APPENDIX B(1) – SUBDIVISION STREET DESIGN GUIDE

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APPENDIX B(1) – SUBDIVISION STREET DESIGN GUIDE

SECTION B(1) – 1 – INTRODUCTION

INTRODUCTION

This document is an appendix of VDOT's Road Design Manual and is intended for users of VDOT's Secondary* Street Acceptance Requirements for the development of new residential streets functionally classified as "local" streets. All other streets must be developed in accordance with appropriate provisions of the Road Design Manual for the appropriate functional classification.

For the purposes of this document, "District Administrator's Designee" means that employee who oversees the land development functions in a particular geographic area. This may be the Residency Administrator, area engineer or that employee designated to perform the "responsible charge" duties for land development as designated by the District Administrator. In cities or towns choosing to use this design guide for the design of their subdivision streets, it means the local official responsible for the review and approval of subdivision street design.

In the event of conflict between this appendix and other provisions of the Road Design Manual, Road and Bridge Standards, and the Secondary Street Acceptance Requirements, the District Administrator's Designee shall determine the governing provision. As indicated in the Secondary Street Acceptance Requirements, any requirements of the subdivision ordinance of the locality that are not in conflict with these requirements shall govern. The Engineer is provided considerable discretionary authority in the application of standards related to local subdivision streets.

The district administrator is authorized to consider and render a decision on unresolved issues between the developer and the engineer that pertain to the interpretation and application of this appendix. All appeals shall be made in writing describing the unresolved issue and include copies of all prior relative correspondence.

All land development proposals should be submitted to the local jurisdiction, which will then coordinate with the Engineer for VDOT review and approval. The Engineer will coordinate with other VDOT sections as needed.

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SECTION B(1) – 2 – DESIGN REQUIREMENTS

PROJECTED TRAFFIC/CAPACITY ANALYSIS

For the purposes of these requirements, "projected traffic" includes the traffic resulting from the complete development of all land to be served by the subject roadway facility, including traffic forecast to be generated by development, both internal and external, to the site* under consideration.

The basis for this forecast will be the governing body's current comprehensive plan or other available information pertinent to the permitted land use and transportation planning for the site and adjacent properties. The trip generation rates in the current version of Trip Generation, published by the Institute of Transportation Engineers (ITE) should be utilized in determining the projection of traffic. The ITE trip generation rate for a single-family detached residential dwelling unit is currently 10 vehicle trips per day. The use of other bona fide traffic studies in determining projected traffic for all types of land development may be considered, subject to their submission for review and approval by the department. In PUD developments, trip generation rates should be developed for each type of land use and combined to determine projected traffic for each of the subdivision streets. Traffic generation developed to meet Chapter 527 (Traffic Impact Analysis Regulations) may be utilized to meet this requirement, at the engineer's discretion.

As an alternative to the application of the projected traffic to the applicable geometric design criteria of these requirements, the department will consider secondary street design based on a capacity analysis concept provided:

1. The governing body permits the utilization of this concept in the design of subdivision streets in the county.
2. The developer furnishes full rationale, from an engineer licensed by the Commonwealth to perform such studies, to support the recommendations of this analysis. The submission should include all pertinent traffic data and computations affecting the design proposal for the streets involved.
3. An acceptable level of service should be accommodated in the street design proposed under the capacity analysis concept. A minimum level of service "D" as defined by the Highway Capacity Manual is generally acceptable for the design of local streets. To maintain an acceptable level of service, additional travel lanes, channelized roadways, etc., may be required.

FUNCTIONAL CLASSIFICATION

The characteristics and magnitude of the service to be provided will be the basis for the department's determination of the functional classification for each subdivision street intended for acceptance into the secondary system. AASHTO's Geometric Design of Highways and Streets provides guidance in the classification of roads.

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The hierarchy of the functional systems consists of principal arterials (for main movement), minor arterials (distributors), collectors and local roads and streets.

Local streets are defined as those streets that provide direct access to adjacent land and serve travel of short distances as compared to the higher systems. Service to long distance* through traffic is discouraged. Most subdivision streets fall in the Local Street classification. The geometric design standards contained in this guide should be used for residential streets classified as "local" roads. All other street classifications should use VDOT's Road Design Manual for geometric design.

1. **Criteria**

   Urban and rural areas have fundamentally different characteristics. Consequently, urban and rural functional systems are classified separately. Most subdivision streets function similar to an urban area; therefore, the urban classification can be used for high-density development with the concurrence of the locality and District Administrator's Designee.

