

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 03 30 51 – Concrete for Bridge Decks
- .3 Section 32 12 16 – Asphalt Paving
- .4 Section 32 12 13.16 – Asphalt Tack Coat

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA A123.23-15(R2020) Product Specification for Polymer-modified Bitumen Sheet, Prefabricated and Reinforced.
  - .2 CAN/CSA A123.4-04(R2018) Asphalt for Constructing Built-up Roof Coverings and Waterproofing Systems.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Latest edition of Manufacturer's literature including performance data and installation procedures.
- .3 A sample of the waterproofing membrane shall be tested and approved prior to incorporation into the Work.
- .4 Submit test results for the Water Absorption Test of the protection board one week prior to installation.
- .5 The Contractor shall give a minimum of 48 hour notice, in writing, prior to commencement of any waterproofing operations.
- .6 Copy of Applicator's certification issued by the manufacturer stating that the Applicator is a qualified installer of the manufacturer's system.

**1.4 QUALITY CONTROL / QUALITY ASSURANCE**

- .1 Protection Board: protection board shall be tested using the Water Absorption Test. Two specimens of protection board 150 mm x 50 mm shall be cut. The specimens shall be oven dried to constant mass at 60 C +/- 1 C. The mass of the specimens before and after drying shall be recorded.
- .2 The specimens shall then be submerged horizontally under 25 mm of water three times as follows:
  - .1 First immersion: the water temperature shall be 23<sup>0</sup> C +/- 2<sup>0</sup> C and the duration of the immersion shall be 4 hours.

- .2 Second immersion: the water temperature shall be  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and the duration of the immersion shall be 20 hours.
- .3 Third immersion: the water temperature shall be  $60^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and the duration of the immersion shall be 80 hours.
- .3 After each immersion the specimens shall be towel dried and the mass recorded.
- .4 The percent mass loss or gain from the original oven dry mass shall be recorded.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 The waterproofing membrane shall be supplied to the job site in cakes, in the Manufacturer's sealed and labelled containers, ready for melting and application.
- .3 The protection board shall be so packaged as to permit shipping, handling and storage without damage to the contents.
- .4 Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Departmental Representative or other personnel.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Primer coat of concrete surface: liquid asphalt primer to CSA A123.4.
- .2 Asphalt Waterproofing Membrane: Waterproofing membrane shall be a hot applied asphalt waterproofing membrane certified by the Manufacturer to conform to the requirements of CSA A123.4.
- .3 Asphalt Waterproofing Membrane shall conform to the physical requirements listed in the following:

Test	Specification (mm)
Cone Penetration at $25^{\circ}\text{C}$	110 (max.)
Cone Penetration at $50^{\circ}\text{C}$	160 (max.)
Flow at $60^{\circ}\text{C}$	3 (max.)

Test results shall be submitted by the Contractor to the Departmental Representative one week prior to installation; however the Departmental Representative may take samples for testing at any time during the operation.

- .4 Protection Boards: shall be formed of asphalt and fillers between two sheet materials. The boards shall be uniform over its entire area to the thickness specified. The thickness of the protection board shall be  $3.6\text{mm} \pm 0.4\text{ mm}$ . The width of the board shall be  $1000\text{mm} \pm 150\text{mm}$  and the length of the board shall be  $1500\text{mm} \pm 150\text{ mm}$ . The board shall have straight edges, square corners and edges free of burrs and breakaways.

Notwithstanding the size tolerance stated, all sheets shall be of the same length and width with a tolerance of +/- 5.0mm and a uniform thickness with tolerance of +/- 0.25mm. The protection board shall have a water absorption of 5.0% maximum and shall show no deterioration or loss of mass during the Water Absorption Test.

- .5 Tack Coat for Protection Boards: tack coat for protection boards shall be RS-1 emulsion.

