

White paper for 2021-841

Short Title: ORD-MC Amend Sec 656.1218 (Intersection Visibility), Subpart C (Landscaping Requirements), Pt 12 (Landscape & Tree Protection Regulations), Chapt 656 (Zoning Code), Ord Code, to Clarify the Measurement of Sight Triangles; Amend Sec 804.617 (Obstructing Visibility), Pt 6 (Misc Driving Rules), Chapt 804 (Jax Traffic Code), Ord Code, to Clarify the Difference in Measurement btwn an Obstruction within a Sight Visibility Triangle Created by a Sign, Poster or Vegetation & the Measurement for Sight Visibility Relative to a Structure.

Objective: Provide safety design standard for street intersection visibility consistent with Florida Department of Transportation that is more specific to individual circumstances, and that would also allow structures to be placed closer to the right-of-way line than currently allowed by the City's "25-foot Triangle Rule."

Background: Assuring that drivers have adequate visibility when entering an intersection is very important. The Florida Department of Transportation (FDOT) has intersection visibility standards and criteria for state roads. However, for local roads we do not have the same type of standards. There are two sections in our Ordinance Code that appear to address the issue but upon closer reading are not the most suitable for the protection of public safety or flexibility of site design for the location of buildings. Application of these two sections in the Ordinance Code, which for purposes of this document we will refer to as the "25-foot Triangle Rule" have resulted in applications that limit development and redevelopment, but do not protect the driving public.

Landscape Code and the 25-foot Triangle Rule. The first local Code section that states the 25-foot Triangle Rule is Sec. 656.1218 (Intersection visibility), which is located in the Landscape Code portion of Jacksonville's Zoning Code. The triangle is created by the intersection of two right-of-way lines, and from that point of intersection you measure 25 feet down each line, and then connect those endpoints, creating a triangle. See **Exhibit A** for an illustration of the triangle. The 25-foot Triangle Rule is interpreted to prohibit "any obstruction" between 2 feet and 8 feet above the pavement within the triangle. Although this regulation is the Landscape Code, "any obstruction" is interpreted to include buildings. See page 2 of proposed ordinance 2021-841.

Sec. 656.1218 is within Subpart C (Landscaping Requirements) of the Landscape Code, which is applicable to "all new landscapes and irrigations systems." It does not say that it is applicable to "all development," but even if it did, Sec. 656.1218 itself speaks of intersections of "accessways" within a "vehicular use area." In plain English, this refers to the intersection of parking lot drive aisles, and also the intersection of a parking lot drive aisle with a road right-of-way. Because this is in the Landscape Code, it is most likely that the drafters would have been referring to proposed *landscaping* that would interfere with a driver's visibility. In a proper landscape design, it is important that a driver be able to see above groundcover and shrubs, and below the tree canopy, which is why there should be a clear area between 2 feet and 8 feet from the pavement.

Drive aisles within a parking lot are typically twenty (20) to 24 feet wide. Thus, when drive aisles intersect with each other, or with a street right-of-way, there is a limited set of circumstances that can occur regarding visibility, thus subsection (a) and (b) of the existing ordinance, which occurs on page 2, lines 14 through 23 of Ordinance 2021-841 have not been changed.

What has been changed is the removal of subsection (c) which refers to the intersection of street rights-of-way. Since road intersections relate to traffic, this would be best addressed in our Traffic Code rather than also in the Landscape Code.

Traffic Code and the 25-foot Triangle Rule. The second local Code section is Sec. 804.617 (Obstructing Visibility) which is in Jacksonville's Traffic Code portion of our Ordinance Code. This Code section also currently requires the measurement from the intersection of two right-of-way lines down each line 25 feet, and then across to create a sight triangle. But in this section in the Traffic Code, the items regulated within that triangle are a "sign, card, poster, pennant, banner, bush, tree, hedge or other obstruction," either on private property or within the City right-of-way. Although the drafters may have meant the "other obstruction" to mean other items like banners, posters, etc., it is being interpreted to also mean buildings.

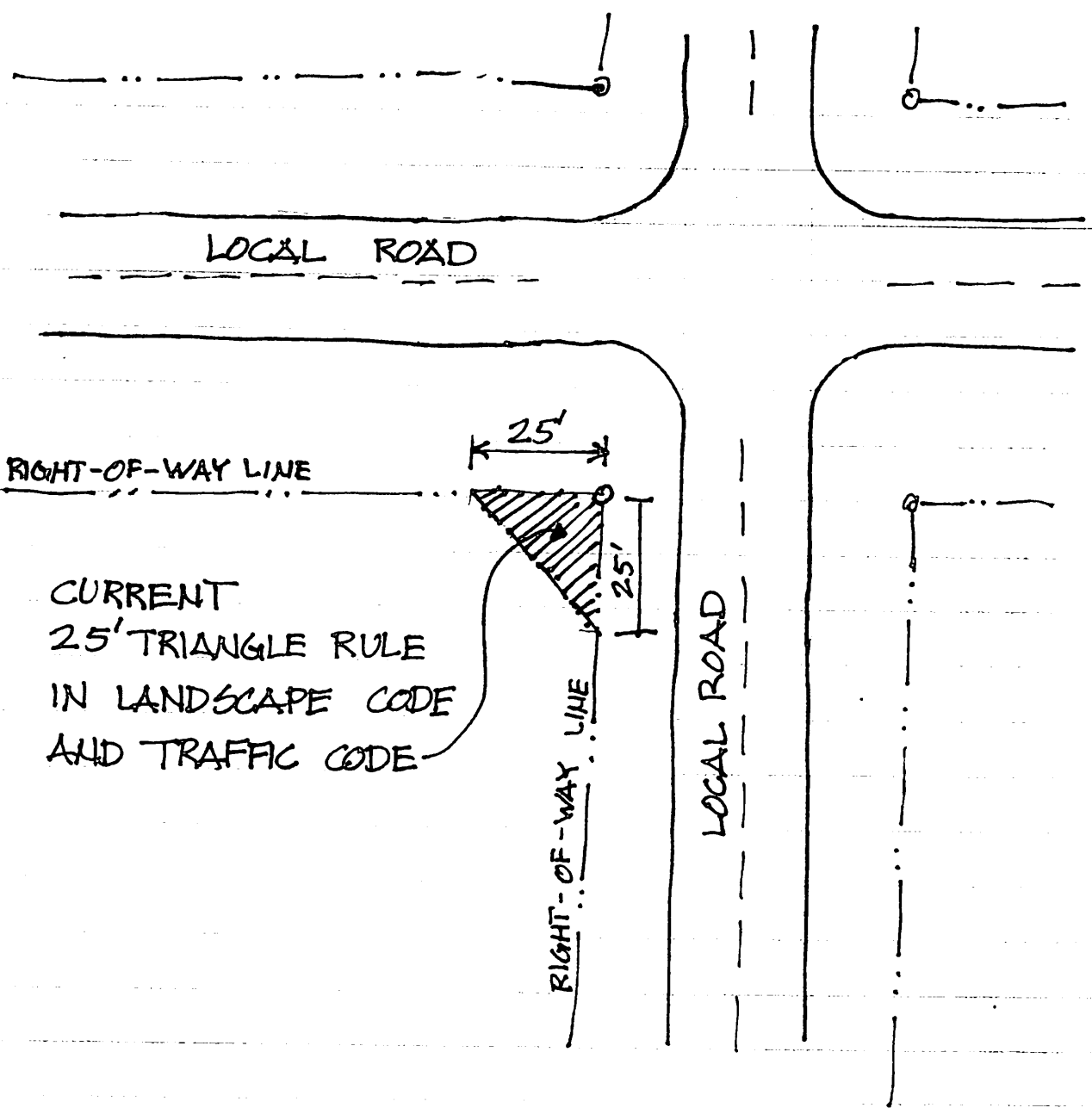
Since intersection visibility relates to traffic circulation, a usable standard for the circumstance of intersecting local roads should be located in the Traffic Code. The widths of street rights-of-way vary greatly. Some local rights-of-way are as narrow as 30 feet, and some are 100 feet or more. Because of this variation, measuring 25 feet down from the intersection of right-of-way lines does not address what a driver would actually see from their perspective as a driver. The genesis of this 25-foot rule is unknown, but it does not seem to address driver safety.