2. **Procedures**

   The department's concurrence of the functional classification for each street within a subdivision should be made prior to departmental approval of a subdivision concept plan. To facilitate the effective development of the plats or plans and permit an expeditious review, this concurrence is recommended prior to the initiation of a detail design for the subdivision. To initiate the functional classification process, the developer should submit the following information:

   a. A sketch accurately depicting the general concept for the proposed development of the subdivision, in conformance with the applicable provisions of the governing body's zoning and subdivision regulations. This sketch should include:

      (1.) The general location and configuration of each street proposed within the subdivision, including the terminus and right of way, including but not limited to anticipated average daily traffic volumes, anticipated percentage of trucks, peak hour traffic volumes, and any proposed phased development of streets.

      (2.) The location and area of each type of permitted land use within the subdivision.

      (3.) The location of any proposed transportation facility, within the subdivision's boundaries, included in the current comprehensive plan of the governing body.

      (4.) The proposed functional classification of each street within the subdivision.

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(5.) Where the governing body's zoning or subdivision regulations, or both, require submission of a conceptual plan in general conformance with the submission of the concept plan noted, such may be acceptable for review by the District Administrator's Designee.*

b. Other available information pertinent to the intended development of the subdivision.

c. Any street proposed for phased development should be reviewed at this time and be approved for such development by the local government and the department.

3. **Approval**

The District Administrator's Designee will provide written concurrence to the appropriate county official and the developer, if applicable, regarding the approved functional classification for each street in the subdivision. Approval of the conceptual plan or subdivision sketch should be considered concurrence of the functional classification and general layout of the streets. This approval shall be valid as long as the basic concept for the subdivision's development, as submitted for review, remains unchanged.

TERRAIN

The desired vertical curve alignment for subdivision street design can be accommodated within most terrains. However, in very rugged areas where the terrain can be classified mountainous, some design exceptions may be allowed. Mountainous terrain is defined as terrain in which longitudinal and transverse changes in the elevation of the ground with respect to a roadway are abrupt, and where the roadbed is obtained by frequent benching or side hill excavation to obtain acceptable horizontal and vertical alignment. The slope, which means the rise and fall of the grade measured both parallel and perpendicular to the centerline of the roadway, generally ranges over 15%.

Geographical location should not be the determining factor in terrain classification. For example, a subdivision street in the Bristol District may or may not have land characteristics of mountainous terrain. Each subdivision should be reviewed individually. Mountainous terrain exceptions are noted on the geometric design tables 1-3. The mountainous terrain classification may be used upon approval by the District Administrator's Designee.

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SECTION B(1) – 3 – ROADWAY GEOMETRIC DESIGN CRITERIA

A. COLLECTOR AND ARTERIAL ROADWAYS

Streets functionally classified as a "collector" and "arterial" should be designed in accordance with applicable provisions of VDOT's Road Design Manual.

B. LOCAL ROADWAYS

The following Geometric Design Standards shown in Tables 1 thru 3 are the minimum design criteria that shall apply to the design of all new residential streets functionally classified as "local" streets:*

1. A single-unit (SU) truck design vehicle, as defined by AASHTO, should be used for the design of all local subdivision streets. Dimensions for this vehicle are depicted in Exhibit 2-4 of the AASHTO Geometric Design of Highways and Streets 2001, shown as Figure 1.