### **Part 3 Execution**

#### **3.1 GENERAL**

- .1 All waterproofing operations shall be carried out when the air and concrete surface temperature are both 5° C or higher.
- .2 The applicator shall be approved by both the Departmental Representative and the manufacturer of the waterproofing system.
- .3 Perform the work in strict conformance with the manufacturer's written instructions and this specification. In the event there is a discrepancy between the manufacturer's written instructions and this specification, the more stringent requirement shall apply. The Departmental Representative shall have sole discretion on these matters.
- .4 Perform all of the operations involved in waterproofing in sequential order, such that there are no delays between individual operations other than those necessary to meet the requirements of these specifications.
- .5 Drainage holes through the deck shall not be plugged by either waterproofing membrane, protection board or asphalt concrete.
- .6 Waterproofing operation shall not commence until the Departmental Representative has approved the preparation work.

#### **3.2 SURFACE PREPARATION**

- .1 Concrete surface to be completed treated by abrasive blast cleaning, or such method as approved by the Departmental Representative to ensure that sound, laitance-free concrete is exposed. If a curing compound had been used on the concrete surface, it shall be completely removed.
- .2 Check the flatness of the surface after surface preparation has been completed. Areas that do not meet a 3mm in 3 m planeness shall be ground by the contractor.
- .3 Sweep all dirt and debris off the surface and dispose of before applying tack coat. Immediately prior to the application of the tack coat, the concrete surface shall be cleaned with a jet of oil-free compressed air to remove all dust and foreign material.

#### **3.3 PRIMER COATING OF PREPARED CONCRETE DECK**

- .1 Apply a primer coat of Liquid Asphalt Primer to the prepared concrete surface at a rate of 0.25 L/m<sup>2</sup> with approved equipment which shall provide a uniform application at the required rate. Primer coat shall be applied when concrete is dry and clean. Waterproofing equipment shall not be permitted upon the primer coat until it has fully cured.

### **3.4 APPLICATION OF ASPHALT WATERPROOFING MEMBRANE**

- .1 Cakes of the waterproofing membrane shall be melted on the job site in a double boiler oil heat transfer type mechanical agitated heating and mixing kettle. The unit shall keep the contents continuously agitated until the material can be drawn free flowing and lump free from the mixing kettle at a temperature with the range recommended by the manufacturer. The kettle shall be equipped with functional permanently installed dial type thermometers to measure the temperature of the melted compound and the oil.
- .2 Waterproofing membrane shall not be applied until the tack coat has cured completely and is free of any surface moisture and dirt. Apply the waterproofing within the temperature range recommended by the manufacturer in the following sequence:
  - .1 Apply the waterproofing along the edge of the deck for the width of 300 mm and up the face of the curbs to the height of 80 mm. Apply the waterproofing along the joint between the deck and approach slab (two locations) for a width of 400 mm between curbs.
  - .2 Place a sheet of rubber membrane reinforcement (minimum 150 mm wide by 1.2 mm thick) up the face of the curbs at a height of 40 mm. Place a sheet of rubber membrane reinforcement (minimum 300 mm wide by 1.2 mm thick) at each joint between the deck and approach slab. Rubber membrane to be placed while the waterproofing is still sticky.
  - .3 Apply waterproofing over the rubber membrane reinforcement.
  - .4 Apply the waterproofing to the tack coated deck so as to form a uniform film having a thickness of 5 +/- 1 mm, unless otherwise specified and approved by the Departmental Representative.

### **3.5 APPLICATION OF PROTECTION BOARD**

- .1 Place protection boards on the waterproofing membrane while the surface is still tacky with the length of the board transverse to the deck centerline. Materials or substances shall not be applied to remove the tackiness prior to installation of the protection board.
- .2 Protection boards shall be placed with edges overlapping 25 mm transversely, unless otherwise approved by the Departmental Representative.
- .3 The protection board edge shall be within 6 mm of all curbs and drain verticals. Place protection boards such that the longitudinal (direction of traffic flow) joints are staggered a minimum of 150 mm.
- .4 The protection boards shall remain free from perforation when applied.