In practice, some development permit applicants have been given individual consideration for the location of structures (obstructions) within the 25-foot triangle because a persuasive argument has been made to the City's Traffic Engineer or Planning Director that the FDOT standard would be more applicable to the situation.

The FDOT standard is found in their Design Manual, in Section 212.11, which describes Clear Sight Triangles. See attached **Exhibit B**. The Design Manual is currently dated January 1, 2021, but is updated on a regular basis. Rather than just a standard 25 feet from the intersecting right-of-way lines, the FDOT regulation considers the eye-position of the driver and the vehicle stopping position. It also considers the speed limit of the roadways, and whether the vehicle is a passenger vehicle or a larger vehicle. Since the point of any sight triangle is whether the driver can see oncoming traffic, it makes sense that a regulation should be geared toward what the driver can see, rather than an arbitrary measurement down right-of-way lines.

Exhibit C, attached, compares the City's existing 25-foot Triangle Rule with the FDOT standard in a real world example of the intersection of Arlington Road and Romney Street. This graphic shows that the visibility required for a driver, and the "triangle" that is created in order for the driver to see oncoming traffic, is much flatter than the 25-foot Triangle Rule. This flatter triangle has the benefit of addressing driver safety, and would also allow buildings to be built much closer to the right-of-way.

How 2021-841 meets the objective: This bill revises two areas of the Ordinance Code: Sec. 656.1218 (Intersection visibility) which is in the Landscape Code portion of the Zoning Code; and Sec. 804.617 (Obstructing Visibility) which is in Jacksonville's Traffic Code portion of our Ordinance Code. The Traffic Code will be the place where the design standard will be located, and the standard will be based upon the FDOT Design Manual section on Clear Sight Triangles. If a circumstance occurs that is not covered in the FDOT Design Manual, then the City's Traffic Engineer will be consulted for a decision on the most appropriate placement of any structure.



For the central part of the turn the use of compound curves is not necessary and the use of simple curves is satisfactory. **Table 212.9.2** provides control radii for minimum-speed turns (10 to 15 mph) that can be used for establishing the location of the median ends.

Table 212.9.2 Control Radii for Minimum Speed Turns

Design Vehicles Accommodated	Control Radius (feet)			
	50 (40 min)	60 (50 min)	75	130
Predominant	P	SU-30	SU-40, WB-40	WB-62FL
Occasional	SU-30	SU-40, WB-40	WB-62	WB-67

212.9.1 U-Turns

Median width should accommodate passenger vehicle (P) left-turn and U-turn maneuvers. If adequate median width does not exist for accommodating U-turns, then consider adding extra pavement width such as a taper or additional shoulder width. See **FDM 210.3** for information on median width criteria.

In cases where U-turn traffic volumes are high, consider the use of jug handles, loop designs, or indirect left turn designs.

212.10 Stopping Sight Distance

See **FDM 210.11.1** for stopping sight distance requirements.



212.11 Clear Sight Triangles

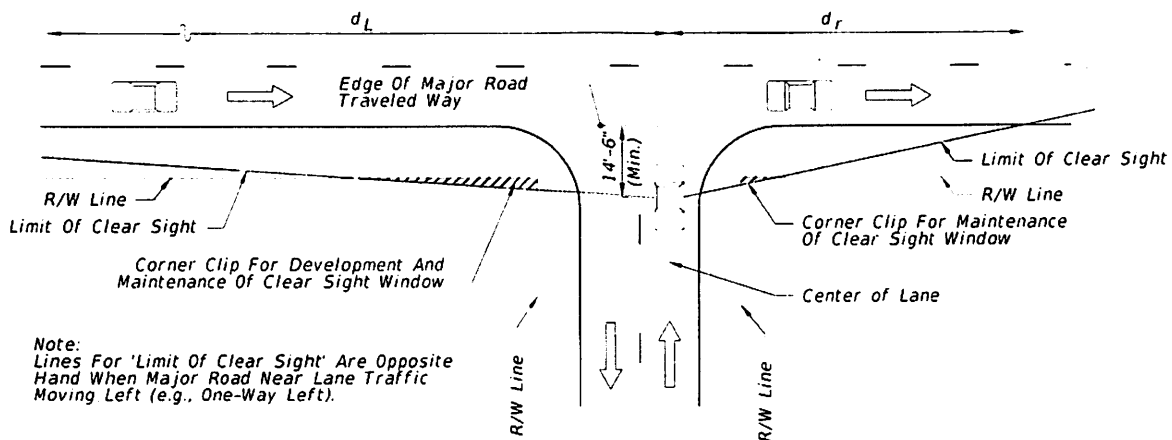
Establish clear sight triangles to assure that drivers are provided a sufficient view of the intersecting highway to identify gaps in traffic and decide when it is safe to proceed. Document the analysis of sight distance for all intersections.