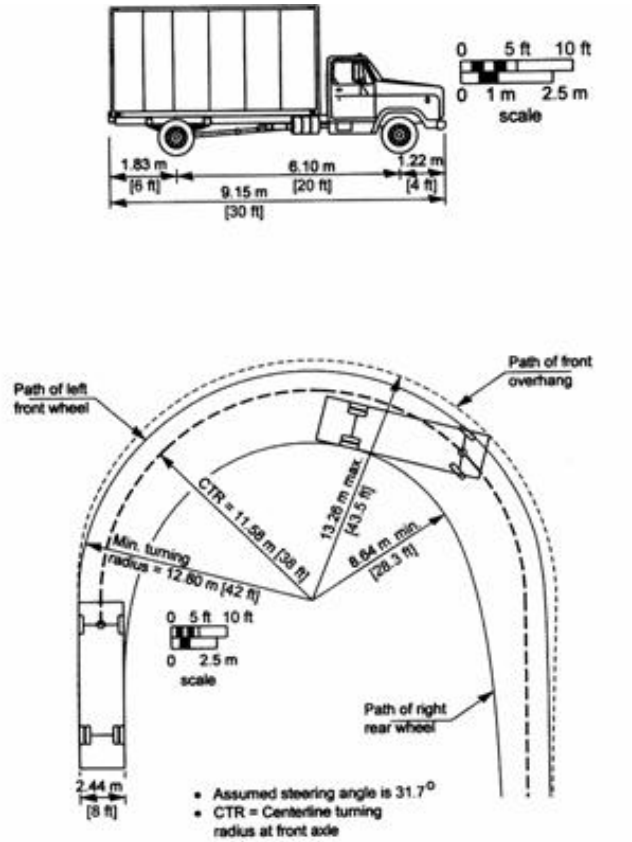

FIGURE 1 - "EXHIBIT 2-4" SCANNED FROM "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," AASHTO, 2001

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2. The typical design criteria for each street should be uniform between intersections. The District Administrator's Designee* may consider modifications as required to satisfy changes in traffic volume or as necessary to address environmentally sensitive areas.

3. Roadway designs should be broadly based on two categories, as depicted in Tables 1 and 2.

    a. Shoulder and Ditch Design
    b. Curb and Gutter Design, further defined by the land use served by the street – residential or nonresidential. (See Section B-4 (G) Curb and Gutter Design).

4. One-way street design criterion is depicted in Table 3.

C. TRANSITIONS AND TURN LANES

1. Left or right turn lanes should be provided at intersections when the department or locality determines that projected turning movements or safety warrants their installation. These facilities shall be designed in accordance with the appropriate provisions of Appendix C of the department's Road Design Manual or other traffic impact tools specifically approved for use by the District Administrator. Where necessary, additional right-of-way width shall be provided to accommodate these facilities.

2. Normally where roadway section widths change, the centerline should not be offset. The length of the transition should be calculated using the following formula for design speeds less than 45 mph.

$$L = S^2W \div 60$$

L = length of transition
S = Design Speed
W = Width of offset on each side

Ex. Road narrows from 36' to 30'. Design speed is 25 mph.
625 (3) ÷ 60= 31.25 ft

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GEOMETRIC DESIGN STANDARDS FOR RESIDENTIAL SUBDIVISION STREETS (GS- SSR)

TABLE 1– CURB AND GUTTER SECTION*

PROJECTED TRAFFIC VOLUME (ADT)	MINIMUM DESIGN SPEED (MPH) (NOT POSTED SPEED)	HORIZONTAL AND VERTICAL CONTROLS Maximum 2:1 Cut or Fill Slope Preferred 3:1 Cut or Fill Slopes					CURB AND GUTTER ROADWAYS (Minimum Widths Measured Face of Curb to Face of Curb)		
		CURVE DATA		MAXIMUM % GRADE	MINIMUM SIGHT DISTANCE		NO PARKING (6)	PARKING 1 SIDE (2)	PARKING BOTH SIDES (2)
		MINIMUM CENTERLINE RADIUS (5)	SUPER-ELEV.		STOPPING (3)	INTERSECTIONS (4)			
UP TO 2000	20	107’	NONE	NOTE (7)	115’	225’	24’ (1)	24’ (1)	29’ (1)
2001 TO 4000	30	335’	NONE	NOTE (8)	200’	335’	26’	31’	36’

NOTES:

For streets with volumes over 4000 or serving heavy commercial or Industrial traffic; use the appropriate geometric design standard. (see VDOT’s Road Design Manual)

The roadway with the highest volume will govern the sight distance.

Right of Way requirements can be found in Section B-4.1 Right Of Way

For volumes 2001 – 4000 vpd, design criteria for the Collector functional class was utilized to determine minimum design values.

1. If the Local Street has 1 point of access, then the roadway width must meet design values (2001 to 4000 vpd).
2. With parking lanes, the horizontal clearance (measured from face of curb) is 1.5’ (Min). 2004 AASHTO Green Book Chapter 5 (Page 399). However, VDOT has established a 3’ minimum setback requirement behind the curb (This Manual, Section B-5, Figure 10).
3. 2004 AASHTO Green Book Chapter 3 (Page 112, Exhibit 3-1)
4. 2004 AASHTO Green Book Chapter 9 (Page 661, Exhibit 9-55). For grades greater than 3%, the time gap must be adjusted and required sight distance recalculated.
5. 2004 AASHTO Green Book Chapter 3 (Page 151, Exhibit 3-16)
6. Horizontal clearance (measured from face of curb) is 1.5’ (Min) 2004 AASHTO Green Book Chapter 5 (Page 399).
7. 2004 AASHTO Green Book Chapter 5 (Page 391).
8. 2004 AASHTO Green Book Chapter 6 (Page 432).

