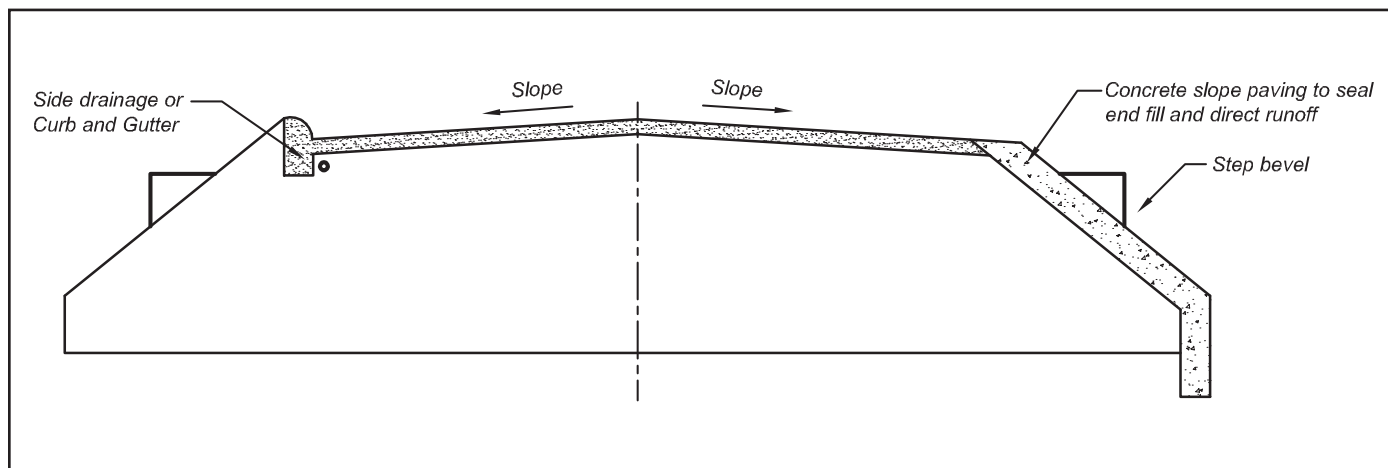


## PROTECTION FROM DE-ICING SALTS AND CHEMICAL EXPOSURE



**Figure 1 – Example profiles to intercept de-icing salts**

A buried structural plate span is protected by the soil cover and typically provides excellent durability. However, road de-icing salts, brackish tidal water, industrial and agricultural runoff and other chemical exposure can be a concern. The AISI Handbook of Steel Drainage & Highway Construction Products and the CONTECH Structural Plate Design Guide provide details on the durability features of structural plate and guidance on overall durability topics. This Technical Bulletin provides some additional considerations.

Road salt and other chemicals can be carried through the soil over time in rain-water runoff. When the chemical laden rain-water reaches the structural plate, recesses, then and evaporates, deposits of sodium chloride, sulfate, calcium carbonate ( $\text{CaCO}_3$ ), aluminate compounds and others can form. In many cases the deposits are unsightly formations and are not corrosive. In cases of high chloride or sulfate salt concentrations, corrosion can occur. Relatively simple design and construction details can minimize the amount of chemical exposure including:

