

Design Element			Manual Section	Design Value (By Type of Area)			
				Suburban	Intermediate	Built-Up	
Design Controls	Design Forecast Period		40-2.02	20 Years	20 Years	20 Years	
	Design Speed (km/h) (1)		40-3.0	Curbed: 70 – 90 Uncurbed: 80 – 100	Curbed: 60 – 80 Uncurbed: 80 – 100	Curbed: 50 – 60	
	Access Control		40-5.0	Partial Control / None	None	None	
	Level of Service		40-2.0	Des: B; Min: C	Des: C; Min: D	Des: C; Min: D	
	On-Street Parking		45-1.04	None	Optional (2)	Optional (2)	
Cross Section Elements	Travel Lane	*Width (3)	45-1.01	Curbed: 3.6 m Uncurbed: 3.6 m	Curbed: Des.: 3.6 m; Min.: 3.3 m Uncurbed: Des.: 3.6 m; Min.: 3.3 m	Curbed: Des.: 3.6 m; Min.: 3.0 m	
		Typical Surface Type (4)	Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete	
	*Curb Offset (5)		45-1.02	0.6 m	0.6 m	0.6 m	
	Shoulder	*Paved Width (6)	45-1.02	Curbed, Rt. Des: 3.0 m; Min 1.2 m Curbed, Lt. Des: 1.2 m; Min 0.6 m Uncurbed, Rt.: 3.0 m; Lt.: 1.2 m	Curbed, Rt. Des: 2.4 m; Min 0.6 m Curbed, Lt. Des: 1.2 m; Min 0.6 m Uncurbed, Rt.: 2.4 m; Lt.: 1.2 m	Right: 1.8 m; Left: 1.2 m	
		Typical Surface Type (4)	Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete	
	Cross Slope	*Travel Lane (7)	45-1.01	2%	2%	2%	
		Shoulder (7A)	45-1.02	Paved Width ≤ 1.2 m: 2%; Paved Width > 1.2 m: 4%	Paved Width ≤ 1.2 m: 2%; Paved Width > 1.2 m: 4%	Paved Width ≤ 1.2 m: 2%; Paved Width > 1.2 m: 4%	
	Auxiliary Lane	Lane Width		45-1.03	Des: 3.6 m; Min: 3.3 m	Des: 3.6 m; Min: 3.3 m	Des: 3.6 m; Min: 3.0 m
		Curb Offset (8)		45-1.03	0.3 m	0.3 m	0.3 m
		Shoulder Width		45-1.03	Des: 3.0 m; Min: 0.6 m	Des: 2.4 m; Min: 0.6 m	Des: 1.8 m; Min: 0.6 m
		Typical Surface Type (4)		Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	TWLTL Lane Width			46-5.0	Des: 4.8 m; Min: 4.2 m	Des: 4.8 m; Min: 4.2 m	Des: 4.2 m; Min: 3.6 m
	Parking Lane Width			45-1.04	N/A	Des: 3.6 m; Min: 3.0 m (9)	Des: 3.6 m; Min: 3.0 m (9)
	Median Width	Depressed		45-2.0	8.0 m – 15.0 m	N/A	N/A
		Raised Island			Des: 5.4 m; Min: 3.9 m (10)	Des: 5.4 m; Min: 1.2 m (10)	Des: 6.0 m; Min: 1.2 m (10)
		Flush / Corrugated			Des: 4.8 m; Min: 3.9 m (10)	Des: 4.8 m; Min: 1.2 m (10)	Des: 5.4 m; Min: 1.2 m (10)
	Sidewalk Width (11)			45-1.06	1.5 m with 1.5-m Buffer (Des)	1.5 m with 1.5-m Buffer (Des)	Varies; 1.8 m Min
	Bicycle-Lane Width (12)			51-7.0	Curbed: 1.5 m Uncurbed: Shld Width +1.2 m	Curbed: 1.5 m Uncurbed: Shld Width +1.2 m	Curbed: 1.5 m
	Clear Zone			49-2.0	(13)	(13)	(13)
	Typical Curbing Type (where used) (14)			45-1.05	Sloping / Vertical	Sloping / Vertical	Sloping / Vertical
	Side Slopes (Uncurbed) (15)	Cut	Foreslope	45-3.0	6:1 (16)	6:1 (16)	N/A
			Ditch Width		1.2 m (17)	1.2 m (17)	N/A
			Backslope		4:1 for 6 m; 3:1 Max. to Top (18)	4:1 for 6 m; 3:1 Max. to Top (18)	N/A
Fill		6:1 to Clear Zone; 3:1 Max. to Toe	6:1 to Clear Zone; 3:1 Max. to Toe		N/A		
Side Slopes (Curbed)	Cut (Backslope)	45-3.0	(19)	(19)	(19)		
	Fill	45-3.0	12:1 for 3.6 m; 3:1 Max. to Toe	12:1 for 3.6 m; 3:1 Max. to Toe	12:1 for 3.6 m; 3:1 Max. to Toe		
Median Slopes (Depressed)			45-2.0	Des: 8:1; Max: 5:1	N/A	N/A	

\* Controlling design criterion.