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GEOMETRIC DESIGN STANDARDS FOR RESIDENTIAL SUBDIVISION STREETS (GS- SSR)

TABLE 2 – SHOULDER AND DITCH SECTION

PROJECTED TRAFFIC VOLUME (ADT)	MINIMUM DESIGN SPEED (MPH) (NOT POSTED SPEED)	HORIZONTAL AND VERTICAL CONTROLS Maximum 2:1 Cut or Fill Slope					SHOULDER AND DITCH ROADWAYS Minimum ditch width (front slope) should be 4 feet or greater, based on slopes of 3:1 or flatter (Gentler slopes promote homeowner maintenance of ditches) (9)			
		CURVE DATA		MAXIMUM % GRADE	MINIMUM SIGHT DISTANCE		MINIMUM PAVEMENT WIDTH (2)			MIN. TOTAL WIDTH OF SHOULDER (11) (10)
		MINIMUM CENTERLINE RADIUS (5)	SUPER-ELEV.		STOPPING (3)	INTER-SECTION (4)	NO PARKING (6)	PARKING 1 SIDE (6)	PARKING BOTH SIDES (6)	
UP TO 2000	20	107’	NONE	NOTE (7)	115’	225’	24’ (1)	24’ (1)	29’ (1)	6’
2001 TO 4000	30	335’	NONE	NOTE (8)	200’	335’	26’	31’	36’	8’

NOTES:

For streets with volumes over 4000 or serving heavy commercial or industrial traffic; use the appropriate geometric design standard. (see VDOT’s Road Design Manual).

The roadway with the highest volume will govern the sight distance.

Right Of Way requirements can be found in Section B-4.1 Right Of Way.

For volumes 2001 – 4000 vpd, design criteria for the Collector functional class was utilized to determine minimum design values

1. If the Local Street has 1 point of access, then the roadway width must meet design values (2001 TO 4000 vpd).
2. Pavement width includes 2’ full depth paved shoulder on each side of the roadway.
3. 2004 AASHTO Green Book Chapter 3 (Page 112, Exhibit 3-1)
4. 2004 AASHTO Green Book Chapter 9 (Page 661, Exhibit 9-55). For grades greater than 3%, the time gap must be adjusted and required sight distance recalculated.
5. 2004 AASHTO Green Book Chapter 3 (Page 151, Exhibit 3-16)
6. Clear zone width for UP TO 2000 vpd is 7’ and clear zone values for 2001 TO 4000 vpd is 10’.
7. 2004 AASHTO Green Book Chapter 5 (Page 391)
8. 2004 AASHTO Green Book Chapter 6 (Page 432)
9. If sidewalk is not constructed, use 6’ wide 4:1 front ditch slopes. This provides for the appropriate clear zone requirements for 0 – 4000 vpd roadways.
10. 2004 AASHTO Green Book Chapter 5 (Page 384, Exhibit 5-5)
11. Add an additional 3’ if guardrail is required.*

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GEOMETRIC DESIGN STANDARDS FOR RESIDENTIAL SUBDIVISION STREETS (GS- SSR)

TABLE 3 – ONE-LANE (ONE-WAY) SUBDIVISION STREETS

TRAFFIC	PROJECTED TRAFFIC VOLUME (ADT)	DESIGN SPEED (MPH) (NOT POSTED SPEED)	HORIZONTAL AND VERTICAL CONTROLS Maximum 2:1 cut or fill slope				ROADWAY SECTION CRITERIA					
					MINIMUM SIGHT DISTANCE		SHOULDER AND DITCH ROADWAYS Minimum ditch width (front slope) should be 4 feet or greater, based on slopes of 3:1 (Gentler slopes promote homeowner maintenance of ditches) *Width includes 3' for G.R. installation.				CURB AND GUTTER ROADWAYS	
			MINIMUM CURVE RADIUS (WITHOUT SUPERELEV.)	MAXIMUM % GRADE	STOPPING	INTERSECTION	TOTAL ROADWAY WIDTH	FILL WITH G.R.	CUT OR FILL W/O G.R.	CLEAR ZONE (FROM EDGE OF TRAVELWAY)	CURB TO CURB WIDTH WITH OR WITHIOUT PARKING ON ONE SIDE	CLEAR ZONE (FROM FACE OF CURB)
ONE-WAY (1- LANE)	≤ 400	20	107' (4)	NOTE (2)	95' (5)	90' (6)	Note (7)	5'	2' (1)	6' (3)	NOTE (7)	1.5'

NOTES:

These design standards may also be used for one-way divided pairs, such as subdivision entrances with wide medians.