Clear sight triangles are the areas along intersection approach legs and across their common corners that should be clear of visual hindrances. Dimensions of clear sight triangles are based on design speed, design vehicle, and the type of traffic control used at the intersection.

212.11.1 Stop Control (AASHTO Case B)

Figure 212.11.1 illustrates clear sight triangles for intersections and driveways.

Figure 212.11.1 Clear Sight Triangles



The minimum driver-eye setback of 14.5 feet from the edge of the traveled way may be adjusted on any intersection leg only when justified by a documented, site-specific field study of vehicle stopping position and driver-eye position.

Exhibits 212-4 through **212-7** provide intersection sight distances for stop controlled intersections. The tables in the exhibits provide sight distance values for Passenger vehicles, Single Unit (SU) Trucks, and Combination vehicles for design speeds ranging from 30 mph to 65 mph. Intersection sight distance based on Passenger vehicles is suitable for most intersections; however, consider the values for SU Vehicles or Combination vehicles for intersections with high truck volumes.

The following guidance applies to **Exhibits 212-4** through **212-7**:

- (1) Limitations
 - (a) The exhibits apply to intersections in all context classifications with stop control or flashing beacon control.
 - (b) The exhibits apply only to intersections with intersecting angles between 60° and 120°, and where vertical and horizontal curves are not present.

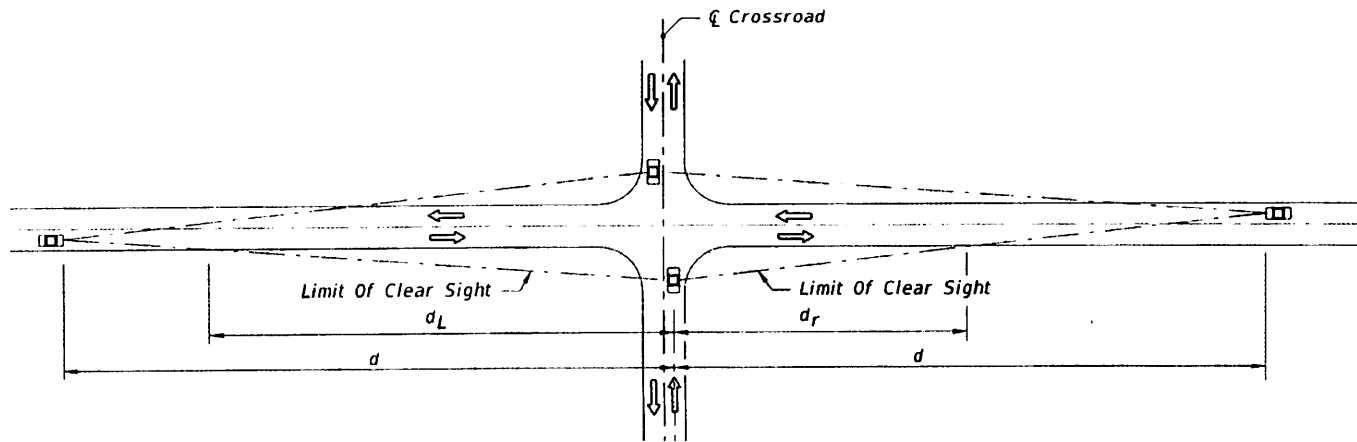
(2) Dimensions

- (a) Sight distance (d) is measured from the center of the entrance lane of the crossroad to the center of the near approach lane (right or left) of the highway.**
- (b) Distances 'd_L' and 'd_r' are measured from the centerline of the entrance lane of the crossroad to a point on the edge of the near side outer traffic lane on the highway.**
- (c) Distance 'd_m' is measured from the centerline of the entrance lane of the crossroad to a point on the median clear zone limit or horizontal clearance limit for the far side road of the highway.**

(3) Vertical limits

- (a) Provide a clear sight window throughout the limits of all intersection sight triangles.**
- (b) Provide a clear line of sight between vehicles at intersection stop locations and vehicles on the highway throughout the limits of all intersection sight triangles.**
- (c) The reference datum between roadways is 3'-6" above respective pavements since observations are made in both directions along the line of sight.**

INTERSECTION SIGHT DISTANCE: 2-LANE UNDIV

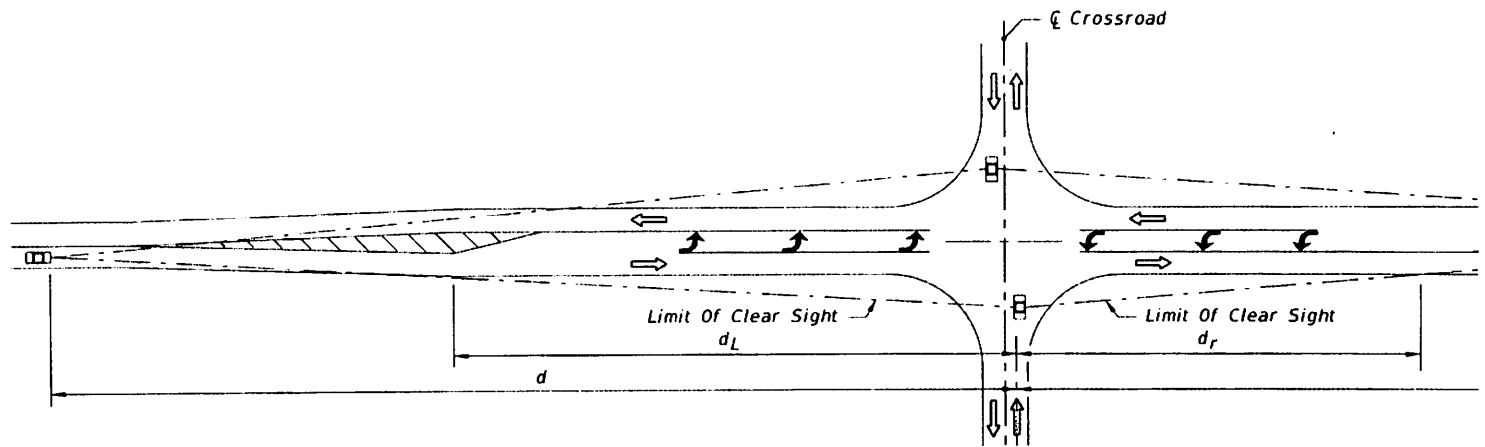


Design Speed (mph)	d (Ft.)
30	330
35	390
40	440
45	500
50	550
55	610
60	660
65	720

