with ASTM D698.

3.10 GRADING AND COMPACTION

- .1 Refer to Sections 31 24 13 - Roadway Excavation, Embankment and Compaction, and 32 11 23 - Granular Base.
- .2 Leave the surface of the compacted recycled material slightly higher than the required elevation, then trim to the design crown and grade. Leave the finished surface even and free of depressions, humps, or loose material.
- .3 Rolling shall commence as soon as it is practical, and follow the predetermined sequence specified in Clause 3.12 Test Sections of these Specifications.

3.11 WATERING, FINISHING AND CURING

- .1 After compaction, the roadway surface shall be treated with a light application of water, and rolled with pneumatic-tired rollers to create a close-knit texture. The finished layer shall be free from:
 1. Surface laminations;
 2. Segregation of fine and coarse aggregate;
 3. Corrugations or any other defects that may adversely affect the performance of the layer.
- .2 Tack coat shall not be applied until the moisture content of the recycled layer is at least 2% below the as-placed moisture content.

3.12 TEST SECTIONS

- .1 At the start of the project, the Contractor shall assemble all the items and equipment for the recycling operations, and process a section of the roadway to:
 1. Demonstrate that the equipment and processes produce recycled layers to meet the requirements specified in these Specifications;
 2. Determine the effect on the gradation of the recycled material by varying the forward speed of the recycled machine and the rotation of the pulverizing drum; and
 3. Determine the sequence and manner of rolling necessary to obtain the minimum compaction requirements.
- .2 The test section shall be at least 100m in length of a full lane-width.
- .3 If the test section fails, or if modifications are made to the methods, processes, equipment, and materials, additional test sections shall be performed in accordance with the requirements listed above before further work is completed, until a satisfactory test section is produced.

3.13 FIELD QUALITY CONTROL

- .1 Check the finished surface of the reclaimed base course to ensure it meets the following tolerances:
 1. Grade: ± 6 mm maximum variation from design elevation.
- .2 When Tolerance Exceeded
 1. Trim high areas and refinish the surface to within tolerance.
 2. Add recycled material to low areas, scarify and blend to full reclamation depth, re-compact to the required density, and refinish the surface.
- .3 Required density of a minimum of 98% of the maximum density in accordance with ASTM D1557 for the full depth foam in-place recycled material.
 1. Density Tests: If a density test result is less than the required density, the initial test result is discarded and three retests shall be performed on the area represented by the failed test. The average of the three tests shall represent the density of that area. If this average is less than the required density, the area shall be reworked to the full depth of the lift, the moisture content altered as necessary and recompacted to the required density. If the area is not retested but is reworked and recompacted, the area shall be tested at normal testing frequencies.

3.14 MAINTENANCE

- .1 If the recycled base floods, drain immediately by natural flow or by pumping to catch basins, manholes, or ditches.

- .2 Maintain finished surfaces in a condition conforming to this section until acceptance.
- .3 The Contractor shall, at its own expense, repair any damages to a prepared recycled base surface as well as repair damages done by its equipment, and shall remove any obstructions it may have placed which will interfere with the normal function of a drainage system.
- .4 The Contractor shall, at all times and at its entire cost, be responsible for protecting the Work site against the entry of surface water into the Work area, including, as may be required, the pumping and removal of such surface water with the discharge of such surface water to a location and in a manner acceptable to the Engineer.

END OF SECTION

TABLE 1: SPECIFICATIONS FOR PREMIUM GRADE ASPHALT CEMENTS

TEST CHARACTERISTICS	A.S.T.M. TEST METHOD	Premium Grades of Asphalt Cements					
		150-200 (A)			200-300 (A)		
Absolute Viscosity, 60°C, Pa – s Penetration, 25°C, 100g, 5s, dmm	D2171	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:			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:		
	D5	Pt.	Abs. Visc.	Pen.	Pt.	Abs. Visc.	Pen.
		A	155	150	C	50	200
		B	70	150	D	92	200
		C	50	200	E	45	300
	D	92	200	F	26.5	300	
Kinematic Viscosity 135 °C, sq. mm/s Penetration, 25 °C, 100g, 5s, dmm	D2170	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:			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:		
	D5	Pt.	Kin. Visc.	Pen.	Pt.	Kin Visc.	Pen.
		A	360	150	C	205	200
		B	225	150	D	285	200
		C	205	200	E	205	300
	D	285	200	F	150	300	
Flash Point, Cleveland Open Cut, °C minimum	D92	205			175		
Solubility in Trichlorethelene, % minimum	D2042	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		
Ductility, 25 °C, cm, maximum	D113	100			-		
Ductility, 15.6 °C, minimum		-			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 170°C and 190°C.