On-street parking is anticipated; a parking lane width not less than 7 feet should be used.

Right Of Way requirements can be found in Section B-4.1 Right of Way.

1. *2004 AASHTO Green Book Chapter 5 (Page 384 – Exhibit 5-5)
2. 2004 AASHTO Green Book Chapter 5 (Page 391)
3. Clear zone widths may be reduced with the concurrence of the District Administrator's Designee where terrain or social/environmental impact considerations are appropriate. (AASHTO 2001 Very Low Volume Local Roads Guide Chapter 4, Page 48)
4. AASHTO 2004 Green Book Chapter 3 (Page 151, Exhibit 3-16)
5. AASHTO 2001 Very Low Volume Local Roads Chapter 4 (Page 34, Exhibit 8)
6. AASHTO 2001 Very Low Volume Local Roads Chapter 4 (Page 45, Exhibit 14, August 2002 Errata)
7. For appropriate design values for total roadway width, SEE AASHTO 2001 Very Low Volume Local Roads Guide (Page 20, Exhibit 2).

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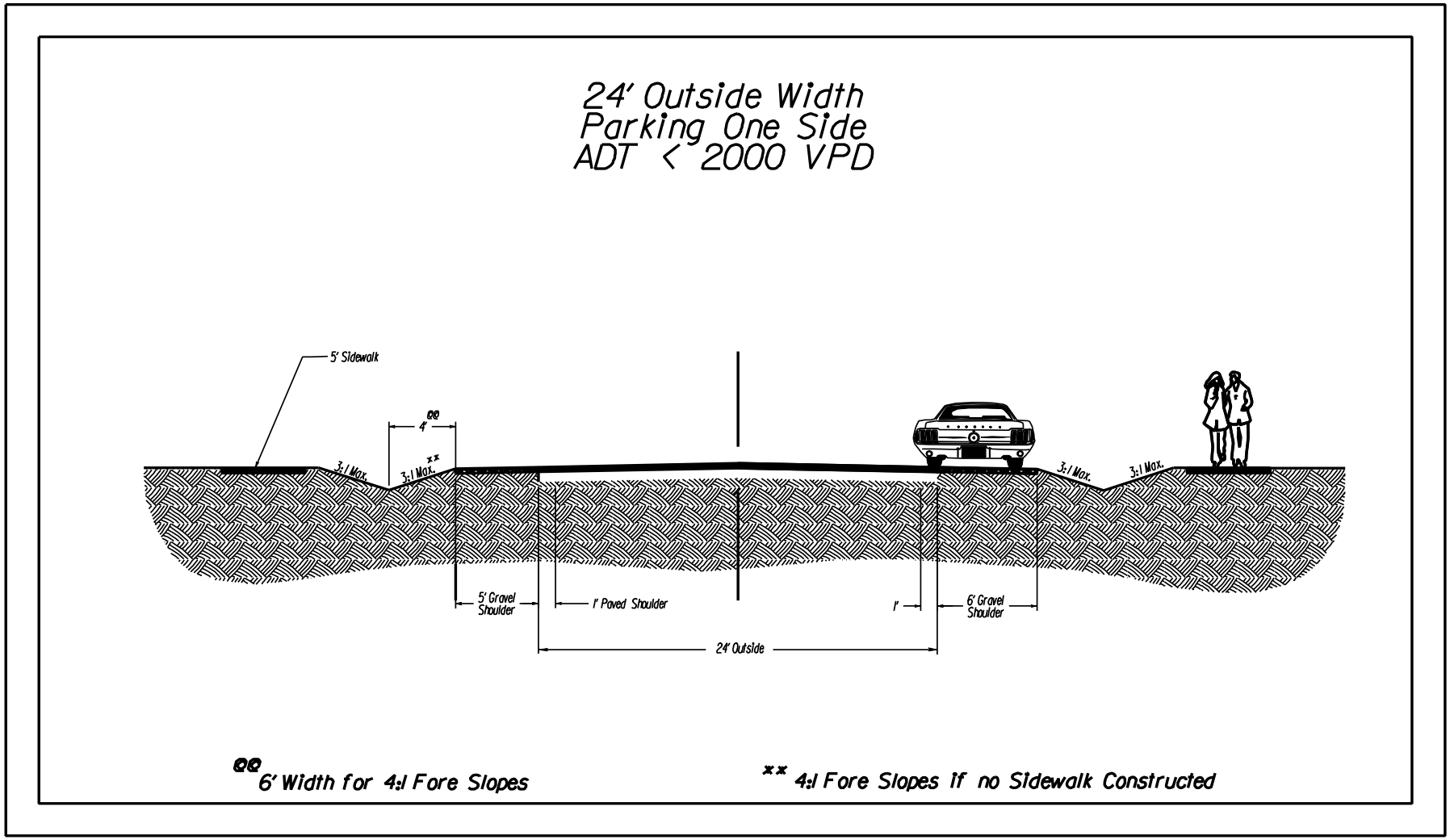