### **3.6 TACK COATING OF PROTECTION BOARD**

- .1 Apply a tack coat of RS-1 emulsion at a rate of 0.14 L/m<sup>2</sup> or as directed by the Departmental Representative. Tack coat material shall be applied to the protection board with approved equipment which will provide a uniform application at the required rate. The tack coat shall be applied only when the protection board is dry, clean and when air temperature is above 5°C. The tack coat shall be placed just sufficiently ahead of paving to allow for adequate curing.

**3.7 PAVING OF BRIDGE DECK AND APPROACH SLABS**

- .1 Place asphalt concrete paving of bridge deck and approach slabs within 48 hours of the completion of waterproofing or as otherwise directed by the Departmental Representative.
- .2 Place asphalt concrete without disturbing or damaging the waterproofing system. Immediately remedy any disturbance and / or damage to the waterproofing system before continuing with paving operations.
- .3 Within 24 hours of paving of the deck and approach slabs, seal the interface between the asphalt concrete and the face of the curb by pouring waterproofing along the joint such that the material extends 25 to 50 mm from the face of the curb and to a thickness of 2 to 4 mm above the asphalt concrete.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 03 30 00 – Cast-in-Place Concrete

**1.2 REFERENCES**

- .1 NCHRP 244, Concrete Sealers for the Protection of Bridge Structures.

**1.3 SUBMITTALS**

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit manufacturer's instructions in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Submit information on 3 projects where the product has been used on a bridge with similar environmental conditions to this project and has been in use for over 5 years. Information to include project name, owner's contact information and brief description of the project.
- .4 Submit samples in accordance with Section 01 33 00 – Submittal Procedures. Samples shall demonstrate the colour and texture of the coating product.
- .5 Submit drawing indicating locations of coloured coating application.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, handle, store and protect materials to prevent damage to packaging.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor. Store coating products in temperatures above 4° C.

**1.5 WASTE MANAGEMENT**

- .1 Separate waste materials for disposal in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facility.
- .3 Unused coating material must not be disposed of into the river, on to the ground or in other locations where it will pose health or environmental hazard.
- .4 Divert unused coating material from landfill to official hazardous material collections site approved by Departmental Representative.

**1.6 PROJECT CONDITIONS**

- .1 Environmental Limitations: conform to manufacturer's written instructions.
- .2 Substrate Conditions:

- .1 Do not proceed with installation of materials until contaminants capable of interfering with adhesion are removed from substrates.

## **1.7 ENVIRONMENTAL REQUIREMENTS**

- .1 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of coatings including special conditions governing use.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Concrete coating system shall be a waterborne, highly flexible, high performance waterproofing coating for protection of new concrete formulated with internally cross-linked acrylic copolymer. The coating system shall be highly breathable yet waterproof, resistant to carbon dioxide diffusion, exceptionally UV light resistant, unaffected by wetting/drying and freeze/thaw, and dirt resistant. The coating system shall also have excellent chemical resistance in an acid environment, long term adhesion and durability, no chalking or leaching, and a high resistance to water ponding.
  - .1 The concrete coating system shall consist of a primer coat followed by a coloured top coat.
  - .2 The coating colour shall be 273P Limestone (gray). Provide colour swatches to Departmental Representative for acceptance prior to placing order.

## **Part 3 Execution**

### **3.1 APPLICATION**

- .1 Apply concrete coating to the pilasters (all surfaces) and the exterior edge of the curbs/sidewalks along the full length of the bridge structure. The curb/sidewalk coating shall be terminated at the top edge of the 25 x 25 chamfer at the top of the curbs, leaving the top surface and the inside edge of the curbs uncoated. The coating shall also be applied to the outside edges of the exterior rigid frames for the full length of the bridge.
  - .1 Do not apply if rain is imminent.
  - .2 Surface ambient temperature must not be less than 7°C or above 32°C during 24 hours after the application.
  - .3 Fresh concrete must be cured for ten days prior to application.
  - .4 Prepare surface for coating in accordance with manufacturer's recommendations.
  - .5 Install to manufacturer's recommendations.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 45 00 – Quality Control
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .4 Section 03 30 00 – Cast-in-Place Concrete

