

| 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 | Chp. 52 | 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 | 2% | 2% | |
| | | Shoulder (6A) | 45-1.02 | Paved Width ≤ 4 ft: 2%; Paved Width > 4 ft: 4% | Paved Width ≤ 4 ft: 2%; Paved Width > 4 ft: 4% | |
| | Auxiliary Lanes | *Lane Width | 45-1.03 | Chp. 52 | 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 | Chp. 52 | Existing | Existing |
| | | Flush (CMB) | | | Existing | Existing |
| | Clear Zone | | 49-2.0 | (8) | (8) | |
| | Side Slopes (9) | Cut | Fore Slope | 54-3.03 | 2:1 or Flatter | 2:1 or Flatter |
| | | | Ditch Width | | 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 | HS-25 & Alt. Military Loading (10) | HS-25 & Alt. Military Loading (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 10 ft Rt. & 4 ft Lt. Shoulders (7) | Travelway Plus 10 ft Rt. & 4 ft Lt. Shoulders (7) | |
| | *Vertical Clearance (Freeway Under) (12a) | New and Replaced Overpassing Bridges (12b) | 54-5.0 | Chp. 69 | 16.5 ft | 16.5 ft (12c) |
| | | Existing Overpassing Bridges | | | 16 ft | 16 ft (12c) |
| | | Sign Truss / Pedestrian Bridges | | | New: 17.5 ft; Existing: 17 ft | New: 17.5 ft; Existing: 17 ft |
| Vertical Clearance (Freeway over Railroad) (13) | | Chp. 69 | 23 ft | 23 ft | | |

* 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 | | 70 mph | 55 mph | 60 mph | 70 mph | |
| | *Stopping Sight Distance | 42-1.0 | 730 ft | 530 ft | 610 ft | 730 ft | |
| | *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 | 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 | 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. Resurfaced pavements may have a 10-year design life.
- (2) Design Speed. The existing posted speed limit may be used in restricted urban conditions, but not less than 50 mph on Interstate highways.
- (3) Surface Type. The pavement type selection will be determined by the Pavement Design Engineer.
- (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. When 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. Typically, 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. When 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 typically 1 ft wider than the paved shoulder width.
- (6) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges 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 > 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 volumes, side slopes and horizontal curvature. See Section 49-2.0.

GEOMETRIC DESIGN CRITERIA FOR FREEWAY

(3R or Partial 4R Project)
Footnotes to Table 54-2A (Continued)

- (9) Side Slopes. Retention of the existing side slope shape 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 and/or shoulder widening).
- (10) Structural Capacity (New or Reconstructed Bridge). Other loadings will apply to the Toll Road or 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 values include 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 generally 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 any improvements are necessary.
- (16) Shoulders (Surface Type). The pavement type selection will be determined by the Pavement Design Engineer. 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.