A3.2.2 Cross Slope

The AASHTO policy on geometric design (Green Book, 1984) is standard practice and should be consulted for more details than those presented in this section.

The design of pavement cross slope is often a compromise between the need for reasonably steep cross slopes for drainage and relatively flat cross slopes for driver comfort. The USDOT, FHWA (FHWA-RD-79-30, 31, 1979) reports that cross slopes of 2 percent have little effect on driver effort in steering, especially with power steering, or on friction demand for vehicle stability. Use of a cross slope steeper than 2 percent on pavements with a central crown line is not desirable. In areas of longitudinal flat slopes and slower traffic speeds (less than 75 kph), a somewhat steeper cross slope may be necessary to facilitate drainage. In such areas, the cross slope may be increased to 2.5 percent. When three or more lanes are inclined in the same direction on multi-lane pavements, it is desirable that each successive pair of lanes, or the portion thereof outward from the first two lanes from the crown line, have an increased slope. The two lanes adjacent to the crown line should be pitched at the normal slope, and successive outward lane pairs, or portions thereof, should be increased by about 0.5 percent. Where three or more lanes are provided in each direction, the maximum outside lane pavement cross slope should be limited to 3 percent.

It is desirable to provide a break in cross slope at two lanes, with three lanes the upper limit. Although not widely encouraged, inside lanes can be sloped toward the median. This should not be used unless four continuous lanes or some physical constraint on the roadway elevations occurs, since inside lanes are used for high speed traffic and the allowable water depth is lower. Median areas should not be drained across travelled lanes. A careful check should be made of designs to minimize the number and length of flat pavement sections in cross slope transition areas, and consideration should be given to increasing cross slopes in sag vertical curves, crest vertical curves, and in sections of flat longitudinal grades. Where kerbs are used, depressed gutter sections can be effective at increasing gutter capacity and reducing spread on the pavement.

Shoulders should generally be sloped to drain away from the pavement, except with raised, narrow medians.

A3.2.3 Kerb and Gutter

Kerbing at the outside edge of pavements is normal practice for low-speed, urban roadway facilities. Where formed gutters are used, they are generally 0.5 to 1 metres wide. Formed gutters (either asphalt or portland cement concrete) are on the same cross slope as the pavement on the high side and depressed with a steeper cross slope on the low side, usually at 8%. Typical practice is to place kerbs at the outside edge of the travelway, the shoulders, or the parking lanes on low speed facilities. The gutter width is included as a part of the pavement width.

A3.2.4 Roadside and Median Ditches

Roadside ditches are commonly used with unkerbed roadway sections to convey runoff from the highway pavement and from areas which drain toward the highway. Due to access and right-of-way limitations, roadside ditches cannot be used on most urban areas. They can be used in cut sections, depressed sections, and other locations where sufficient right-of-way is available and driveways or intersections are infrequent.

Kerbed highway sections are relatively inefficient at conveying water, and the area tributary to the gutter section should be kept to a minimum to reduce the hazard of water on the pavement. Where practicable, the flow from major areas draining toward kerbed highway pavements should be intercepted by ditches or other pipe/inlet systems, as appropriate.