

REQUIREMENTS FOR WATERPROOFING OF PRECAST CONCRETE CULVERTS

1.0 SCOPE

This Special Provision covers the requirements for waterproofing of:

- a) Joints between precast concrete culvert elements and top corners of the precast concrete culverts, using self-adhering waterproofing (SAW) membrane; and
- b) Waterproofing of the top portion of precast concrete culvert, or protection or distribution slab, using hot-applied rubberized asphalt (HRA) waterproofing membrane.

2.0 REFERENCES

This Special Provision refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

- OPSS 914 Waterproofing Bridge Decks and Culverts with Hot-Applied Rubberized Asphalt Waterproofing Membrane
- OPSS 929 Abrasive Blast Cleaning - Concrete Construction

Ontario Provincial Standard Specifications, Material

- OPSS 1215 Protection Board

Ontario Ministry of Transportation Publications:

MTO Forms:

- PH-CC-340 Field Sample Data Sheet - Concrete
- PH-CC-701 Request to Proceed
- PH-CC-702 Notice to Proceed

3.0 DEFINITIONS

For the purpose of this Special Provision, the following definitions apply:

Culvert means a precast concrete structure that is typically embedded in fill, and is used to convey water, pedestrians, vehicles, cyclists, or animals.

Deck means as defined in OPSS 914.

Distribution Slab means a reinforced concrete slab on top of the culvert that may be specified when the earth cover is less than 600 mm to improve load distribution on a culvert.

Hot-Applied Rubberized Asphalt (HRA) Waterproofing Membrane means as defined in OPSS 914.

Protection Board means as defined in OPSS 914.

Protection Slab means a concrete slab that may be placed on the top of the culvert in an area exposed to chlorides.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

4.01 Submission Requirements

4.01.01 SAW Membrane

Three copies of the following shall be submitted to the Contract Administrator 7 Days prior to commencement of waterproofing of the joints and top corners of the culvert:

- a) Product name;
- b) Data sheet of the SAW membrane;
- c) Data sheet of the SAW membrane primer;
- d) Data sheet of the termination sealant;
- e) Application instructions; and
- f) Any other applicable details.

5.0 MATERIALS

5.01 HRA Waterproofing Membrane

Materials for HRA waterproofing membrane shall be according to the Materials section of OPSS 914.

5.02 Protection Board

Protection board shall be according to OPSS 1215.

5.03 SAW Membrane

SAW membrane shall be a product specified in Table 1. The minimum width of the SAW membrane roll shall be 900 mm.

5.04 SAW Membrane Primer

SAW membrane primer used with the SAW membrane shall be as recommended by the SAW membrane manufacturer.

6.0 EQUIPMENT

Equipment shall be according to the Equipment section of OPSS 914.

7.0 CONSTRUCTION

7.01 General

Waterproofing shall be completed after the culvert has been installed according to the Contract Documents.

Culvert waterproofing shall consist of:

- a) Surface preparation;

- b) Application of SAW membrane primer;
- c) Application of SAW membrane;
- d) Application of termination sealant;
- e) Application of primer for HRA waterproofing membrane;
- f) Application of first layer of HRA waterproofing membrane;
- g) Application of membrane reinforcement immediately after the application of the first layer of HRA waterproofing membrane;
- h) Application of the second layer of HRA waterproofing membrane;
- i) Application of protection board immediately after placement of the second layer of HRA waterproofing membrane.

Prior to the application of waterproofing:

- a) Concrete curing shall be completed according to the Contract Documents.
- b) Concrete shall be air cured for at least 72 hours.
- c) The concrete surface shall be clean and smooth with any sharp projections or fins removed.
- d) The surface of the concrete shall be abrasive blast cleaned according to OPSS 929 to expose sound, laitance-free concrete.
- e) Surface preparation shall be completed, according to OPSS 914.

7.02 Storage of Waterproofing Materials

The SAW membrane, the SAW membrane primer, and the termination sealant shall be properly stored and maintained at the waterproofing manufacturer's recommended temperatures and conditions.

7.03 SAW Membrane

7.03.01 Extent of Coverage

The following areas of the culvert shall be waterproofed using SAW membrane:

- a) Joints on the top surface of the culvert and 50% of the vertical portion of the joints, from the top of the culvert to the culvert mid-height.
- b) The two top corners of the culvert, with half the width of the roll on the horizontal top surface of the culvert and half the width of the roll on the adjacent vertical surface of the culvert.
- c) When the Contract Documents specify the placement of a protection or distribution slab on the top surface of the culvert, the SAW membrane placement on the joints shall be limited to the 50% vertical portion plus a minimum 200 mm length placed on each side of the top surface of the culvert joint, measured from the culvert top edges.

The SAW membrane shall go over the top of steel connector plates, where present, and shall be extended to cover the entire connector plate.

SAW membrane shall not be applied to portions of the culvert that will not be covered with earth or granular material, as specified in the Contract Documents.

Protection board shall be applied to cover the SAW membrane applied to the vertical surfaces of the culvert.

7.03.02 Application of SAW Membrane

7.03.02.01 General

The SAW membrane shall be installed according to the SAW membrane manufacturer's recommendations, and the requirements specified in this Special Provision.