FIGURE 1.1 - 24' OUTSIDE WIDTH PARKING ONE SIDE*

* Added 3/09

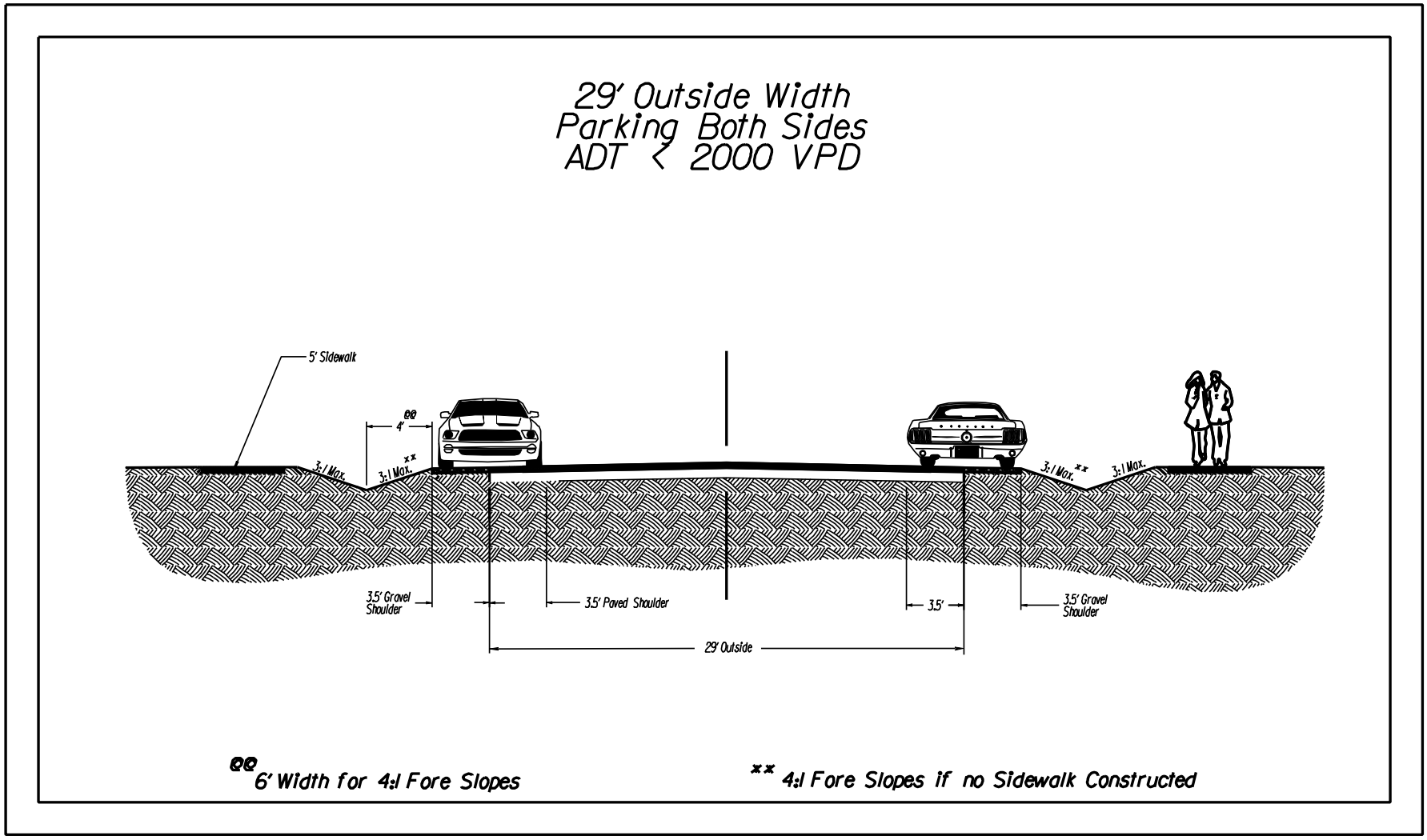

FIGURE 1.2 – 29' OUTSIDE