Passenger

SIGHT DI

2-LANE UNDIVIDED



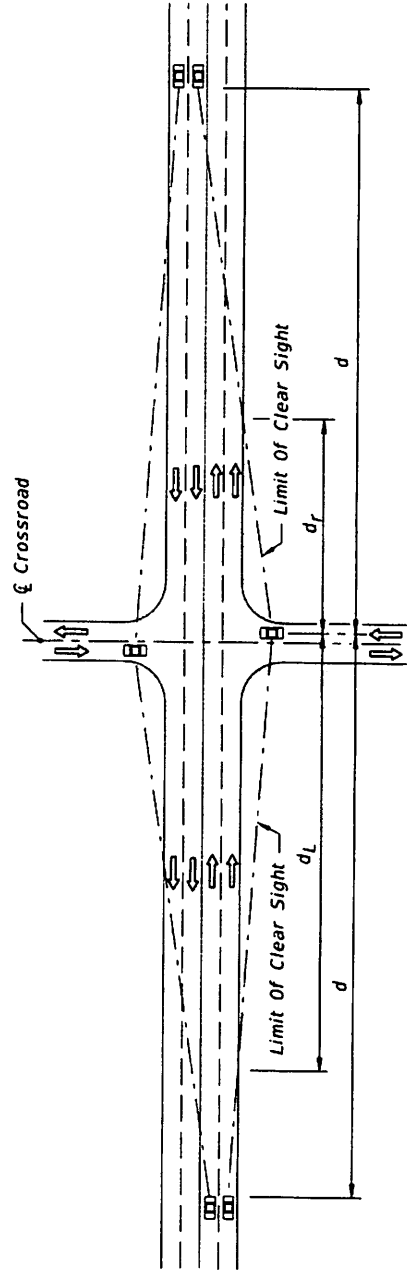
2-LANE WITH LEFT TURN LANE

Design	d	d	d

Design	d	d	d

Design	d	d	d

INTERSECTION SIGHT DISTANCE: 4-LANE UNDIVIDED

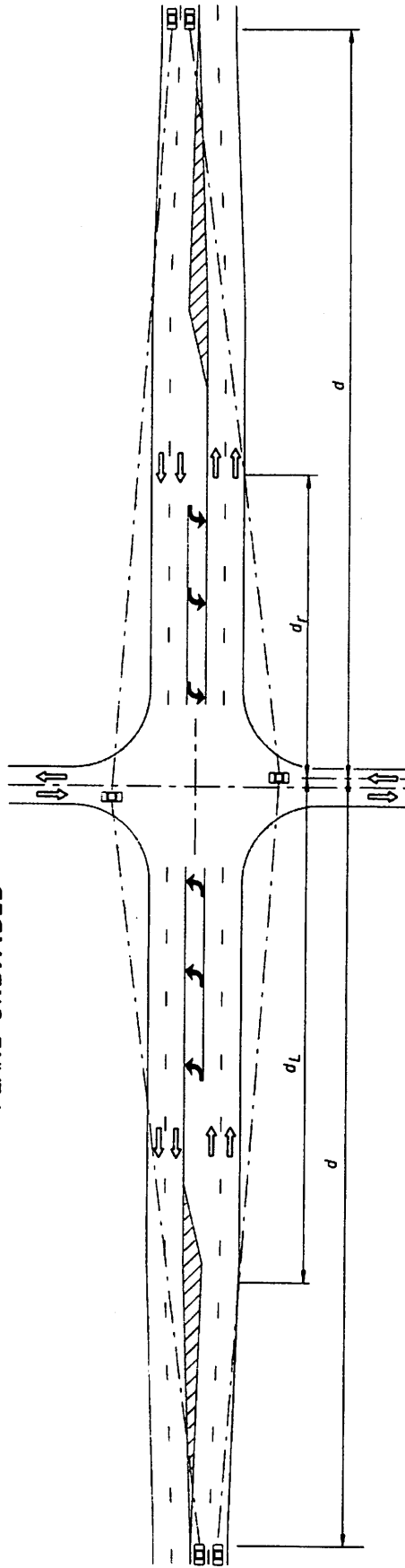


Design Speed (mph)	d (Ft.)	d_L (Ft.)	d_r (Ft.)
30	355	255	120
35	415	295	135
40	475	335	155
45	530	375	175
50	590	420	195
55	650	460	215
60	705	500	230
65	765	545	250

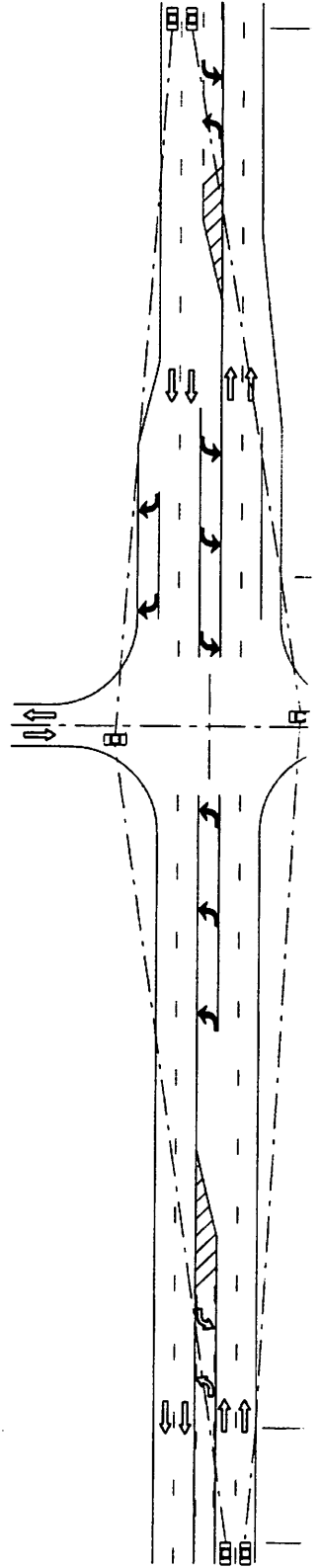
Passenger Vehicle

SIGHT DISTANCE (d) AI 4

4-LANE UNDIVIDED



4-LANE UNDIVIDED WITH LEFT TURN LANE



Design Speed (mph)	30	35	40	45	50	55	60	65
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INTERSECTION SIGHT DISTANCE: 4-LANE DIV