7.03.02.02 Application of SAW Membrane Primer

Immediately prior to the application of the SAW membrane primer, the concrete surface shall be cleaned with an air compressor to remove all dust and other foreign material.

The minimum air and concrete surface temperature shall be 5 °C at the time of the SAW membrane primer application.

The concrete surface shall be dry at the time of application of the SAW membrane primer.

The SAW membrane primer shall be evenly applied with a roller or brush at a rate of 6.2 to 7.4 m²/L, or at a higher rate if recommended by the SAW manufacturer.

The SAW membrane primer shall be prevented from entering the culvert joint.

If the SAW membrane primer is left exposed for more than 12 hours, the SAW membrane primer shall be evenly reapplied prior to application of the SAW membrane.

7.03.02.03 Application of SAW Membrane

The minimum air and concrete surface temperature shall be 5 °C at the time of the SAW membrane application.

Release paper shall be removed prior to placement of the SAW membrane.

The SAW membrane shall be installed with a minimum overlap between sheets of 65 mm for both horizontal and vertical applications and shall be firmly bonded to the concrete surface.

All terminations of the SAW membrane shall be sealed against moisture ingress with the termination sealant listed in Table 1, with a minimum thickness of 3 mm and minimum width of 25 mm.

Protection board applied to the SAW membrane on the vertical surfaces of the culvert shall be secured to the SAW membrane using the termination sealant listed in Table 1.

7.03.03 Inspection of the Installed SAW Membrane

An inspection of the SAW membrane installation shall be undertaken in the presence of the Contract Administrator. Any required repairs shall be carried out, to the satisfaction of the Contract Administrator, prior to proceeding with waterproofing of the top surface of the culvert.

Defects or deficiencies affecting the performance of the SAW membrane including but not limited to tears or voids in the SAW membrane or inadequate overlaps, shall be repaired by removal of the SAW membrane in the affected area and reapplication with new SAW membrane to meet the requirements of this Special Provision.

After waterproofing of all elements of a culvert within a construction stage with the SAW membrane, and prior to application of the HRA waterproofing membrane, a MTO form PH-CC-701, Request to Proceed shall be submitted to the Contract Administrator. The next operation shall not proceed until a MTO form PH-CC-702, Notice to Proceed has been received from the Contract Administrator.

7.03.04 Materials Sampling

The following samples shall be taken in the presence of the Contract Administrator:

- a) SAW membrane (1 m in length).
- b) Protection board (700 mm x 500 mm).
- c) SAW membrane primer (approximately 500 ml).

The samples shall be placed in a bag along with a MTO form PH-CC-340, Field Sample Data Sheet - Concrete and submitted to the Contract Administrator.

7.04 Application of HRA Waterproofing Membrane to the Culvert

7.04.01 Extent of Coverage

The following areas of the culvert shall be waterproofed using HRA waterproofing membrane:

- a) Top portion of culverts, for culverts without distribution or protection slabs.
- b) Top portion of the distribution slab or protection slab for culverts with distribution or protection slabs.

7.04.02 Application of HRA Waterproofing Membrane

HRA waterproofing membrane application shall be applied after application of the SAW membrane has been completed.

HRA waterproofing membrane shall be applied according to the Design and Submission Requirements, Materials, Equipment, and Construction sections of OPSS 914, with the following amendments and additions:

- a) HRA waterproofing membrane shall be applied to the culvert within 48 hours of completion of application of the SAW membrane.
- b) HRA waterproofing membrane primer shall not be applied on the SAW membrane.
- c) The requirement to extend the HRA waterproofing membrane 300 mm down the vertical faces does not apply.

7.05 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

8.0 QUALITY ASSURANCE

8.01 Acceptance of SAW Membrane

The Contract Administrator shall carry out an inspection of the SAW membrane installation prior to application of the HRA waterproofing membrane and shall reject all or a portion of the work based on the presence of one or more of the following defects or deficiencies:

- a) SAW membrane not meeting the requirements of this Special Provision.
- b) The presence of tears, voids, or other defects in the SAW membrane.
- c) Repairs that do not meet the requirements of this Special Provision.

8.02 Acceptance of HRA Waterproofing Membrane

Acceptance of HRA waterproofing shall be according to the Quality Assurance section of OPSS 914.

9.0 MEASUREMENT FOR PAYMENT

9.01 Actual Measurement

9.01.01 Precast Concrete Culvert Waterproofing

Measurement of precast concrete culvert waterproofing shall be by area in square metres of the top surface, with no measurement of any vertical surfaces or overlap between self-adhering and HRA waterproofing.

9.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clause under Actual Measurement.

10.0 BASIS OF PAYMENT

10.01 Precast Concrete Culvert Waterproofing - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

**TABLE 1
SAW Materials**

Manufacturer	SAW Membrane	SAW Membrane Primer	Termination Sealant
WR Meadows	MEL-ROL	Mel-prime	Pointing mastic
Henry	Blueskin WP200	Blueskin Primer	570-05 Polybitume
Grace Construction Products	Bituthene System 4000	Bituthene System 4000 Surface Conditioner	Bituthene Liquid Membrane
Notes: 1. The SAW membrane, the SAW membrane primer, and the termination sealant shall be from the same manufacturer.			

WARRANT: Always with this tender item on all contracts with precast concrete culverts with spans greater than 3.0 m.