

CHAPTER THIRTY-FOUR CROSS SECTION ELEMENTS

This chapter provides guidance to consider in the design of cross section elements including lane and shoulder widths, cross slopes, width and type of medians, side slopes, right-of-way, and utilities. Part V, Design of Highway Types, provides criteria for various cross section elements on new construction, reconstruction, and 3R projects. Where a cross section element applies to a specific highway type, Part V presents this information. For example:

- Cross sectional widths for bridges and underpasses are discussed in Chapter 39.
- Median widths and median openings for freeways and expressways are discussed in Chapters 44 and 45, respectively.
- Typical cross section figures for the various functional classifications are presented in Chapters 44 through 48.
- For definitions on area classifications, see Chapter 43.
- Chapter 48 discusses sidewalk and on-street parking design criteria.
- Cross section criteria for 3R projects are discussed in Chapters 49 and 50.
- For surface type and structural design of pavements, see Chapter 54.

34-1 GENERAL

34-1.01 Definitions

The following definitions apply to the highway cross section:

1. **Auxiliary Lane.** The portion of the roadway adjoining the traveled way for purposes supplementary to through traffic movement including parking, speed change, turning, storage for turning, weaving, or truck climbing.
2. **Back Slope.** The side slope created by connecting the ditch bottom, shelf, or shoulder at the hinge point, upward and outward, to the natural ground line.
3. **Barrier (Vertical) Curb.** A longitudinal element placed at the edge of the traveled way for delineation, to control drainage, to manage access, and to minimize right-of-way

Summary of Comments on Chapter_34_080624.pdf

Page: 4

	Author: Lkirchler	Subject: Inserted Text	Date: 6/24/2008 2:30:34 PM
	sidewalks,		
	Author: Lkirchler	Subject: Cross-Out	Date: 6/24/2008 2:30:43 PM
	Author: Lkirchler	Subject: Cross-Out	Date: 6/24/2008 2:30:54 PM
	Author: Lkirchler	Subject: Inserted Text	Date: 6/24/2008 2:30:41 PM
	17 and		
	Author: Lkirchler	Subject: Inserted Text	Date: 6/24/2008 2:31:12 PM
	s		
	Author: Lkirchler	Subject: Inserted Text	Date: 6/24/2008 2:31:47 PM
	new bullet: Chapter 48 discusses on-street parking design criteria.		
	Author: Lkirchler	Subject: Inserted Text	Date: 6/24/2008 2:32:11 PM
	New bullet: For ADA design requirements, see Chapter 58.		

acquisitions. Vertical curbs range in height between 6 in (150 mm) and 9 in (225 mm) and are vertical or nearly vertical.

4. **Buffer Area.** The space between the back of curb and sidewalk.
5. **Cross Slope.** The slope in the cross sectional view of the traveled way, travel lanes, shoulders, median surface, or gutters, expressed as inch(es) per foot (percent) based on the change in vertical compared to the change in horizontal.
6. **Concrete Barrier.** A rigid barrier constructed in a narrow median where no or minimal deflection distance is available and which can accommodate most vehicle impacts without penetration.
7. **Depressed Median.** The area located between opposing directions of the traveled ways which is designed with shoulders and fill slopes and is lower in elevation than the traveled ways. Its main function is to provide a safe distance between opposing traffic. It is also designed to carry a certain portion of roadway drainage and for snow storage.
8. **Flush Median.** A median which is in the same plane as the surface of the adjacent traveled ways.
9. **Front Slope.** The side slope created by connecting the shoulder or shelf at the hinge point, downward and outward, to the ditch bottom or natural ground.
10. **Hinge Point.** The point from which the fill height or depth of cut is determined. For fills, the point is located at the intersection of the shoulder and the fill slope. For cuts, the hinge point is located at the toe of the back slope.
11. **Maintenance Border Area.** Additional width which is set aside for right-of-way purposes adjacent to each side of the construction limits. This clear width provides an area for maintenance operations, retention of natural growth, erosion control, slope rounding and, in some cases, for accommodating public utilities.
12. **Median.** The portion of a cross section which separates the opposing directions of the traveled ways. The median width includes the inside shoulders or curb and gutters.
13. **Median Slope.** The slope in the cross section view of a median beyond the inside shoulders, expressed as a ratio of the change in vertical to the change in horizontal (V:H).
14. **Mountable (Sloping) Curb.** A longitudinal element placed at the edge of the traveled way for delineation, to control drainage, to manage access, and to outline corner islands. Sloping curbs have a height of 6 in (150 mm) or less with a slope face of approximately 45°.