Median 22' or Less				
Design Speed (mph)	d (Ft.)	d_L (Ft.)	d_r (Ft.)	d_m (Ft.)
30	395	280	90	325
35	460	325	100	380
40	525	375	115	430
45	590	420	130	485
50	655	465	145	540
55	720	510	160	590
60	785	555	175	645
65	850	605	185	700

25'-64' Median				
Design Speed (mph)	d (Ft.)	d_L (Ft.)	d_v (Ft.)	d_{vL} (Ft.)
30	355	255	330	240
35	415	295	390	280
40	470	335	445	320
45	530	375	500	360
50	590	420	550	400
55	650	460	610	440
60	705	500	665	480
65	765	545	720	520

Passenger Vehicle

Median 35' or Less				
Design Speed (mph)	d (Ft.)	d_L (Ft.)	d_r (Ft.)	d_m (Ft.)
30	540	385	110	460
35	630	450	125	535
40	720	510	145	615
45	810	575	160	685
50	900	640	180	760
55	990	700	195	840
60	1080	765	215	915
65	1170	830	230	990

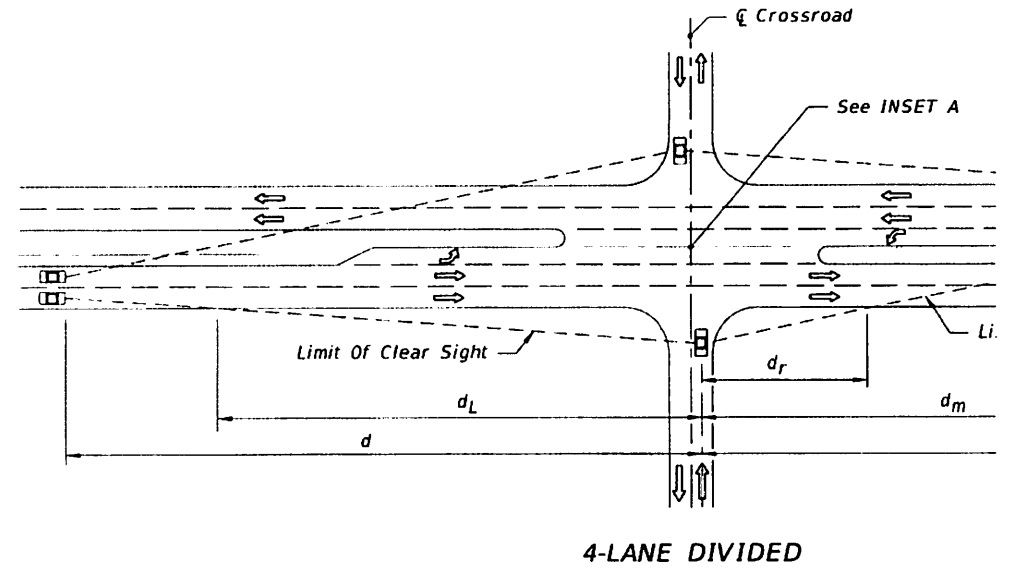
40'-64' Median				
Design Speed (mph)	d (Ft.)	d_L (Ft.)	d_v (Ft.)	d_{vL} (Ft.)
30	450	320	420	330
35	525	375	490	385
40	600	425	560	440
45	675	480	630	490
50	750	530	700	545
55	825	585	770	600
60	900	640	840	655
65	975	690	910	710

SU Vehicle

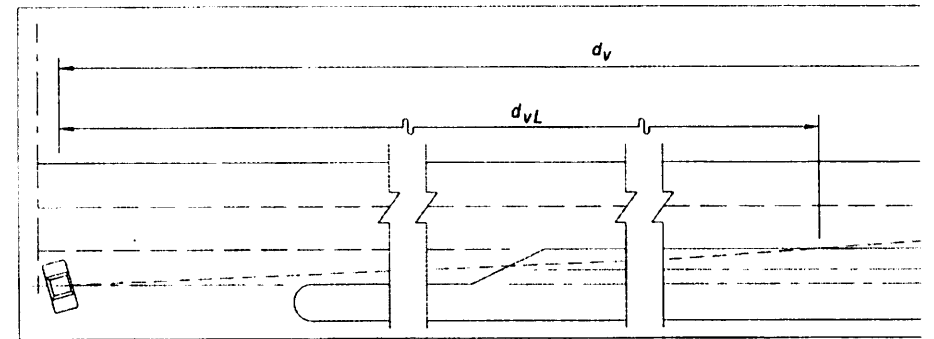
Median 30' or Less				
Design Speed (mph)	d (Ft.)	d_L (Ft.)	d_r (Ft.)	d_m (Ft.)
30	615	435	120	520
35	720	510	140	605
40	820	580	160	690
45	925	655	180	780

35'-50' Median				
Design Speed (mph)	d (Ft.)	d_L (Ft.)	d_r (Ft.)	d_m (Ft.)
30	670	475	105	585
35	780	555	120	680
40	890	630	140	780
45	1000	710	155	875

64' Median				
Design Speed (mph)	d (Ft.)	d_L (Ft.)	d_v (Ft.)	d_{vL} (Ft.)
30	540	385	510	435
35	630	450	595	500
40	720	510	680	575
45	810	575	760	645



4-LANE DIVIDED



Where The Median Is Sufficiently Wide For The Design Vehicle To Pause In The Length Plus 6' Min.) The Clear Line Of Sight To The Right (d_v) Is Measured From Pause Location, i.e., Not From The Cross Road Stop Position; Distances d_r & d_m

