

Geomembranes over Buried Bridges & Culverts

Purpose

The purpose of installing an impermeable membrane over buried bridges and culverts is to intercept any in-flows:

- 1) containing deicing chemicals, and directing the in-flow to a drainage system.
- 2) which may cause icicles or undesirable conditions for traffic passing through the structure.

Situation

When surface water contact with the structure is undesirable, placement of a drainage system below the roadway is considered a best mitigation measure. It consists of an impervious barrier that directs flow to a collection system.

Deicing chemicals are frequently used on paved roadways during winter times. Appropriate measures should be considered to minimize the infiltration of the deicing chemicals into the structural backfill zone, and to provide means to drain the in-flow away from the structure.

Additionally, traffic will prefer to pass through structures without icicles hanging from them.

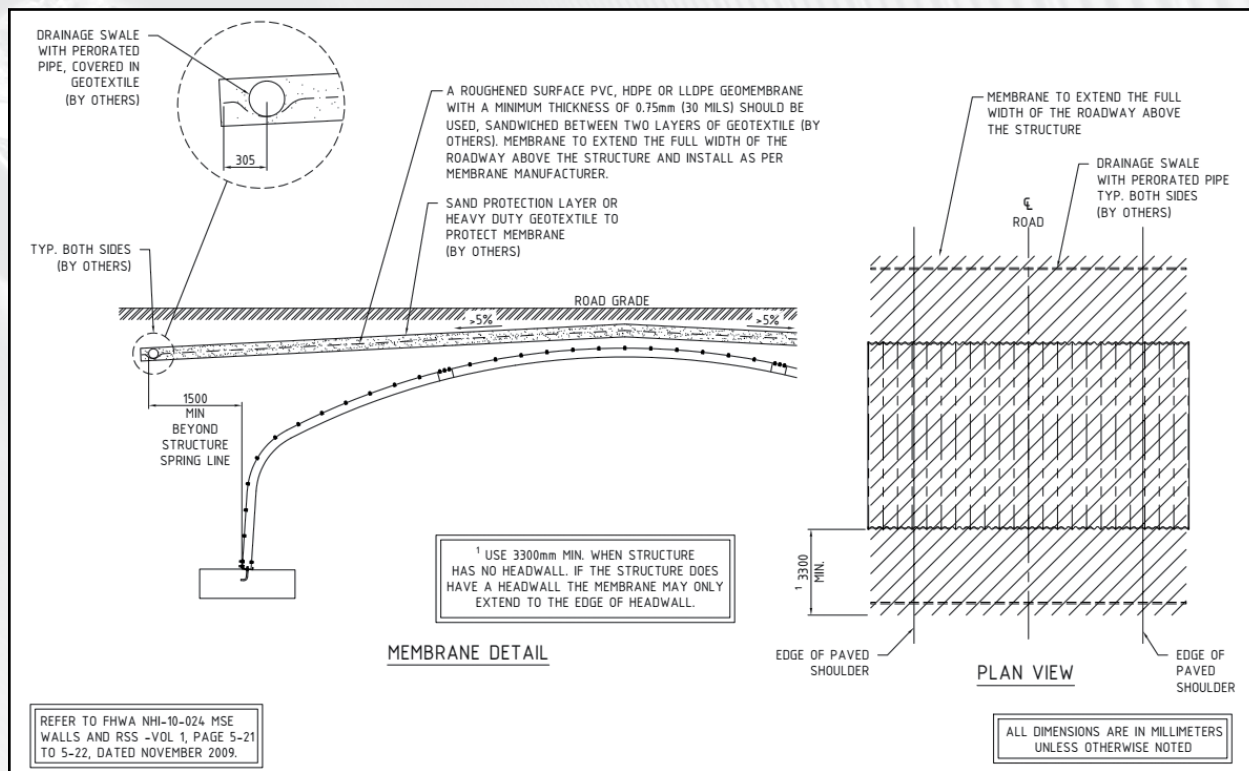
Geomembrane Material and Installation

A roughened surface PVC, HDPE or LLDPE geomembrane with a minimum thickness of 0.75 mm (30 mils) should be used. Non-woven geotextiles are preferred as they contain a higher puncture resistance and better frictional characteristics as compared to woven geotextiles.

Geomembrane should be installed below the paved roadway. Handling and installation of geomembranes should follow the geomembrane manufacturer's requirements.

The membrane shall be sandwiched between two layers of geotextile to reduce the risk of punctures from granular material. Membrane system should span over the footprint of the structure plus 1500 mm on either side, and sloped a minimum 5% towards drains. The membrane should be tied to a drainage system to collect and discharge the in-flow to an external drainage system. Additional detailed information can be found in FHWA-NHI-10-024.

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Resilience and Sustainability

This guide is a solution for in place structures (existing infrastructure), where salts are used on the roads. Typically, on average asphalt roads lifespan is 18 years. During rehabilitation, owners may want to consider installing a membrane under the road surface to protect the assets below. For information on this practice, please see the Geomembrane Guideline on the CSPI website in the resources section under the Technical Bulletins tab.

References

NCSPA Tech Note 210 – Best Management Practices for Installing and Maintaining CSP Detention Systems, National Corrugated Steel Pipe Association, January 2020

Performance-Based Specification for Design and Construction of Structural Culverts, Ministry of Transport of Ontario, March 2015

Practical Design Considerations That Can Extend the Service Life of Metal Buried Bridge and Culvert Structures, Contech, Darrell Sanders

Canadian Highway Bridge Design Code, CSA S6, 2019

Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, Ryan R. Berg, Barry R. Christopher, and Naresh C. Samtani, Ph.D., P.E (2009). – Volume I. FHWA-NHI-10-024.