WIDTH PARKING ON BOTH SIDES*

* Added 3/09

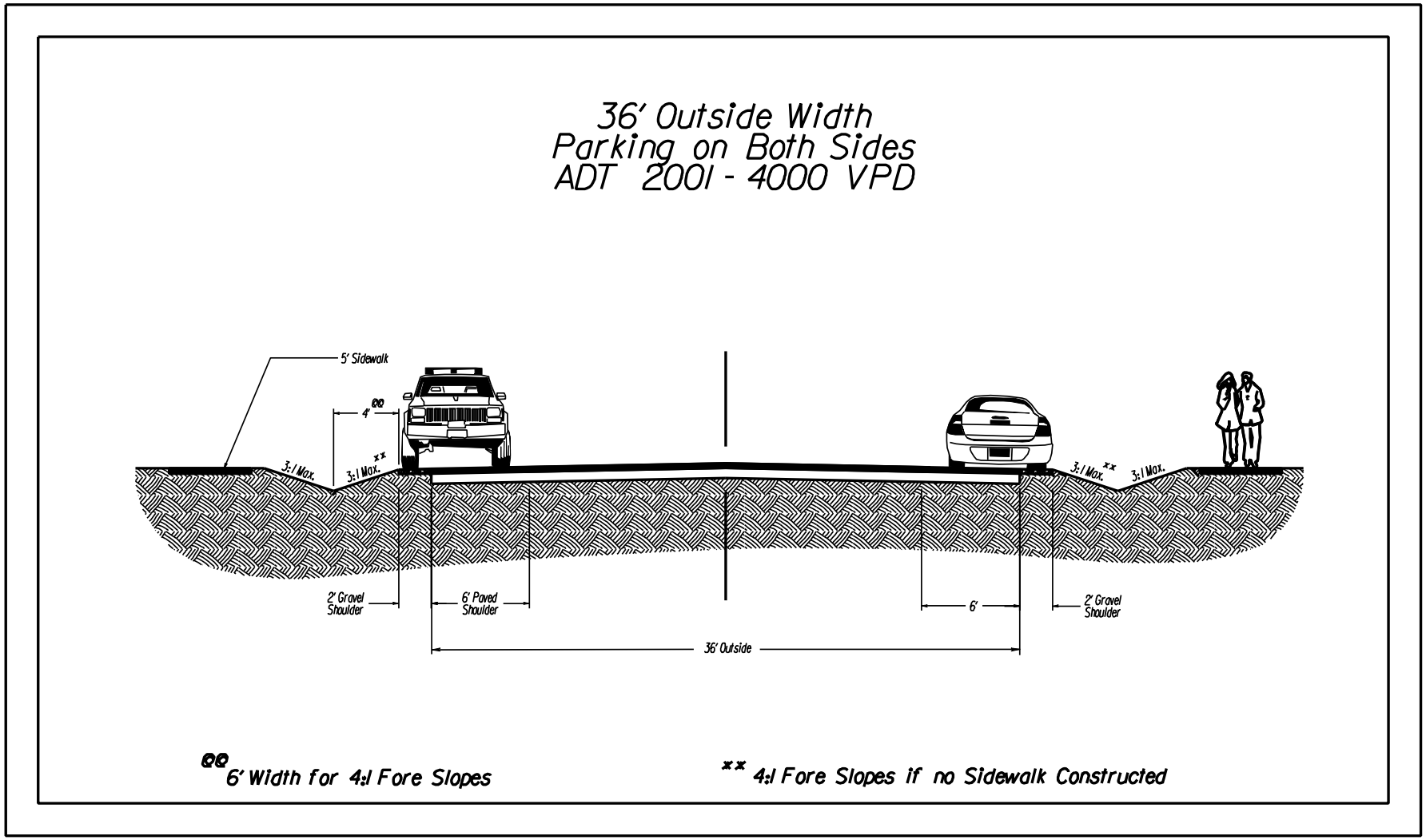

FIGURE 1.3 OUTSIDE WIDTH PARKING ON BOTH SIDES*