Author: Lkirchler Subject: Inserted Text Date: 6/24/2008 2:34:17 PM
, which is typically used for signposts, fire hydrants, street furniture, bus shelters, landscaping, etc.

Author: Lkirchler Subject: Inserted Text Date: 6/24/2008 2:44:23 PM

New:

Crosswalk. That part of the roadway at an intersection that is included within the extensions of the lateral lines of the sidewalks on opposite sides of the roadway, measured from the curbline, or in the absence of curbs from the edges of the roadway, or in the absence of a sidewalk on one side of the roadway, the part of the roadway included within the extension of the lateral lines of the sidewalk at right angles to the centerline. Also, any portion of a roadway at an intersection or elsewhere that is distinctly indicated for pedestrian crossing by lines or other markings on the surface. *Source: AASHTO Ped. Guide.

15. **Raised-Curb Median.** A median which contains a raised-curb, greater than 2 inches (50 mm) in height, within its limits.
16. **Roadside.** A general term denoting the area adjoining the outer edge of the roadway.
17. **Roadside Clear Zone.** The distance beyond the edge of traveled way that should be clear of any non-traversable hazards or fixed objects.
18. **Roadway.** The combination of the traveled way, both shoulders or curb and gutters, and any auxiliary lanes on the mainline highway. Traveled ways separated by a depressed median have two or more roadways.
19. **Shelf.** On curbed facilities, the relatively flat area (2% to 5% slope) located between the back of the curb and the break for the fill slope or back slope.
20. **Shoulder.** The portion of the roadway contiguous to the traveled way for the accommodation of stopped vehicles, for emergency use, and for lateral support of subbase, base, and surface courses.
21. **Side Slope.** A ratio used to express the steepness of a slope adjacent to the roadway. The ratio is expressed as vertical to horizontal (V:H).
22. **Sidewalk.** That portion of the highway cross section separated from the roadway and constructed for the use of pedestrians.
23. **Toe of Slope.** The intersection of the front slope or back slope with the natural ground or ditch bottom.
24. **Top of Slope.** The intersection of the back slope with the natural ground, before any rounding is applied.
25. **Traveled Way.** The portion of the roadway for the movement of vehicles, exclusive of shoulders, curb and gutter, and auxiliary lanes.
26. **Traversable Median.** A median which is outlined with 2 in (50 mm) high mountable curb and gutter and used as a direct substitute for the flush two-way, left-turn lane (TWLTL). It is not designed to be a physical barrier nor is it intended to impede left-turn movements across the median.

34-1.02 Nomenclature

Figures 34-1A, 34-1B, and 34-1C provide the basic nomenclature for cross section elements of freeways and expressways, rural highways, and urban streets.

7. Roadside Safety. When examining curbs relative to roadside safety, the designer should review Chapter 38 for clear zone and roadside barrier guidance.
8. Transitions. Figure 34-2B illustrates two situations where a shoulder section is transitioned to a curbed section.
9. Driveways. The IDOT *Policy on Permits for Access Driveways to State Highways* presents the design details for the use of curbs at driveways. See Section 36-7.
10. Mail Delivery. In many cases where a roadway is changed from a rural cross section with shoulders to a curb and gutter section (e.g., through a small town or adjacent to the urban development of a city), the designer must consider how the curb and gutter might affect mail delivery. One option requires the construction of mailbox turnouts along the street. Another is the construction of a continuous 6 ft (1.8 m) shoulder with a curb and a 2 ft (600 mm) gutter behind the shoulder. See Chapter 58 for design details.
11. Disabled Accessibility. Curbs should be designed with sidewalk ramps at all pedestrian crosswalks to provide adequate access for the safe and convenient movement of physically disabled individuals. Chapter 58 and the *IDOT Highway Standards* provide details on the design and location of sidewalk ramps.
12. Parking Considerations. Curb heights adjacent to on-street parking should be 6 in (150 mm) or less. If a 9 in (225 mm) curb height is used, provide a wider gutter width. Curb heights on streets and parking lots with diagonal or perpendicular parking also should be limited to a 6 in (150 mm) maximum height.