**1.2 REFERENCES**

- .1 ASTM C719-22, Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
- .2 ASTM C793-05 (2017), Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
- .3 ASTM C1193-16, Standard Guide for Use of Joint Sealants.
- .4 ASTM C1330-18, Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- .5 ASTM D412-16 (2021), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
- .6 ASTM D2240-15 (2021), Standard Test Method for Rubber Property – Durometer Hardness.
- .7 ASTM D5893/D5893M-16 (2021), Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

**1.3 SUBMITTALS**

- .1 Submit product data including printed product literature and data sheets in accordance with Section 01 33 00 – Submittal Procedures. Data to include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
  - .1 Submit sample for color selection.
  - .2 Submit sample for verification. Provide samples in color offered with joint sealants formed between two 150 mm long strip of material matching appearance of surfaces adjacent to joint sealants.
- .3 Submit manufacturer's instructions in accordance with Section 01 33 00 – Submittal Procedures.
  - .1 Include preparation and installation instructions for each product used.
- .4 Submit standard drawings illustrating manufacturer's recommended sealant joint profiles and dimensions applicable. Indicate width, width-to-depth ratio, thickness of joint sealant, and depth of recess limitations recommended by manufacturer.



.5 Preconstruction field-adhesion test reports.

.6 Field quality control adhesion test reports.

#### **1.4 QUALITY ASSURANCE**

.1 Preconstruction Field-Adhesion Testing: Prior to installing pavement sealants, field test adhesion to joint substrates using ASTM C1193 Method A. Verify adhesion is adequate. Modify joint preparation recommendations for failed joints and re-test. Submit written report to Departmental Representative.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

.1 Deliver, handle, store and protect materials to prevent damage to packaging.

.2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

.3 Replace defective or damaged materials with new.

#### **1.6 WASTE MANAGEMENT DISPOSAL**

.1 Separate waste materials for disposal in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.4 Divert unused joint sealing material from landfill to official hazardous material collections sites approved by Departmental Representative.

.5 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic material destined for recycling.

.6 Fold up metal banding, flatten, and place in designated area for recycling.

#### **1.7 PROJECT CONDITIONS**

.1 Environmental Limitations: conform to manufacturer's written instructions.

.1 Do not install silicone sealant during inclement weather or when such conditions are expected. Allow wet surfaces to dry.

.2 Do not install sealants when temperature is above 50° C or below 4.4°C.

.3 Do not install sealant when temperature is at or below dew point (the temperature at which the air is saturated with moisture vapor and liquid water (dew) begins to form).

.2 Substrate Conditions:

.1 Do not proceed with installation of materials until contaminants capable of interfering with adhesion are removed from substrates.

## 1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

## Part 2 Products

### 2.1 MATERIALS

- .1 One-part, non-sag silicon material that cures to a low-modulus silicone rubber sealant designed for sealing joints in Portland cement concrete and accommodates typical thermal movements to the following requirements:

<u>Test Method</u>	<u>Test</u>	<u>Value</u>
<b>As Supplied</b>		
Colour		Grey
ASTM D2202	Slump of Sealants	Pass (< 0.30 inches)
ASTM C1183	Extrusion Rate	90 – 250 g/min
ASTM C679	Tack Free Time	Pass (5 hours max)
ASTM C792	Heat Aging	3.05% loss max
ASTM C661	Durometer Shore A-2	15 - 25
ASTM C792	Specific Gravity	1.450 – 1.515
<b>As Cured – 21 days at 25°C (77°F) and 50% RH</b>		
ASTM D412	Ultimate Elongation	≥ 1200%
ASTM D412	Tensile Stress @ 150%	28 psi (45 psi max)
<b>Performance</b>		
ASTM C719	Movement, 10 cycles at +100/-50 percent	No Failure
ASTM C793	Accelerated Weathering at 5,000 hours	No cracks, blisters or bond loss

## Part 3 Execution

### 3.1 JOINT SEALANT APPLICATION

- .1 Apply sealant to the following:
  - .1 Between approach slab and rigid frame.

