Shoulder Cross Slope

Design Manual
Chapter 3
Cross Sections
Originally Issued: 05-02-97
Revised: 08-05-13

This section describes the appropriate shoulder cross slopes to use for various roadway sections.

Normal Shoulder Cross Slope

All shoulders should slope away from the roadway, except in a limited number of situations. The shoulder cross slope should be sufficient to rapidly drain water or snow melt away from the pavement surface, but not cause adverse effects to vehicle operation.

The type of shoulder has bearing on the cross slope. Refer to Section 1C-1 for the acceptable ranges of and preferred values for shoulder cross slopes.

Shoulders with Curbs

Shoulders with curbs are treated the same as those without.

Shoulders on the Interstate

The cross slope of the shoulder should not be less than the cross slope of the adjacent lane. The exception is shoulders in superelevated roadways, as is discussed later in this section.

Some interstates are designed with the intent that the shoulder will provide for future capacity improvement and/or act as traffic lanes to maintain traffic during construction. In these situations, design the shoulder cross slopes and transitions to meet traffic lane requirements.

Shoulders Designed to Accommodate Bicycles

In areas where a portion of the shoulder is paved to accommodate bicycles, the District, in conjunction with the designer, must determine the shared use path category with which the segment of roadway will comply. The cross slope must meet the requirements of the selected category defined in Section 12B-02.

The cross slope of shoulders in superelevated curves should be treated as addressed below. Designers must be aware that this may yield cross slopes which do not comply with Section 12B-02. If this occurs, the design should be amended to comply or the exceptions documented.

Shoulder Slope Transitions

In some locations, for example bridge approaches and exit gores, the shoulder cross slope will need to transition from the normal cross slope. These transitions should be detailed within the plan. The maximum rate of change should be 1% in 12.5 ft. If the shoulder is anticipated to serve as a traffic lane in the future, the transition rate should be obtained from Section 2A-3. For example, a 24 foot roadway with a design speed of 65 mph has an x value of 84 feet (Table 5 in Section 2A-3). This results in a rate of change of 1% in 42 ft.

Bridge Approaches

Bridges and the double reinforced section of the bridge approach section are typically built without a crown break at the shoulder line. The designer should transition the cross slope of the shoulders to match the bridge cross slope in the area outside of the full-width bridge approach section.

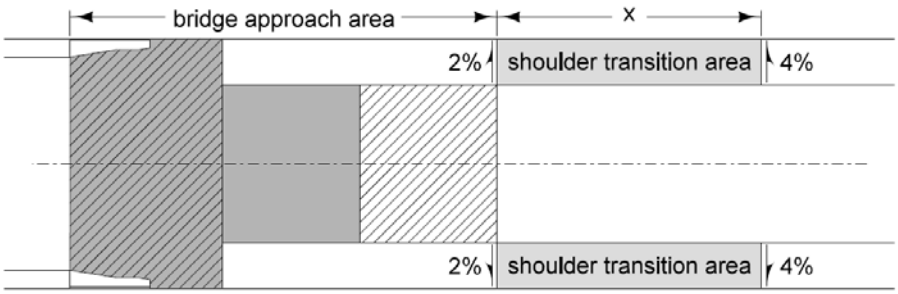

Figure 1: Shoulder transition at bridges.

Exit Gores

Shoulders with a normal cross slope of 4% will need to be transitioned to 3% in areas adjacent to ramp tapers. The areas abutting the shoulders, such as the gore nose, are sloped at 3%; therefore, the shoulder should transition from 3% to 4%.

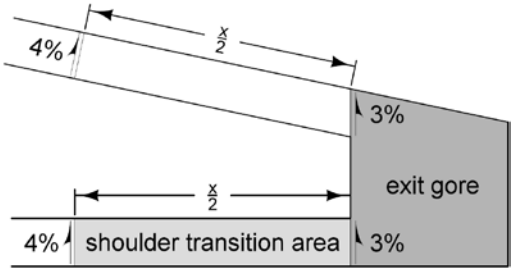

Figure 2: Shoulder transition at exit gores.

Shoulders on Superelevated Roadways

The cross slope break between the shoulder and pavement surface should be limited to an algebraic difference of 8%.

Low Side Shoulders

Shoulders on the low side of super elevated roadways should slope away from the roadway. The normal cross slope of the shoulder should be maintained until the cross slope of the roadway exceeds the normal shoulder cross slope. The transition of the shoulder cross slope should equal the transition rate of the roadway.

For example, if the mainline pavement is super elevated at 5%, the low side shoulder would slope away at 5%. The shoulder cross slope transition would begin where the mainline pavement cross slope equals the normal cross slope of the shoulder and transition at an equivalent super elevation transition rate.

High Side Shoulders

Shoulders on the high side of super elevated curves should slope away from the roadway. The normal cross slope of the shoulder should be maintained until the algebraic difference between the cross slope of the shoulder and the cross slope of the roadway reaches 8%. Once the algebraic difference in cross slope reaches 8%, the shoulder cross slope should transition up at an equivalent transition rate as the adjacent roadway to maintain the 8% algebraic difference.

For example, if the mainline pavement is superelevated at 6%, the high side shoulder should slope away at 2%.

PV-300 Series Standard Road Plans

Refer to the PV-300 series for details of shoulder transition in super elevated roadways.

Chronology of Changes to Design Manual Section:

003C-003 Shoulder Cross Slope

8/5/2013 Revised

Rewrote to discuss general shoulder cross slope design rather than just at superelevated curves. Added material to explain cross slope to accommodate bicycles. Added material to explain slope transition in areas such as gores and bridge approaches.

5/2/1997

New material