Des: Desirable. Min: Minimum.

**GEOMETRIC DESIGN CRITERIA FOR URBAN ARTERIAL, 4 OR MORE LANES  
(New Construction or Reconstruction)**

**Figure 53-6**

Design Element			Manual Section	Design Value (By Type of Area)				
				Suburban		Intermediate		Built-Up
Bridges	New or Reconstructed Bridge	*Structural Capacity (20)	Ch. 60	HL-93		HL-93		HL-93
		*Clear-Roadway Width(21)	45-4.01	Uncurbed: Full Paved Approach Width Curbed: Full Approach Curb-to-Curb Width				
	Existing Bridge to Re-main in Place	*Structural Capacity	Ch. 72	HS-20		HS-20		HS-20
		*Clear-Roadway Width	45-4.01	Uncurbed: Travelway Plus 0.6 m on Each Side; Curbed: Full Approach Curb-to-Curb Width				
	*Vertical Clearance (Arterial Under) (22)	New or Replaced Overpassing Bridge (22a)	44-4.0	5.05 m		5.05 m (22b)		5.05 m (22b)
		Existing Overpassing Bridge		4.30 m		4.30 m		4.30 m
		Sign Truss / Pedestrian Bridge (22a)		New: 5.35 m; Existing: 5.20 m		New: 5.35 m; Existing: 5.20 m		New: 5.35 m; Existing: 5.20 m
Vertical Clearance (Arterial over Railroad) (23)		Ch. 69	7.00 m					
Alignment Elements	Design Speed			50 km/h	60 km/h	70 km/h	80 km/h	90 km/h
	*Stopping Sight Distance		42-1.0	65 m	85 m	105 m	130 m	160 m
	Decision Sight Distance	Speed / Path / Direction Change	42-2.0	U: 195 m SU: 170 m	U: 235 m SU: 205 m	U: 275 m SU: 235 m	U: 315 m SU: 270 m	U: 360 m SU: 315 m
		Stop Maneuver		155 m	195 m	235 m	280 m	325 m
	Intersection Sight Distance, -3% to +3% (28)		46-10.0	P: 105 m SU: 135 m	P: 125 m SU: 160 m	P: 150 m SU: 185 m	P: 190 m SU: 235 m	P: 230 m SU: 280 m
	*Minimum Radius for $e_{max}=4\%$ / $6\%$		43-2.0	80 m / 75 m (24a)	130 m/120 m (24a)	185 m/170 m (24a)	230 m (24a)	305 m (24a)
	*Superelevation Rate (25)		43-3.0	Up to $e_{max} = 6\%$			$e_{max}=8\%$	
	*Horizontal Sight Distance		43-4.0	(26)				
	*Vertical Curvature (K-value)	Crest	44-3.0	7	11	17	26	39
		Sag		13	18	23	30	38
	*Maximum Grade (27)	Level	44-1.02	8%	7%	6.5%	6%	5.5%
Rolling		9%		8%	7.5%	7%	6.5%	
Minimum Grade		44-1.03	Desirable: 0.5% Minimum: 0.3% (Curbed); 0.0% (Uncurbed)					

U: Urban; SU: Suburban.

\* Controlling design criterion. A deviation from such is a design exception, and is subject to approval. See Section 40-8.0.

These criteria apply to a route either on or off the National Highway System, regardless of funding source.

### GEOMETRIC DESIGN CRITERIA FOR URBAN ARTERIAL, 4 OR MORE LANES (New Construction or Reconstruction)

Figure 53-6 (Continued)