* Added 3/09

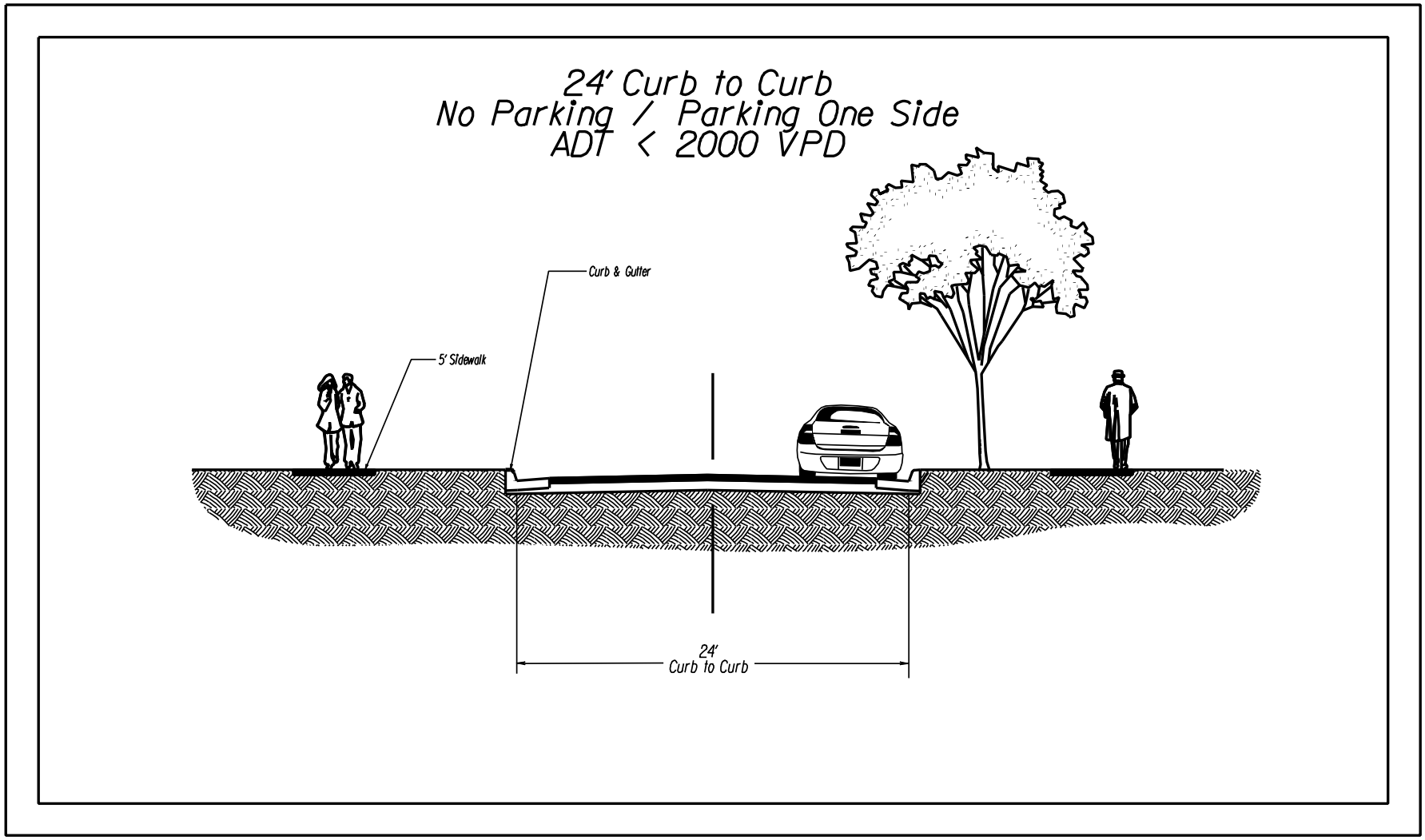

FIGURE 1.4 – 24' CURB TO CURB NO PARKING / PARKING ON ONE SIDE*

* Added 3/09