A3. Road Drainage-Gutter & Inlet Design

Note: This appendix was reproduced from the Roadway Design Manual – Drainage, Section 400: Roadway Drainage (Gutter, Inlet, and Pavement Hydraulics)

A3.1 Introduction

Variables of major concern for pavement drainage evaluations include depth of gutter flow and pavement spread. These variables and roadway features such as cross slope, longitudinal slope, and gutter sections can affect the size, type, and spacing of inlets. This section provides fundamentals of gutter flow, inlet interception capacity, and bridge deck drainage, and an evaluation of the potential for hydroplaning.

The level of service of facilities that provide drainage of roadway surfaces should be consistent with the level of service being provided by the roadway. Guidelines are given for evaluating roadway features as they relate to pavement drainage, and for selecting an appropriate design frequency. The potential for hydroplaning, which can occur at design speeds greater than 75 km per hour when there is water on the pavement, is discussed. Procedures for performing gutter flow calculations are based on a modification of Manning's Equation. Inlet capacity calculations for kerb opening inlets, grated gutter inlets, combination inlets, slotted pipe and trench drain inlets, and bridge deck drainage features are discussed.

A3.2 Roadway Features

Roadway features considered during gutter, inlet, and pavement drainage calculations include:

- Longitudinal slope
- Cross slope
- kerb and gutter sections
- Ditches
- Bridge decks
- Shoulder gutters

A3.2.1 Longitudinal Slope

A minimum longitudinal gradient is important for a kerbed pavement, since it is susceptible to stormwater spread. Flat gradients on unkerbed pavements can lead to a spread problem if vegetation is allowed to build up along the pavement edge.

Desirable gutter grades should not be less than 0.3 percent for kerbed pavements, and not less than 0.2 percent in very flat terrain. Minimum grades can be maintained in very flat terrain by use of a saw-tooth or rolling profile. To provide adequate drainage in sag vertical curves, a minimum slope of 0.3 percent should be maintained within 50 feet of the level point in the curve. This is accomplished where the length of the curve (L) divided by the algebraic difference in grades (A) is equal to or less than 167 (L/A < 167). Special gutter profiles should be developed to maintain a minimum slope of 0.2 percent up to the inlet. Although ponding is not usually a problem at crest vertical curves, on extremely flat curves a similar minimum gradient should be provided to facilitate drainage.