CHART 1: SPECIFICATIONS FOR ASPHALT CEMENT ABSOLUTE VISCOSITY

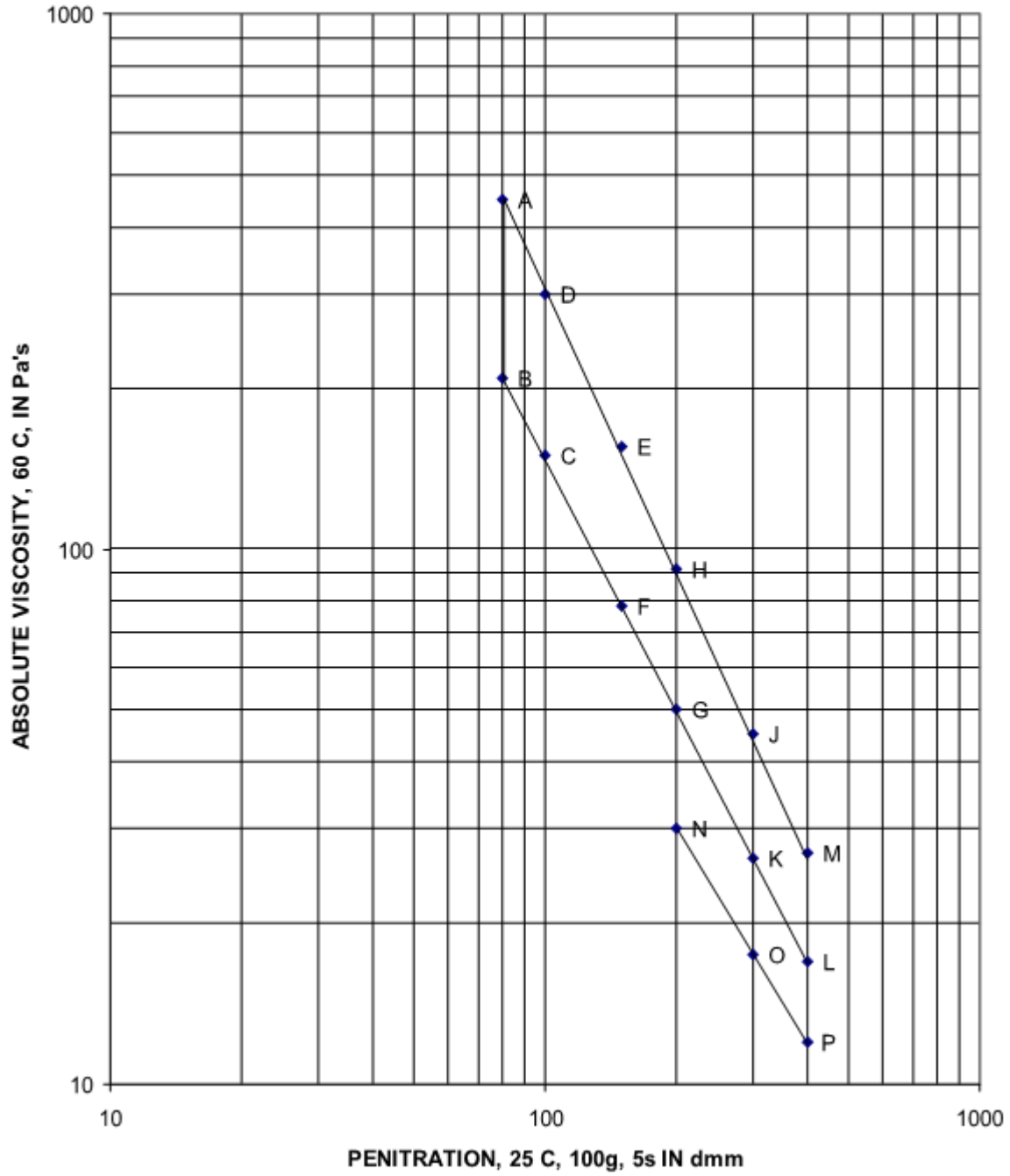


CHART 2: SPECIFICATIONS FOR ASPHALT CEMENT KINEMATIC VISCOSITY

