

Design Element		Manual Section	Rural	Urban		
Design Controls	Design Forecast Year		54-3.01	20 Years (1)	20 Years (1)	
	*Design Speed (km/h)		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	3.6 m	3.6 m	
		Surface Type(3)	Chp. 52	Asphalt / Concrete	Asphalt / Concrete	
	Shoulder	*Right Width(4)	54-3.03	Usable: 3.3 m; Paved: 3.0 m	Usable: 3.3 m; Paved: 3.0 m	
		*Left Width(5)		2 Lanes: 1.2 m Paved. 3 Lanes: 3.0 m Paved	2 Lanes: 1.2 m Paved. 3 Lanes: 3.0 m Paved	
	Cross Slope	Surface Type(3)	Chp. 52	Asphalt / Concrete	Asphalt / Concrete	
		*Travel Lane (6)	45-1.01	2%	2%	
	Shoulder (6A)		45-1.02	Paved Width ≤ 1.2m: 2%; Paved Width > 1.2 m: 4%	Paved Width ≤ 1.2m: 2%; Paved Width > 1.2 m: 4%	
		Auxiliary Lanes	*Lane Width	45-1.03	3.6 m	3.6 m
	Median Width	*Shoulder Width		Left or Right: Des: 3.6 m; Min: 1.8 m	Left or Right: Des: 3.6 m; Min: 1.8 m	
		Depressed	54-3.03	Existing	Existing	
	Clear Zone	Flush (CMB)		Existing	Existing	
			49-2.0	(8)	(8)	
	Side Slopes (9)	Cut	Foreslope		2:1 or Flatter	2:1 or Flatter
			Ditch Width	54-3.03	Existing	Existing
Back Slope				2:1 or Flatter	2:1 or Flatter	
Fill		45-3.0		2:1 or Flatter	2:1 or Flatter	
Median Slopes		45-3.03	Desirable: 8:1; Maximum: 4:1	Desirable: 8:1; Maximum: 4:1		
Bridges	New and Reconstructed Bridges	*Structural Capacity	Chp. 60	HL-93 (10)	HL-93 (10)	
		*Clear Roadway Width(11)	54-5.0	Full Paved Approach Width	Full Paved Approach Width	
	Existing Bridges to Remain in Place	*Structural Capacity	Chp. 72	HS-20	HS-20	
		*Clear Roadway Width	54-5.0	Travelway Plus 3.0 m Rt. & 1.2 m Lt. Shoulders (7)	Travelway Plus 3.0 m Rt. & 1.2 m Lt. Shoulders (7)	
	*Vertical Clearance (Freeway Under) (12a)	New and Replaced Overpassing Bridges (12b)	54-5.0	5.05 m	5.05 m (12c)	
		Existing Overpassing Bridges		4.90 m	4.90 m (12c)	
		Sign Truss / Pedestrian Bridges		New: 5:35 m; Existing: 5.20 m	New: 5.35 m; Existing: 5.20 m	
Vertical Clearance (Freeway over Railroad) (13)		Chp. 69	7.00 m	7.00 m		

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

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

Table 54-2A

Design Element		Manual Section	Rural	Urban			
Alignment Elements	Design Speed		110 km/h	90 km/h	100 km/h	110 km/h	
	*Stopping Sight Distance	42-1.0	220 m	160 m	185 m	220 m	
	*Minimum Radii	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-values)	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	4.9 m	4.9 m		
		Surface Type (3)	Chp. 52	Asphalt / Concrete	Asphalt / Concrete		
	Shoulder	Right Width	48-5.02	Usable: 3.3 m. Paved: Des: 2.4 m; Min: 2.3 m	Usable: 3.3 m. Paved: Des: 2.4 m; Min: 2.3 m		
		Left Width		Usable: 2.1 m. Paved: Des: 1.2 m; Min: 0.8 m	Usable: 2.1 m. Paved: Des: 1.2 m; Min: 0.8 m		
		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	Upgrades	48-5.04	3% - 5%	3% - 5%			
	Downgrades		4% - 6%	4% - 6%			

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

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

Table 54-2A (Continued)

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

Footnotes to Table 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. A design speed of 80 km/h or higher should be used 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 0.6 m from the effective usable-shoulder width. See Section 49-5.0 for more information.
 - b. If the number of trucks exceeds 250 DDHV, a 3.6-m right shoulder should be considered. If the 3.6-m shoulder is used, the usable-shoulder width will be 3.9 m.
 - 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 0.6 m from the effective usable-shoulder width. See Section 49-5.0 for more information.
 - b. When there are 3 or more lanes in one direction, a 3.6-m 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-shoulder width is 0.3 m 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.
- (7) Shoulders for Bridge to Remain in Place. For such a bridge of length > 60 m, the minimum width for both shoulders may be 1.2 m. This requirement does not apply to a bridge-deck replacement.

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

Footnotes to Table 54-2A (Continued)

- (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 will most often 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 of New or Reconstructed Bridge. See Sections 49-5.0 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 150-mm allowance for future overlays.
 - c. A 4.3-m clearance may be used in an urban area where an alternative freeway facility with a 4.9-m 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 100 m, 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 100 m, 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.