- .2 Between bridge deck sidewalk and sidewalk on approach slab.
- .3 At bridge curb/sidewalk joints.
- .2 Examine joint profiles and surfaces to determine if work is ready to receive paving sealants. Verify joint dimensions are adequate for development of sealant movement capability. Proceed with paving sealant work once conditions meet sealant manufacturer's recommendations.
  - .1 Comply with width, width-to-depth ratio, thickness of joint sealant, and depth of recess limitations published by manufacturer for specific products.
- .3 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil, grease, and other matter which may impair Work using materials and methods recommended by sealant manufacturer.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.
  - .1 Remove laitance, form-release agents, dust, and other contaminants.
- .6 Mask adjacent surfaces to prevent staining or damage by contact with sealant or primer.
- .7 Prime joint substrates when recommended by sealant manufacturer or when indicated by preconstruction testing. Apply recommended primer using sealant manufacturer's recommended application techniques. Allow to dry according to manufacturer's recommendations prior to sealant application.
- .8 Select joint backing materials recommended by sealant manufacturer to be compatible with sealant material. Install backing material at depth required to produce profile of paving sealant allowing optimal sealant movement. Install continuously without gaps, twisting, stretching, or puncturing backing material. Use gauge to ensure uniform depth to achieve correct profile, coverage, and performance.
- .9 Apply sealant to manufacturer's instructions. Comply with recommendations in ASTM C1193.
  - .1 Tool non-sag type sealants immediately with appropriately shaped tool to force sealants against joint backing and joint substrates, eliminating voids and ensuring full contact.
    - .1 Provide concave, smooth, uniform, sealant finish. Eliminate air pockets and ensure complete contact on both sides of joint opening.
    - .2 Tool joints with one continuous stroke.
    - .3 Use tooling agents recommended by sealant manufacturer for application.
- .10 Curing: to manufacturer's recommendations.
- .11 Cleanup.
  - .1 Clean adjacent surfaces immediately and leave work neat and clean.
  - .2 Remove excess and droppings, using recommended cleaners as work progresses.
  - .3 Remove masking tape after initial set of sealant without disturbing seal.

**END OF SECTION**

**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 45 00 – Quality Control
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .4 Section 32 12 16 – Asphalt Paving

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM D5329-20, Standard Test Methods for Sealant and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements.
  - .2 ASTM D6690-21 (Type IV), Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS)
- .3 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

**1.3 SUBMITTALS**

- .1 Submit product data including printed product literature and data sheets, in accordance with Section 01 33 00. Data to include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit manufacturer's instructions in accordance with Section 01 33 00 – Submittal Procedures.
  - .1 Include installation instructions for each product used.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, handle, store and protect materials to prevent damage to packaging.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.
- .3 Replace defective or damaged materials with new.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for disposal in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

- .3 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.
- .4 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.
- .5 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .6 Fold up metal banding, flatten and place in designated area for recycling.

## 1.6 PROJECT CONDITIONS

- .1 Environmental Limitations: conform to manufacturer's written instructions. Do not apply joint sealing material when the ambient temperature is below 2°C or according to the sealant manufacturer's instructions.
- .2 Substrate Conditions:
  - .1 Do not proceed with installation of materials until contaminants capable of interfering with adhesion are removed from substrates.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

## Part 2 Products

### 2.1 MATERIALS

- .1 Sealants shall be a high performance, hot applied, single component, low modulus joint and crack sealant capable of undergoing thermal movements indicated on Contract Documents.
- .2 Sealant must exhibit low temperature bonding properties while still maintaining a high degree of resiliency to reject incompressibles.
- .3 Sealant shall permit high elongation at low temperatures with low stress development.
- .4 Sealant must have properties to prevent flowability out of the joint or from being picked up by tires of passing vehicles at high service temperatures.
- .5 Sealants to conform to the following requirements:

