

Design Element			Manual Section	Rural	Urban	
Design Controls	Design Forecast Year		54-3.01	20 Years (1)	20 Years (1)	
	*Design Speed (mph)		54-3.01	Min: Original Design Speed	Min: Original Design Speed (2)	
	Access Control		40-5.0	Full Control	Full Control	
	Level of Service		40-2.04	Desirable: B; Minimum: C	Desirable: B; Minimum: D	
Cross Section Elements	Travel Lane	*Width	54-3.03	12 ft	12 ft	
		Surface Type(3)	Chp. 52	Asphalt / Concrete	Asphalt / Concrete	
	Shoulder	*Right Width(4)	54-3.03	54-3.03	Usable: 11 ft; Paved: 10 ft	Usable: 11 ft; Paved: 10 ft
		*Left Width(5)			2 Lanes: 4 ft Paved. 3 Lanes: 10 ft Paved	2 Lanes: 4 ft Paved. 3 Lanes: 10 ft Paved
		Surface Type(3)	Chp. 52	Asphalt / Concrete	Asphalt / Concrete	
	Cross Slope	*Travel Lane (6)	45-1.01	45-1.01	2%	2%
		Shoulder (6A)	45-1.02	45-1.02	Paved Width ≤ 4 ft: 2%; Paved Width > 4 ft: 4%	Paved Width ≤ 4 ft: 2%; Paved Width > 4 ft: 4%
	Auxiliary Lane	*Lane Width	45-1.03	45-1.03	12 ft	12 ft
		*Shoulder Width			Left or Right: Des: 12 ft; Min: 6 ft	Left or Right: Des: 12 ft; Min: 6 ft
	Median Width	Depressed	54-3.03	54-3.03	Existing	Existing
		Flush (CMB)			Existing	Existing
	Clear Zone		49-2.0	49-2.0	(8)	(8)
	Side Slopes (9)	Cut	Foreslope	54-3.03	54-3.03	2:1 or Flatter
			Ditch Width		Existing	Existing
			Backslope		2:1 or Flatter	2:1 or Flatter
Fill		45-3.0	45-3.0	2:1 or Flatter	2:1 or Flatter	
Median Slopes		45-3.03	45-3.03	Desirable: 8:1; Maximum: 4:1	Desirable: 8:1; Maximum: 4:1	
Bridges	New or Reconstructed Bridge	*Structural Capacity	Chp. 60	Chp. 60	HL-93 (10)	
		*Clear-Roadway Width(11)	54-5.0	54-5.0	Full Paved Approach Width	
	Existing Bridge to Remain in Place	*Structural Capacity	Chp. 72	Chp. 72	HS-20	
		*Clear-Roadway Width	54-5.0	54-5.0	Travelway Plus 10 ft Rt. & 4 ft Lt. Shoulders (7)	
	*Vertical Clearance (Freeway Under) (12a)	New or Replaced Overpassing Bridge (12b)	54-5.0	54-5.0	16.5 ft	16.5 ft (12c)
		Existing Overpassing Bridge			16 ft	16 ft (12c)
		Sign Truss / Pedestrian Bridge			New: 17.5 ft; Existing: 17 ft	New: 17.5 ft; Existing: 17 ft
Vertical Clearance (Freeway over Railroad) (13)		Chp. 69	Chp. 69	23 ft	23 ft	

* Controlling design criterion (see Section 40-8.0).

**GEOMETRIC DESIGN CRITERIA FOR FREEWAY
(3R or Partial 4R Project)**

Figure 54-2A

Design Element		Manual Section	Rural	Urban			
Alignment Elements	Design Speed		70 mph	55 mph	60 mph	70 mph	
	*Stopping Sight Distance	42-1.0	730 ft	530 ft	610 ft	730 ft	
	*Minimum Radius	43-2.0	Existing (14)	Existing (14)			
	*Superelevation Rate (15)	43-3.0	$e_{max} = 8\%$	$e_{max} = 8\%$			
	*Horizontal Sight Distance	43-4.0	See Section 43-4.0	See Section 43-4.0			
	*Vertical Curvature (K-value)	Crest	44-3.0	Existing (14)	Existing (14)		
		Sag		Existing (14)	Existing (14)		
	*Maximum Grade	Level	54-3.02	Existing (14)	Existing (14)		
		Rolling		Existing (14)	Existing (14)		
Minimum Grade		44-1.03	Desirable: 0.5%; Minimum: 0.0%	Desirable: 0.5% Minimum: 0.0%			
Interchange Elements	Traveled Way	Width	48-5.02	16 ft	16 ft		
		Surface Type (3)	Chp. 52	Asphalt / Concrete	Asphalt / Concrete		
	Shoulder	Right Width	48-5.02	Usable: 11 ft. Paved: Des: 8 ft; Min: 7.5 ft	Usable: 11 ft. Paved: Des: 8 ft; Min: 7.5 ft		
		Left Width		Usable: 7 ft. Paved: Des: 4 ft; Min: 2.5 ft	Usable: 7 ft. Paved: Des: 4 ft; Min: 2.5 ft		
		Surface Type (16)	Chp. 52	Asphalt / Concrete	Asphalt / Concrete		
	Cross Slope	Traveled Way	48-5.02	2%	2%		
		Shoulder (17)		Right: 4%; Left: 2%	Right: 4%; Left: 2%		
	Superelevation		48-5.03	$e_{max} = 8\%$	$e_{max} = 4\%, 6\%, \text{ or } 8\% (18)$		
	Maximum Grade	Upgrade	48-5.04	3% - 5%	3% - 5%		
Downgrade		4% - 6%		4% - 6%			

