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Replacement	WATERPROOFING	
Job No. R.072239.001		2016-03-18

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 16.01 - Asphalt Paving
- .4 Section 32 12 13.16 - Asphalt Tack Coat

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing.
 - .2 CAN/CGSB-37.50-M89, Hot Applied, Rubberized Asphalt for Roofing and Waterproofing.
 - .3 CAN/CGSB-37.51-M90, Application for Hot-Applied Rubberized Asphalt, for Roofing and Waterproofing.

1.3 ACTION AND INFORMATION 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 over dried to constant mass at

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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 230 C +/- 20 C and the duration of the immersion shall be 4 hours.
 - .2 Second immersion: the water temperature shall be 230 C +/- 20 C and the duration of the immersion shall be 20 hours.
 - .3 Third immersion: the water temperature shall be 600 C +/- 20 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 Tack coat for Bridge Deck Surface: liquid asphalt primer to CGSB 37-GP-9Ma.
- .2 Hot applied rubberized asphalt waterproofing membrane: hot applied rubberized asphalt waterproofing membrane to CAN/CGSB 37-GP-50M.
- .3 Asphalt Waterproofing Membrane shall conform to the physical requirements listed below:

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Test	Specification (mm)
Cone Penetration at 250°C	110 (max.)
Cone Penetration at 500°C	160 (max.)
Flow at 600°C	3 (max.)

Submit test results 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: formed of asphalt and fillers between two sheet materials. Uniform board, free from perforations when applied. Thickness: 3.6 mm \pm 0.4 mm. 1000 mm x 1500 mm with square corners and straight edges free of burrs and breakaways. All sheets of same length and width within \pm 5.0 mm, thickness within \pm 0.25 mm. Maximum water adsorption: 5.0%, with no deterioration or loss of mass during 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 50°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 Abrasive blast clean concrete deck to expose sound, laitance-free concrete. Remove any curing compounds.
- .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 TACK COAT

- .1 Apply tack coat uniformly at a rate of 0.25 L/m² with approved equipment to clean and dry concrete. Do not permit equipment on tack coat until cured.

3.4 HEATING AND MIXING OF 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
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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 MEMBRANE AND MEMBRANE REINFORCEMENT_____

.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-1emulsion at a rate of 0.14 L/m² 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 5oC. The tack coat shall be placed just sufficiently ahead of paving to allow for adequate curing.

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- 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

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| <u>1.1 RELATED SECTIONS</u> | .1 Section 01 33 00 - Submittal Procedures |
| | .2 Section 03 30 00 - Cast-in-Place Concrete |
| <u>1.2 REFERENCES</u> | .1 NCHRP 244, Concrete Sealers for the Protection of Bridge Structures. |
| <u>1.3 SUBMITTALS</u> | .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 samples in accordance with Section 01 33 00 - Submittal Procedures. Samples shall demonstrate the colour and texture of the coating product. |
| | .4 Submit drawing indicating locations of coloured coating application. |
| <u>1.4 DELIVERY, STORAGE AND HANDLING</u> | .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. |
| <u>1.5 WASTE MANAGEMENT</u> | .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. |
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- .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 crosslinked 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 241P Parchment. Provide colour swatches to Departmental Representative for acceptance prior to placing order.
- .2 Sealing compound for top surface of curbs and uncoated faces of abutment and wingwalls below grade:
 - .1 100% Silane solution concrete sealer to NCHRP 24, Series II Reduction of Water Absorption. Ensure compatibility with water proofing membrane where applicable.

PART 3 - EXECUTION

3.1 APPLICATION

- .1 Apply concrete coating to the crash blocks (all four sides) and the exterior edge of the curbs along the full length of the bridge structure. The curb 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 both the narrow and wide curbs uncoated. The coating shall also be applied to the outside edges of the bridge deck and the soffit of the bridge deck from the exterior girder to the outside edges of the bridge deck for the full length of the bridge. The exposed surfaces of the wingwalls and abutments, projecting down 600mm (min) below finished grades, shall also be coated.
 - .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.
- .2 Apply concrete coating to golf cart bridge abutments and wingwalls, projecting down 600mm (minimum) below finished grades.
- .3 Apply sealing compound to top surface of curbs and to abutment and wingwall surfaces indicated. Clean overspray. Clean sealant from adjacent surfaces. After concrete has cured and surface of concrete is dry, apply one coat of silane concrete sealer uniformly to all surfaces indicated. First application shall be 165mL/m². Do not apply silane sealer to damp surfaces. allow coatings to thoroughly dry prior to applying subsequent coatings.
- .4 Do not leave uncoated any exposed concrete surface above grade for either the golf cart bridge or the highway bridge.