<u>PROPERTIES</u>	<u>TEST METHODS</u>	<u>SPECIFICATIONS</u>	<u>TYPICAL RESULTS</u>
Penetration @ 25°C 150G, 5 sec	ASTM D5329	90-150	120

Flow @ 60°C	ASTM D5329	3 MM MAX.	1.0
Bond at -29°C 200% ext – 1/2"	ASTM D5329	PASS 3 CYCLES	PASS
Resiliency @ 25°C	ASTM D5329	60% min	70%
Asphalt Compatibility	ASTM D5329	PASS	PASS
Ductility @ 25°C	ASTM D113		50 CM
Heat Stability 6 hours @ pouring temp.	ASTM D5329	PASS ALL REQUIREMENTS	PASS
Min softening point	ASTM D36	Min. 80°C	84°C

## 2.2 EQUIPMENT

- .1 Contractor shall supply all tools, machinery and equipment required in the execution of all phases of the work.
- .2 Routing and Cutting Equipment: The routing and cutting equipment shall be of a type which can expeditiously cut and form joint to the sizes specified. Be capable of continually creating well defined right angle routs. The equipment shall have cutter tools which are capable of cutting grooves 20 mm wide by 40 mm deep leaving the sides of the joint absolutely clean, smooth and ready for sealing.
- .3 Compressor: Compressed air equipment is required to effectively clean the routed joints. The compressor, which may be attached to the hot air lance, shall provide a clean oil-free air jet of a minimum flow of 4m<sup>3</sup>/min, a minimum velocity of 990 m/s and a minimum pressure of 600 kPa.
- .4 Hot Air Lance: Hot air lance is required to dry and pre-heat joints prior to applying sealing material. The hot air lance must be used at all times to warm the joint and remove moisture. It is acceptable to use the compressor and air lance simultaneously. Tiger torches are not permitted.
- .5 Heating Equipment for melting sealant:
  - .1 Double-jacketed melting boiler capable of providing indirect heating and constant agitation of the joint sealing material.
  - .2 Totally automatic temperature control system controlling both head transfer oil temperature and sealing compound temperature. Temperature controls will be capable of maintaining the temperature of the sealant within manufacturer's tolerances.
  - .3 Heated sealant applicator wand shall be attached to a heated hose and attached to a heated sealant chamber.

**Part 3 Execution**

**3.1 PROTECTION**

- .1 Protect installed Work of other trades from staining or contamination.

**3.2 PREPARATION**

- .1 Rout joint to dimensions indicated on the contract documents.
- .2 Following routing, joint shall be cleaned with high compressed air free of oil to rid joint of debris and/or moisture.

**3.3 JOINT SEALANT APPLICATION**

- .1 Install asphalt impregnated fiber board beneath expansion joint system at approach end of each approach slab as indicated on Contract Documents prior to installing joint sealant.
- .2 Do not use sealant material that has been frozen.
- .3 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil, grease and other matter which may impair Work using materials and methods recommended by the low modulus sealant manufacturer.
- .4 Ensure joint surfaces are dry and frost free. Verify that conditions of substrate previously installed under other Section or Contracts are acceptable for pavement sealant application in accordance with manufacturer's written instructions.
- .5 Prepare joint sealant product in accordance with manufacturer's directions.
- .6 Prepare surfaces in accordance with manufacturer's directions.
- .7 Apply sealant to manufacturer's instructions.
  - .1 The joint sealing material shall be applied by heated sealant applicator wand. The sealing material shall be placed within two minutes after heating of the joint with the hot compressed air lance.
- .8 Curing: to manufacturer's recommendations.
- .9 Cleanup:
  - .1 Care shall be taken to avoid spillage of the material on the pavement. Should spillage occur, the contractor shall clean it up at his own expense.
  - .2 Clean adjacent surfaces immediately and leave Work neat and clean.
- .10 Prior to opening the area to traffic, all joints shall be thoroughly checked for areas exhibiting adhesion failure, damage to the sealant, foreign objects in the sealant or other problems. All areas not meeting the acceptable criteria shall be prepared and resealed until satisfactory.

**END OF SECTION**