INSET A

Vehicle Type	Vehicle Length (Ft.)
Passenger (P)	10

INTERSECTION SIGHT DISTANCE: 6-LANE DIV

Median 22' or Less				
Design Speed (mph)	d_x (Ft.)	d_L (Ft.)	d_r (Ft.)	d_m (Ft.)
30	415	295	80	355
35	485	345	90	415
40	555	395	105	470
45	625	445	115	530
50	690	490	130	585
55	760	540	140	645
60	830	590	155	705
65	900	640	170	765

25'-64' MEDIAN				
Design Speed	d	d_L	d_v	d_{vL}
30	375	265	330	240
35	440	315	385	280
40	500	355	445	320
45	565	400	500	360
50	625	445	555	400
55	690	490	610	440
60	750	530	665	480
65	815	580	720	520

Passenger Vehicle

Median 35' or Less				
Design Speed (mph)	d_x (Ft.)	d_L (Ft.)	d_r (Ft.)	d_m (Ft.)
30	570	405	90	495
35	665	470	105	580
40	760	540	120	660
45	855	605	135	745
50	955	675	155	830
55	1050	745	170	915
60	1145	810	185	995
65	1240	880	200	1080

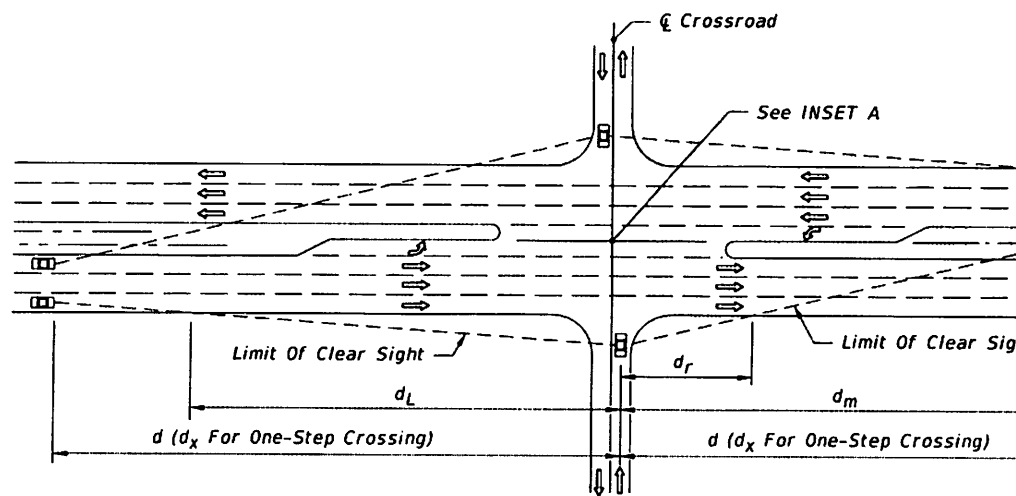
40'-64' Median				
Design Speed (mph)	d	d_L	d_v	d_{vL}
30	480	340	420	330
35	560	400	490	385
40	640	455	560	440
45	720	510	630	490
50	805	570	700	545
55	885	625	770	600
60	965	685	840	665
65	1045	740	910	710

SU Vehicle

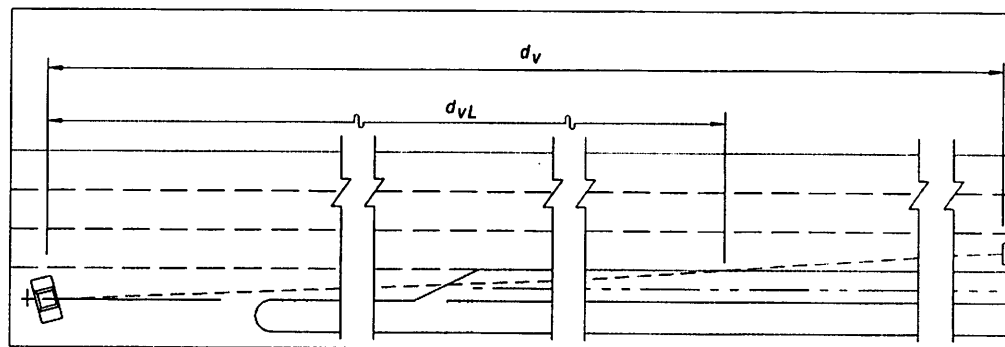
Median 30' or Less				
Design Speed (mph)	d_x (Ft.)	d_L (Ft.)	d_r (Ft.)	d_m (Ft.)
30	650	460	110	560
35	755	535	130	655
40	865	615	145	745

35'-50' Median				
Design Speed (mph)	d_x (Ft.)	d_L (Ft.)	d_r (Ft.)	d_m (Ft.)
30	700	495	95	625
35	815	580	115	725
40	930	660	130	825

64' Median				
Design Speed (mph)	d	d_L	d_v	d_{vL}
30	570	405	510	435
35	665	470	590	500
40	760	540	680	575



6-LANE DIVIDED



Where The Median Is Sufficiently Wide For The Design Vehicle To Pause In The Median (V_v Length Plus 6' Min.) The Clear Line Of Sight To The Right (d_v) Is Measured From The Vehicle Pause Location, i.e., Not From The Cross Road Stop Position; Distances d_r & d_m Do Not

INSET A

Vehicle Type	Vehicle Length (Ft.)
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212.11.2 All-Way Stop Control (AASHTO Case E)

Provide clear sight lines on each of the approach legs for all-way stop controlled intersections.

212.11.3 Signal Control (AASHTO Case D)

For signalized intersections incorporate the following:

- (1) Develop sight distances based on AASHTO 'Case D-Intersections with Signal Control'.
- (2) The first vehicle stopped on any approach leg is visible to the driver of the first vehicle stopped on each of the other approach legs.
- (3) For permissive left turns provide sufficient sight distance for left turning vehicles to select gaps in oncoming traffic and complete left turns.
- (4) If a traffic signal is to be placed on two-way flashing operation (i.e. flashing yellow on the major road approaches and flashing red on the minor road approaches) under off peak or nighttime conditions, then provide the appropriate departure sight triangles for AASHTO Case B (Stop Control on the Minor Road).
- (5) If right turns on red are permitted from any approach leg then provide the appropriate departure sight triangle to the left for AASHTO Case B above.