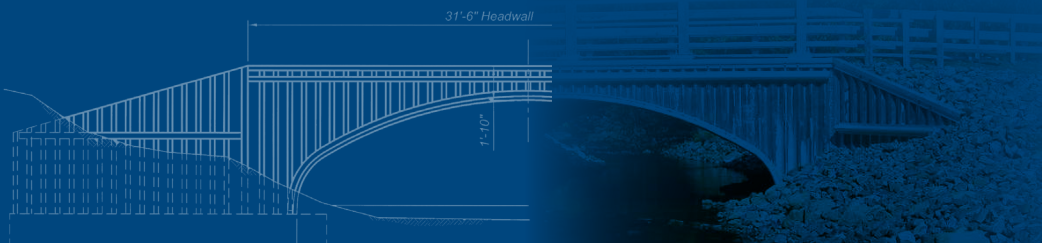
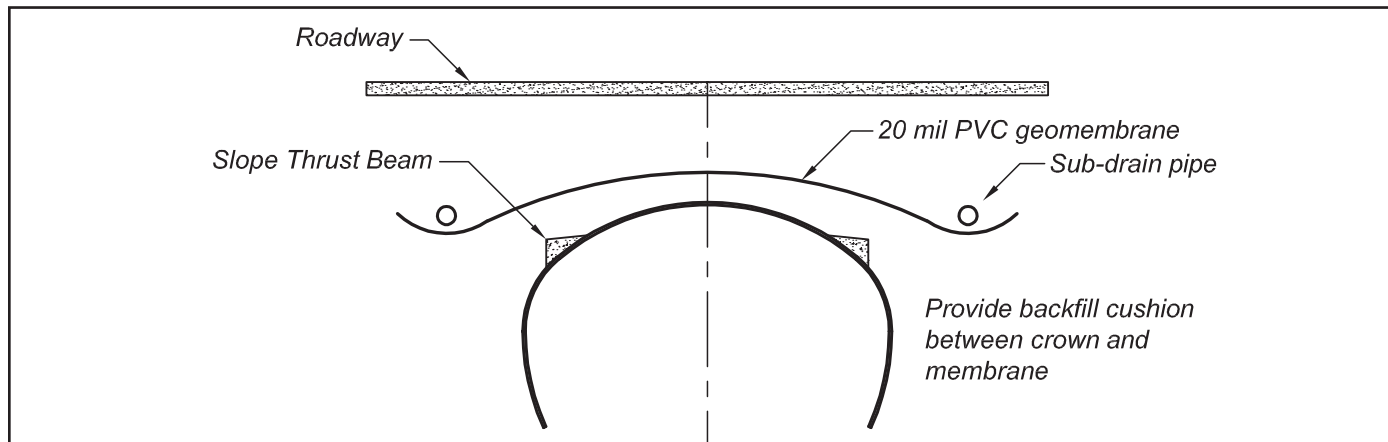
1. On long-span structures, pour the tops of thrust beams with a slight slope so that water drains away from the structure.
2. Drain the roadway surface into side storm sewers (corrugated metal pipe or slotted drain) away from the structure or direct drainage over slope pavement.

**See Figure 1**

3. Place compacted clay caps over the granular backfill in unpaved or grassy areas to make this impervious to contaminated runoff.
4. Field-apply spray-on asphalt or bitumen coating to the outer surfaces of the plate.
5. Place a polymer membrane over the structure and slope it back beyond the structure to drain water away from the structure. The membrane should be placed over a "cushion" of granular backfill above the crown so that the bolt heads do not damage the membrane. 20 mil thick PVC geo-membranes used for pond and landfill liners are effective. Granular materials in the structural backfill zone into which the contaminated water will drain should be competent for this exposure.

**See Figure 2**

6. In re-line applications, the soil side of aluminum structural plate is commonly painted with zinc primer when exposed to high pH (caustic) environments. This occurs during back-grouting of reline structures with cement based materials.

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**Figure 2 – Geomembrane detail**

The build up of crystallized chemical deposits like calcium carbonate ( $\text{CaCO}_3$ ) can form because of water hardness naturally present at the site or from sources listed above. These deposits resemble stalactites or a dull gray patina covering the surface. Superficial iron oxide (rust) deposits form around bolt holes and seams exposed to constant wet/dry cycles. In many cases, the iron oxide product resembles “puffy” rust which volumetrically is mostly air and the underlying metal is still relatively thick. Passive oxidation occurs almost immediately and is a natural protective layer for metals, especially aluminum and weathering steel. While only a cosmetic concern, passive oxidation layers should not be removed.