**GEOMETRIC DESIGN CRITERIA FOR URBAN ARTERIAL, 4 OR MORE LANES  
(New Construction or Reconstruction)**

**Footnotes to Figure 53-6**

- (1) Design Speed. The minimum design speed should equal the minimum value, the anticipated posted speed limit after construction, or the legal speed limit on a non-posted highway. The legal speed limit in an urban district is 30 mph (48 km/h). Based on an engineering study, the design speed may be raised to an absolute maximum of 55 mph (88 km/h).
- (2) On-Street Parking. In general, on-street parking is discouraged.
- (3) Travel-Lane Width. For an arterial on the National Truck Network, the right lane must be 3.6 m in width.
- (4) Surface Type. The pavement-type selection will be determined by the INDOT Office of Pavement Engineering.
- (5) Curb Offset. The curb offset (for both left and right sides) should be 0.6 m. Vertical curbs introduced intermittently should be offset 0.6 m. A continuous curb used along a median or channelizing island may be offset 0.3 m.
- (6) Shoulder Width. The value applies to the paved-shoulder width. The following will also apply.
  - a. For an uncurbed section, the shoulder is paved to the front 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. For an uncurbed section, a desirable additional 0.3 m of compacted aggregate will be provided.
  - c. For a curbed section, the curb offset is included in the paved shoulder width.
- (7) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable for an existing bridge to remain in place.
- (7A) Cross Slope (Shoulder). See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.
- (8) Curb Offset for Auxiliary Lane. In a curbed section, the offset may be zero.
- (9) Parking Lane. Where a parking lane will be used as a travel lane during peak hours or may be converted to a travel lane in the future, the width should be equal to the travel lane width plus a 0.3-m offset to the curb (if present). The cross slope for a parking lane is typically 1% steeper than that of the adjacent travel lane.
- (10) Minimum Median Width. The criteria assume the presence of a mountable curb with a 0-m curb offset.
- (11) Sidewalk Width. A buffer of less than 0.6 m wide is not permitted. If no buffer is provided, the sidewalk width should be 1.8 m.
- (12) Bicycle-Lane Width. The value is in addition to the width of a parking lane, if present. See Section 51-7.0 for additional details.
- (13) Clear Zone. The following will apply.
  - a. Facility with Vertical Curbs. The clear zone will be measured from the edge of travel lane or will be to the right-of-way line, whichever is less. No clear zone is required where there is 24-h parking.
  - b. Facility with Sloping Curbs or without Curbs. The clear zone will vary according to design speed, traffic volumes, side slopes, and horizontal curvature.
  - c. Curbed Facility. There should be an appurtenance-free area as measured from the gutter line of any curb.
  - d. Value. See Section 49-2.0 for specific clear-zone value.

**GEOMETRIC DESIGN CRITERIA FOR URBAN ARTERIAL, 4 OR MORE LANES  
(New Construction or Reconstruction)**

**Footnotes to Figure 53-6 (continued)**

- (14) Curbing Type. Vertical curbs may only be used with design speed of 70 km/h or lower.
- (15) Side Slope (Uncurbed). Value is for new construction. See Sections 45-3.0 and 45-8.0 for more information. For a reconstruction project, see Section 49-3.0.
- (16) Foreslope. See Sections 49-2.0 and 49-3.0 for the lateral extent of the foreslope in a ditch section.
- (17) Ditch Width. A V-ditch should be used in a rock cut. See Section 45-8.0.
- (18) Backslope. The backslope for a rock cut will vary according to the height of the cut and the geotechnical requirements. See Section 45-8.0 for typical rock-cut sections.
- (19) Side Slope (Curbed) Cut. Typically, a shelf or sidewalk will be present immediately behind the curb before the toe of the backslope. The minimum width of a shelf will be 1.8 m. Where a sidewalk is present, the toe of the backslope will typically be 0.3 m beyond the edge of sidewalk. See Section 45-3.0 for more information.
- (20) Structural Capacity (New or Reconstructed Bridge). The following will apply:
- a. 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.
  - b. A State-highway bridge within 25 km of a Toll-Road gate must be designed for Toll-Road loading.
  - c. A bridge on an Extra-Heavy-Duty Highway must be designed for the Michigan Train truck loading configuration.
  - d. See Chapter Sixty for additional information on the loading configurations.
- (21) Width (New or Reconstructed Bridge). See Section 59-1.0 for more information on bridge width.
- (22) Vertical Clearance (Arterial Under Railroad). The following will apply:
- a. Value includes an additional 150-mm allowance for future pavement overlays.
  - b. In a highly-urbanized area, a minimum clearance of 4.30 m may be provided if there is at least one route with a 4.90-m clearance.
  - c. Vertical clearance applies from usable edge to usable edge of shoulders.
- (23) Vertical Clearance (Arterial Over Railroad). See Chapter Sixty-nine for additional information on railroad clearance under a highway.
- (24) Minimum Radius. The following will apply:
- a. Based on  $e_{\max} = 4\%$  or  $6\%$  and low-speed urban street conditions.
  - b. Based on  $e_{\max} = 8\%$  and open-road conditions.
- (25) Superelevation Rate. See Section 43-3.0 for values of superelevation rate based on design speed and radius. See Section 43-3.0 and the INDOT *Standard Drawings* for information on superelevation requirements.
- (26) Horizontal Sight Distance. For a given design speed, the necessary middle ordinate will be determined by the radius and the sight distance which applies at the site. Sometimes the stopping-sight-distance value for a truck will apply. See the discussion in Section 43-4.0.
- (27) Where adjacent sidewalks are present, the maximum desirable grade is 5%.
- (28) Intersection Sight Distance. For a left turn onto a 2-lane roadway: P = Passenger car; SU = single unit truck. See Figure 46-10G for value for a combination truck.