212.11.4 Left Turn from Highway (AASHTO Case F)

Provide sufficient sight distance to accommodate a left turn maneuver for locations where left turns across opposing traffic are permitted. **Table 212.11.1** provides clear sight distance values for left turn from highway.

For additional information on determining the sight distance refer to Chapter 9 of AASHTO's ***A Policy on Geometric Design of Highways and Streets***.

Table 212.11.1 Sight Distance for Left Turn from Highway

Design Speed (mph)	d_a (feet)								
	1 Lane Crossed			2 Lane Crossed			3 Lane Crossed		
	P	SU	Comb.	P	SU	Comb.	P	SU	Comb.
25-30	245	290	330	265	320	365	290	350	395
35	285	335	385	310	370	425	335	410	460
40	325	385	440	355	425	485	385	465	525
45	365	430	495	400	475	545	430	525	590

Notes:

- (1) Provide a lateral offset (LO) of 6' as shown in the diagram above. d_b may be determined by the equation $d_b = d_a (w/(w+12))$. For roadways with non-restricted conditions, d_a and d_b should be based on the geometry for the left turn storage and on clear zone widths.
- (2) For wide medians where the turning vehicle can approach the through lane at or near 90°, use d values from tables in **Exhibits 212-6** and **212-7**. (The clear sight line origin is assumed to be 14.5 feet from the edge of the near travel lane.)

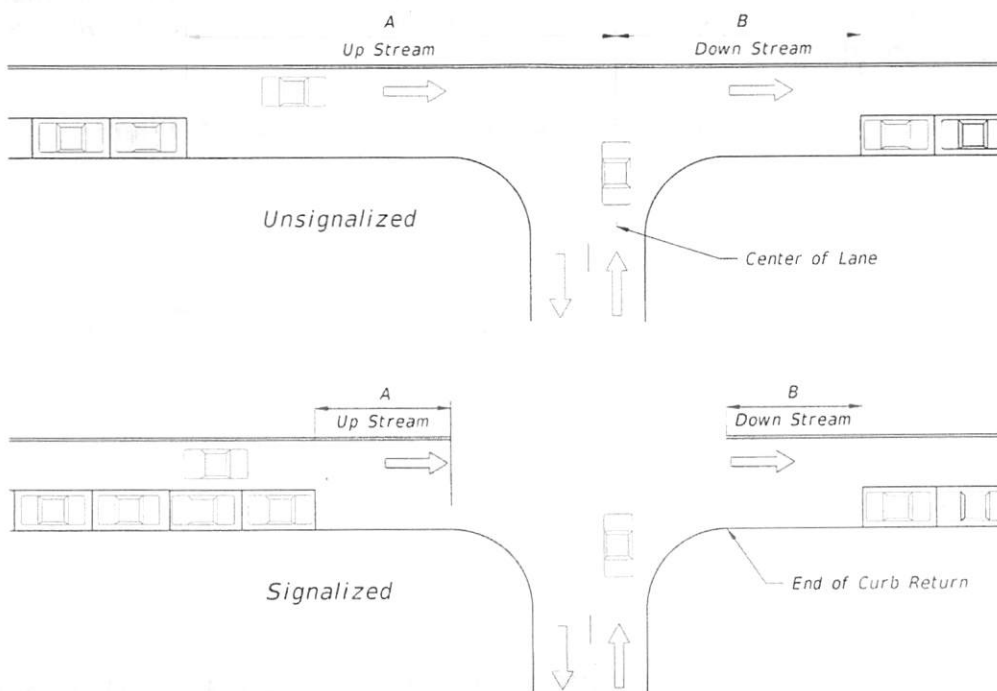
212.11.5 On-Street Parking

Table 212.11.2 provides parking restrictions for intersections; including mid-block crossings and roundabout approaches. For additional information, see the following:

- **FDM 210.2.3** for additional information concerning on-street parking.
- **FDM 222.2.6** for information concerning curb extensions (bulb-outs).
- **Chapter 316, Florida Statutes (F.S.)**, for laws governing parking spaces.

Table 212.11.2 Parking Restrictions for Driveways and Intersections

Control Type	Posted Speed (mph)	A - Up Stream (ft)	B - Down Stream (ft)	
			2-Lane	4-Lane or more
Unsignalized	< 35	90	60	45
	35	105	70	50
Signalized	< 35	30	30	30
	35	50	50	50



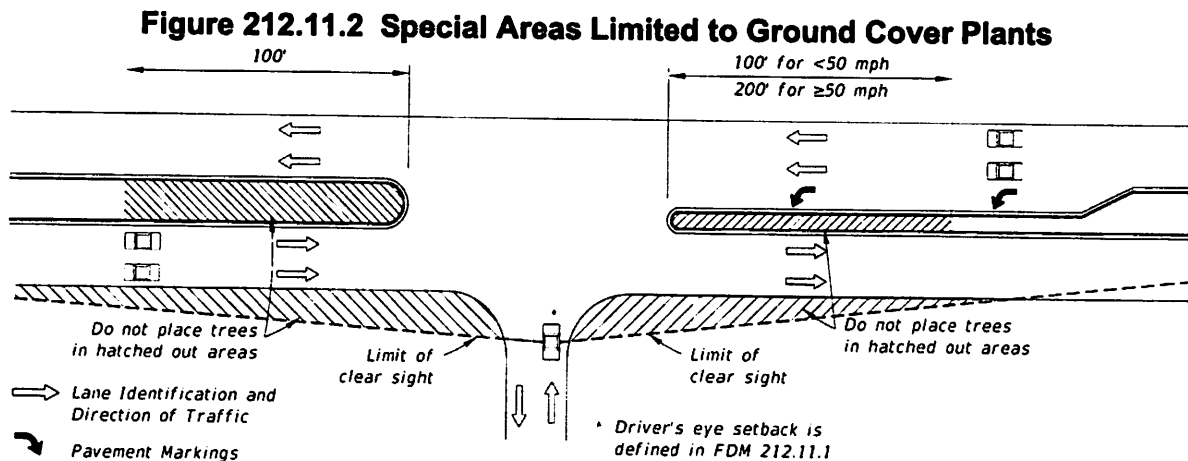
Notes:

- (1) For entrances to one-way streets, the downstream restriction (B) may be reduced to 20 feet.
- (2) Do not place parking within 20 feet of a marked crosswalk.