* Controlling design criterion (see Section 40-8.0).

**GEOMETRIC DESIGN CRITERIA FOR FREEWAY
(3R or Partial 4R Project)**

Figure 54-2A (Continued)

**GEOMETRIC DESIGN CRITERIA FOR FREEWAY
(3R or Partial 4R Project)**

Footnotes to Figure 54-2A

- (1) Design Forecast Year. A resurfaced pavement has a 10-year design life.
- (2) Design Speed. The existing posted speed limit may be used in restricted urban conditions. The design speed should be 50 mph or higher on an Interstate highway.
- (3) Surface Type. The pavement type selection will be determined by the Office of Pavement Engineering.
- (4) Shoulder Width, Right. The following will apply.
 - a. The shoulder is paved to the face of guardrail. The desirable guardrail offset is 2 ft from the effective usable-shoulder width. See Section 49-5.0 for more information.
 - b. If the number of trucks exceeds 250 DDHV, a 12-ft right shoulder should be considered. If the 12-ft shoulder is used, the usable-shoulder width will be 13 ft.
 - c. Usable-shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.
- (5) Shoulder Width, Left. The following will apply.
 - a. The effective usable-shoulder width is equal to the paved-shoulder width. The desirable guardrail offset is 2 ft from the effective usable-shoulder width. See Section 49-5.0 for more information.
 - b. Where there are 3 or more lanes in one direction, a 12-ft left shoulder should be provided if practical.
 - c. Usable-shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point. Usable width is 1 ft wider than the paved-shoulder width.
- (6) Cross Slope, Travel Lane. Cross slopes of 1.5% are acceptable on an existing bridge to remain in place.
- (6A) Cross Slope, Shoulder. See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.

**GEOMETRIC DESIGN CRITERIA FOR FREEWAY
(3R or Partial 4R Project)**

Footnotes to Figure 54-2A (Continued)

- (7) Shoulders for Bridge to Remain in Place. For such a bridge of length > 200 ft, the minimum shoulder width on the right and the left may be 3.5 ft. This requirement does not apply to a bridge deck replacement.
- (8) Clear Zone. The clear zone will vary according to design speed, traffic volume, side slopes and horizontal curvature. See Section 49-2.0.
- (9) Side Slopes. Retention of an existing side slope of 2:1 or flatter most often will be acceptable. However, an existing fill slope of steeper than 4:1 should be evaluated for flattening. Section 54-3.03 provides additional information for side-slope criteria for a project with freeway widening (i.e., lane or shoulder widening).
- (10) Structural Capacity (New or Reconstructed Bridge). HS-25 loading with Alternate Military Loading should be applied for each project with notice to proceed with design beginning September 1, 2004, through December 31, 2005. Other loadings will apply to the Toll Road or an Extra Heavy Duty Highway. See Chapter Sixty for more information.
- (11) Width (New or Reconstructed Bridge). See Sections 45-4.01 and 59-1.0 for more information on bridge width.
- (12) Vertical Clearance (Freeway Under). The following will apply.
 - a. Vertical clearance applies from usable edge to usable edge of shoulders.
 - b. Table value includes an additional 0.5 ft allowance for future overlays.
 - c. A 14-ft clearance may be used in an urban area where an alternative freeway facility with a 16-ft clearance is available; see Section 54-3.02.
- (13) Vertical Clearance (Freeway Over Railroad). See Chapter Sixty-nine for additional information on railroad clearance under a highway.
- (14) Existing Conditions. For these design elements, the existing conditions are satisfactory unless accident history dictates that a modification is necessary.
- (15) Superelevation Rate. The designer should review Sections 43-2.0 and 43-3.0 to determine if improvements are necessary.
- (16) Shoulders (Surface Type). The pavement-type selection will be determined by the Office of Pavement Engineering. For a ramp with curve radii less than or equal to 350 ft, the shoulders will have the same pavement design as the travelway.
- (17) Cross Slope (Shoulders). For a ramp with curve radii less than or equal to 350 ft, the shoulder cross slope will be the same as the travelway.
- (18) Superelevation. The maximum superelevation rate will depend on site conditions. The highest rate practical should be used, especially for a descending ramp.