END OF SECTION

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PART 1 - GENERAL

<u>1.1 RELATED REQUIREMENTS</u>	.1	Section 03 30 00 - Cast-in-Place Concrete.
	.2	Section 32 11 23 - Aggregate Base Courses.
<u>1.2 REFERENCES</u>	.1	Canadian General Standards Board (CGSB)
	.1	CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
	.2	Underwriters Laboratories of Canada (ULC)
	.1	CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
	.3	Health Canada/Workplace Hazardous Materials Information System (WHMIS)
	.1	Material Safety Data Sheets (MSDS).
<u>1.3 ACTION AND INFORMATIONAL SUBMITTALS</u>	.1	Product Data:
	.1	Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
	.2	Manufacturer's Instructions:
	.1	Submit manufacturer's installation instructions.
<u>1.4 WASTE MANAGEMENT AND DISPOSAL</u>	.1	Separate waste materials for reuse and recycling 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.

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PART 2 - PRODUCTS

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| <u>2.1 INSULATION</u> | <ul style="list-style-type: none"> .1 Extruded polystyrene to (XPS) Expanded to CAN/ULC-S701. <ul style="list-style-type: none"> .1 Type: VI (ASTM C578). .2 Compressive strength: 275kPa. .3 Thickness: 25mm as indicated. .4 Size: to suit. .5 Edges: shiplapped. .2 Adhesive (for polystyrene): to CGSB 71-GP-24. <ul style="list-style-type: none"> .1 As recommended by insulation manufacturer. .2 VOC emission: zero. |
| <u>2.2 ADHESIVE</u> | |

PART 3 - EXECUTION

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| <u>3.1 MANUFACTURER'S INSTRUCTIONS</u> | <ul style="list-style-type: none"> .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets. |
| <u>3.2 WORKMANSHIP</u> | <ul style="list-style-type: none"> .1 Install insulation after substrate materials are dry. .2 Install insulation to maintain continuity of thermal protection to foundation. .3 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints. .4 Offset both vertical and horizontal joints in multiple layer applications. .5 Do not enclose insulation until it has been inspected and approved by Departmental Representative. |

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| <u>3.3 EXAMINATION</u> | <p>.1 Examine substrates and immediately inform Departmental Representative in writing of defects.</p> <p>.2 Prior to commencement of work ensure:</p> <p style="padding-left: 20px;">.1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.</p> |
| <u>3.4 FOUNDATION INSULATION</u> | <p>.1 Exterior application: extend boards vertically and horizontally along mudslab. Protect with layer of compacted granular base in accordance with Section 32 11 23 - Granular Base.</p> |
| <u>3.5 CLEANING</u> | <p>.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.</p> |

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED WORK

- .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 C719-14, Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
- .2 ASTM C793-05(2010), Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
- .3 ASTM C1193-13, Standard Guide for Use of Joint Sealants.
- .4 ASTM C1330-02(2013), Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- .5 ASTM D412-06a(2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
- .6 ASTM D2240-05(2010), Standard Test Method for Rubber Property - Durometer Hardness.
- .7 ASTM D5893/D5893M-10, 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.

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- .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. 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.

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1.6 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 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 silicone 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>
As Supplied		
Colour		
ASTM D2202	Slump of Sealants	Pass (< 7.6mm
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
As Cured - 21 days at 25°C and 50% RH		
ASTM D412	Ultimate Elongation	≥ 1200%
ASTM D412	Tensile Stress @ 150%	28 psi (45 psi
	max)	
Performance		
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 abutment back wall.
 - .2 Between approach slab and wingwalls.
 - .3 Between bridge deck curb and curb on approach slab.
 - .4 At bridge deck curb 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.

