

It is preferable to slope median areas and inside shoulders to a centre swale, to prevent drainage from the median area running across the pavement. This is particularly important for high-speed facilities and for facilities with more than two lanes of traffic in each direction. In some cases, detention can be included in shallow medians to reduce the size of runoff facilities, but this must be carefully engineered to handle higher intensity rainfall.

### **A3.2.5 Bridge Decks**

Drainage of bridge decks is similar to other kerbed roadway sections. It is often less efficient, because cross slopes are flatter, parapets collect large amounts of debris, and small drainage inlets or scuppers have a higher potential for becoming clogged by debris. Bridge deck constructability usually requires a constant cross slope, so the guidelines in Section A3.2.2 do not apply. Because of the difficulties in providing and maintaining adequate deck drainage systems, gutter flow from roadways should be intercepted before it reaches a bridge. In many cases, deck drainage must be carried several spans to the bridge end for disposal.

Zero gradients and sag vertical curves should be avoided on bridges. The minimum desirable longitudinal slope for bridge deck drainage should be 0.2 percent. When bridges are placed on a vertical curve and the longitudinal slope is less than 0.2 percent, the gutter spread should be checked to ensure a safe, reasonable design.

Piped and grated scupper type inlets are the recommended method of deck drainage because they can reduce the problems of transporting a relatively large concentration of runoff in an area of generally limited right-of-way. They also have a low initial cost and are relatively easy to maintain. However, the use of scuppers should be evaluated for site-specific concerns, and scuppers should always be piped in down drains to stable and erosion protected runoff points. Runoff collected and transported to the end of the bridge should generally be collected by inlets and down drains, although paved flumes may be used for extremely minor flows in some areas.

### **A3.2.6 Shoulder Gutters**

Shoulder gutters are used to protect fill slopes from erosion caused by water from the roadway pavement. Shoulder gutters are required on all fill slopes higher than 3 metres in areas where permanent vegetation cannot be established. An inspection of the existing/proposed site conditions and contact with the Agriculture Section shall be made by the Consultant to determine the likelihood that vegetation will survive.

Shoulder gutters are also required at bridge ends where concentrated flow from the bridge deck would otherwise run down the slope or over a retaining wall/abutment. This section of gutter should be long enough to include the transitions necessary. Shoulder gutters are not required on the high side of super-elevated sections or adjacent to barrier walls on high fills.

Shoulder gutter ditch bottom type inlet spacing shall be based on consideration of future additional median lanes. Bypass should not exceed 25 percent for intermediate inlets.

The terminal inlet must be assured of intercepting 100 percent of the flow coming to it, including bypass from intermediate inlets. The maximum flow allowed at the terminal inlet should be 0.043 cubic metres per second for grades steeper than 1.4 percent. For grades flatter than 1.4 percent, the flow shall not exceed 80% of the maximum 100% intercept width of the gutter inlet. In any case, the distance from the last intermediate inlet to the terminal inlet should not exceed 70 metres.