T Author: Lkirchler Subject: Inserted Text Date: 6/24/2008 2:46:55 PM
potential

T Author: Lkirchler Subject: Replacement Text Date: 6/24/2008 2:46:46 PM
crossing locations

34-4 ROADSIDE ELEMENTS

34-4.01 General

Earth slopes are required to provide roadside and median ditches adjacent to highway facilities and to provide a stable transition from the highway profile to adjacent terrain features. With maintenance operations, economy may be attained through the use of mechanized equipment which operates best on relatively flat earth slopes. Flat slopes also facilitate turf establishment and are often required for soil stability. In addition to aesthetic enhancement, flat and well-rounded side slopes, combined with proper roadway elevations above natural ground lines, minimize snow drifting problems. With proper elevations, cross winds sweep the snow from the roadway surface, thus facilitating snow removal operations.

Using broad flat slopes on roadside ditches, which are totally visible to the driver, lessen the feeling of restriction and add considerably to a driver's willingness to use the shoulder and earth slope area in emergencies. The use of flat side slopes for roadside ditches reduces both the depth and velocity of water, and thereby minimizes damage from erosion. See Chapter 3 for guidance on earth slopes and clear zones.

For urban facilities other than freeways and expressways, side slopes generally will be determined on a case-by-case basis considering the roadside development and right-of-way restrictions. For some urban projects, relatively steep side slopes and/or retaining walls may be required.

34-4.02 Fill Sections

Front slopes in fill sections are the slopes extending outward and downward from the hinge point to intersect the ditch bottom or natural ground line. The slope criteria depends upon the fill height, urban/rural location, project scope of work, and the presence of curbs. Figures 34-4A and 34-4B present the fill slope criteria. The designer should also consider the following:

1. Maximum Slope. As indicated in Figures 34-4A and 34-4B, the maximum front slope should be 1V:3H. A 1V:3H slope is a practical maximum when considering maintenance operations (e.g., mowing), erosion control, and roadside safety. Slopes steeper than 1V:3H should be used where fill heights are greater than 30 ft (9 m). Slopes steeper than 1V:3H will normally require a roadside barrier; see Figure 38-6J for the location of the barrier where curbs are present.
2. Shelf. For curbed sections, a 3 ft to 10 ft (900 mm to 3.0 m) shelf is provided beyond the curb. If sidewalks are present or anticipated, the shelf width should be 10 ft (3.0 m) and sloped away from the roadway at a rate of 2%. If no sidewalks are present or anticipated, slope the shelf away from the roadway at 5%.
3. Benching. Where the height of a fill exceeds 30 ft (9 m), consider benching of the slope to minimize erosion problems. Approximately halfway down the slope, provide a bench with

34-4.03(b) Material and Soils Conditions

The designer must ensure that permanent erosion control is considered in the design of ditches in cut slopes. The designer should contact the district landscape architect and the district geotechnical engineer, who will review the existing soils conditions to determine if additional measures may be required to control erosion (e.g., additional topsoil, special plantings, paving). It will be the designer's responsibility to consider their recommendations for incorporation into the plans. As a general guide, longitudinal ditch slopes less than 1% can be seeded, slopes of 1% to 3% usually will require sodding or seeding with an erosion control blanket, and slopes greater than 3% will require riprap or other protective lining. Very flat longitudinal ditch slope (i.e., < 0.4%) may require a paved ditch so as to maintain the flowline over time. For more information on the design of ditch linings, the designer should review Chapter 40 in the *BDE Manual* and the *IDOT Drainage Manual*.

34-4.03(c) Hydraulic Design

Roadside and median ditches are to be designed according to the criteria presented in Chapter 40 and the *IDOT Drainage Manual*. The use of these criteria will ensure the proper drainage of the pavement subgrade and the adequate conveyance of surface flow without creating erosion of ditch sections.

34-4.04 Cut Sections With Curbs

On facilities with curbs, a shelf is provided with a back slope beyond the shelf. The shelf is usually sloped towards the roadway to eliminate the need for a separate drainage system behind the curb. Where sidewalks are present or anticipated in the future, provide a shelf width of 10 ft (3.0 m) with a cross slope of 2%. Where sidewalks are not present or anticipated in the future, the shelf cross slope should be 5% to provide for adequate drainage. This criteria is illustrated in Figure 34-4D.

Where the height of a cut exceeds 30 ft (9 m), consider benching the back slope to minimize erosion problems. Approximately halfway down the slope, provide a bench with a V-type ditch. On short sections, the bench can be graded to drain to one side. For longer sections, grade the bench to drain from both directions. For additional guidance on benching designs, the designer should contact the district geotechnical engineer.

Author: Lkirchler Subject: Inserted Text Date: 6/24/2008 2:49:08 PM
If a wider sidepath or bikeway is present or anticipated, additional shelf width will be necessary.