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- .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

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| <u>1.1 RELATED SECTIONS</u> | .1 | Section 01 33 00 - Submittal Procedures. |
| | .2 | Section 01 74 21 - Construction/Demolition Waste Management and Disposal. |
| | .3 | Section 05 12 33 - Structural Steel for Bridges. |
| <u>1.2 REFERENCES</u> | .1 | ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip. |
| | .2 | ASTM A240/A240M-15b, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications. |
| | .3 | ASTM B36/B36M-13, Standard Specification for Brass Plate, Sheet, Strip, And Rolled Bar. |
| | .4 | ASTM B121/B121M-11, Standard Specification for Leaded Brass Plate, Sheet, Strip, and Rolled Bar. |
| | .5 | ASTM D4894-15, Standard Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials. |
| | .6 | ASTM D4895-15, Standard Specification for Polytetrafluoroethylene (PTFE) Resin Produced From Dispersion. |
| | .7 | CAN/CSA-S6-14, Canadian Highway Bridge Design Code. |
| | .8 | CAN/CSA G40.21M-13, General requirements for rolled or welded structural quality steel/ Structural quality steel |
| | .9 | CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, Metals and Metal Products. |
| | .10 | CSA G189-1966, Sprayed Metal Coatings for Atmospheric Corrosion Protection. |
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- .11 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

1.3 SUBMITTALS

- .1 Submit in writing, a minimum of thirty (30) days in advance of installation, the same of the manufacturer supplying the bearings, including manufacturer's part number and the physical dimensions of bearings.
- .2 Submit shop drawings in accordance with Section 01 33 00 and including as a minimum the following:
 - .1 Total bearing dimensions.
 - .2 Part numbers for bearings.
 - .3 Maximum load capacity.
 - .4 Load capacity at serviceability limit states
 - .5 Rotational capacity of each bearing under maximum and minimum load.
 - .6 Compression stiffness.
 - .7 Maximum movement capacity.
 - .8 Installation details.
 - .9 Material properties of the bearing components and test procedures employed to determine the properties.
 - .10 All welds and necessary connections of bearing components.
- .3 Submit in advance of installation the manufacturer's certification that materials supplied meet the specified requirements of these specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 All materials shall conform to the requirements of CAN/CSA-S6.
 - .2 Bearings shall be of an approved type sufficient to provide as a minimum, the loading and movement capacities indicated in the Contract Documents.
 - .3 Steel is in accordance with CAN/CSA G40.21M, Grade 350W.
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- .4 Stainless steel is type 304 as per ASTM A240 and A167, bright annealed Grade 4 or mirror finished Grade 8.
- .5 Teflon (polytetra fluoroethylene, PTFE) 100% virgin, 15% glass filled reinforced or 25% carbon fiber filled reinforced in accordance with ASTM D4894 or D4895.
- .6 Sealing rings shall be made from brass that complies to ASTM B36/B36M half hard (for rings of rectangular cross sections) and ASTM B121, Composite 2 for rings of circular cross sections.
- .7 Bearing pressure, compressive deflections, rotation and shear deformations shall conform to the limits as specified in CAN/CSA-S6.

2.2 FABRICATIONS

- .1 The dimensions of the bearings shall be as indicated on the Drawings. All bearing sizes shall be confirmed by the Supplier and shall conform to the requirements of CAN/CSA-S6; design highway live load shall be CL625. Bearing details and dimensions are based on assumed dimensions. If dimensions of actual bearing assembly is different than those shown on the design drawings, upon approval by Departmental Representative the Contractor will be responsible to make adjustments as required to maintain finished road elevations and to ensure proper clearance can be maintained for the bearing assemblies.
- .2 All exposed steel surfaces of bearing assemblies shall be hot dip galvanized in accordance with CAN/CSA G164 with minimum zinc coating of 763 g/m² or metalized in accordance with CSA G189.
- .3 Each bearing shall be marked with the date of manufacture and an individual alphanumeric identification.
- .4 The pot shall be deep enough for the seal and piston rim to remain in full contact with the vertical face of the pot wall.
- .5 Provision for rotation about any horizontal axis shall be by deformation of the elastomer. The rotation of the elastomer about a horizontal axis

shall be limited so that the vertical strain induced at the perimeter of the elastomer at SLS shall not exceed 15% of the elastomer thickness. A pot bearing shall be loaded with at least 25% of the SLS load capacity in order to provide satisfactory rotational operation.

- .6 The induced eccentricity, e , as a result of shifting of the axial load from the centre of the bearing under the maximum rotation at SLS shall not exceed 4% of the diameter of the elastomer.
- .7 The average pressure on the elastomer at SLS shall not exceed 40 MPa. All surfaces of the elastomer shall be treated with a lubricant that is not detrimental to the elastomer.
- .8 Sealing rings:
 - .1 General: a seal shall be used between the pot and the piston. At SLS, the seal shall be designed to prevent escape of elastomer under compressive load and simultaneously applied cyclic rotations. At ULS, it shall also be sufficient to prevent escape of elastomer under the compressive load and simultaneously applied static rotation. These requirements shall be deemed satisfied if the sealing rings meet the requirements below:
 - .1 Rings with rectangular cross-section:
 - .1 When the cross section of the rings is rectangular, three rings shall be used. Each ring shall be circular in plan and shall be cut at one point around its circumference. The faces of the cut shall be bevelled at 45° to the vertical. The rings shall be oriented so that the three cuts are equally spaced around the circumference of the pot.
 - .2 The width of each ring shall be equal to or greater than the larger of 0.02 internal diameter of the pot and 6mm, but shall not exceed 20mm. The depth of each ring shall be equal to or greater than the larger of 0.2 times the width and 1mm.
 - .2 Rings with circular cross-section:
 - .1 When the cross section of the rings is circular, one circular closed ring with an outside diameter equal to the internal diameter of the pot shall be used. It shall have a cross-sectional diameter equal to or

greater than the larger of 0.0175 the
internal diameter of the pot and 4mm.

.9 Pot:

.1 The pot shall consist of a wall and a base. All of the components of the pot shall be designed to act structurally as a single unit.

.2 The thickness of the base shall be equal to or greater than the larger of 0.06 the internal diameter of the pot and 20mm when bearing directly on concrete or grout, and equal to or greater than the larger of 0.04 the internal diameter of the pot and 15mm when bearing directly on steel girders or load distribution plates.

.3 At ULS, the pot wall shall be thick enough to resist all induced forces. In lieu of rigorous analysis, this requirement may be satisfied for unguided sliding pot bearings by using a wall thickness specified in CAN/CSA-S6.

.10 Piston:

.1 The piston shall have the same plan shape as the inside of the pot. The piston shall be thick enough to resist the loads imposed on it, but not less than 0.06 the internal diameter of the pot.

.2 The perimeter of the piston shall have a rim through which horizontal loads can be transmitted. The diameter of the piston rim shall be smaller than the internal diameter of the pot by 0.5 to 1.25mm. The piston perimeter above the rim shall be set back or tapered to prevent binding. The height of the piston rim shall be large enough to transmit the horizontal forces between the pot and the piston as specified in CAN/CSA-S6.

2.3 TOLERANCES

- .1 Bearing tolerances shall be as indicate in the following table:

Beating Tolerances		
Bearing Thickness	$\leq -40\text{mm}$	-0mm to +3mm
Bearing Thickness	$>40\text{mm}$	-0mm to +6mm
Bearing plan dimension		-0mm to +6mm

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install bearings accurately with respect to the location and elevation, on level and smooth beating surfaces where indicated on the Drawings.
- .2 Adjust bearing plinth elevations when bearing thickness varies from the reference bearing thickness shown on the Drawings.
- .3 Tolerance for top of bearing elevations shall be as indicated in the table below:

Tolerance for Top of Bearing

<u>Structure Type</u>	<u>Top of Bearing Elevation</u>
Concrete Structures	+2.5mm
Steel Structures	+3.0mm
Box Girders	+2.0mm
Deviation from Level	±0.1°

END OF SECTION