212.11.6 Trees and Vegetation

Intersections should be designed to accommodate the placement of trees and other desired vegetation (e.g., ground cover plants, trunked plants) in urbanized context classifications while still maintaining clear sight triangles. Ground cover plants are naturally low-growing plants with a maximum mature height of ≤ 18 inches. Trunked plants are those with a mature trunk diameter of 4 inches or less (measured 6 inches above the ground).

Maintain clear sight triangles for all approaches. Do not place trees within the hatched-out areas as shown in **Figure 212.11.2**. The hatched-out areas are for ground cover plants only. Coordinate with the Project Landscape Architect for the placement of vegetation and the necessary space above and below ground for tree growth that will maintain clear sight triangles.

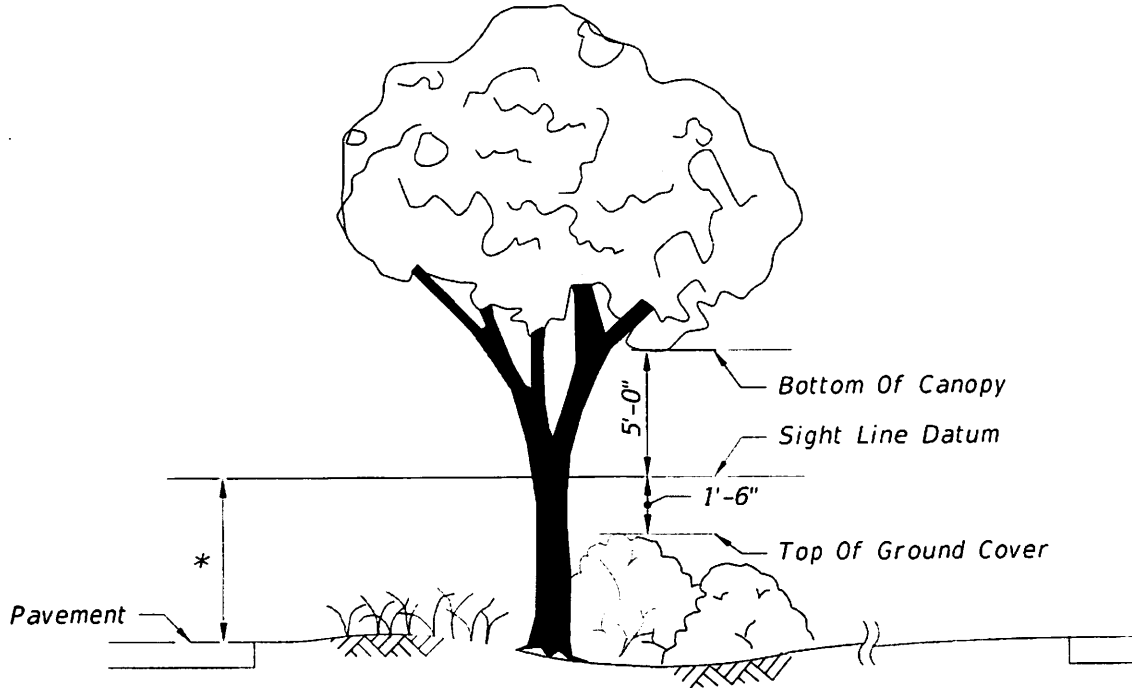


Where left turns from the major road are permitted, do not locate trees within the distance d_b shown in **Table 212.11.1** (see **FDM 212.11.4**) and not less than the distances shown in **Figure 212.11.2** and the spacings in **Table 212.11.3** as applicable.

212.11.6.1 Clear Sight Window Concept

The clear sight window concept may provide opportunities for vegetation within the limits of intersection sight triangles. This concept is illustrated in **Figure 212.11.3**. This detail provides the required vertical clear sight limits with respect to the sight line datum. Do not place trees within the hatched-out areas as shown in **Figure 212.11.2** (even if using the clear sight window concept). The hatched-out areas are for ground cover plants only.

Figure 212.11.3 Window Detail



* Since observations are made in both directions, the line of sight datum between roadways is 3.5 feet above both pavements.

The horizontal limits of the window are defined by clear sight triangles. Within the limits of clear sight triangles, the following restrictions apply:

- Canopy of trees and trunked plants must be at least 5 feet above the sight line datum.
- The top of the ground cover plants must be at least 1.5 feet below the sight line datum.

See **FDM 228.2(2)(a)** for additional information about plant selection and placement. Enforcing these limits provides a clear line of sight for approaches to an intersection.

When trees are located in the median of a divided roadway and fall within the limits of a clear sight triangle, conform to **Table 212.11.3** for tree size and spacing. Spacing values for trees with diameter of 11 inches or less were derived assuming a maximum 6-foot wide shadow band on a vehicle at the stop bar location when viewed by a mainline driver beginning at sight distance 'd'. This is illustrated in **Figure 212.11.4**. Spacing values for

trees with diameter greater than 11 inches and less than or equal to 18 inches were derived assuming a 2 second full view of the vehicle at the stop bar when viewed by the mainline driver beginning at sight distance 'd'. (See **Figure 212.11.5**).

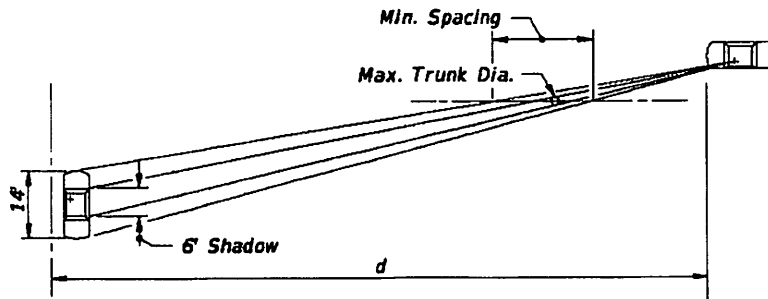
Table 212.11.3 Minimum Tree Spacing

Design Speed (mph)	Minimum Tree Spacing (Center-to-Center of Trunk) (feet)	
	4" < Tree Diameter ≤ 11"	11" < Tree Diameter ≤ 18"
25-30	25	90
35	30	105
40	35	120
45	40	135
50	50	150
55	55	165
60	60	180

Notes:

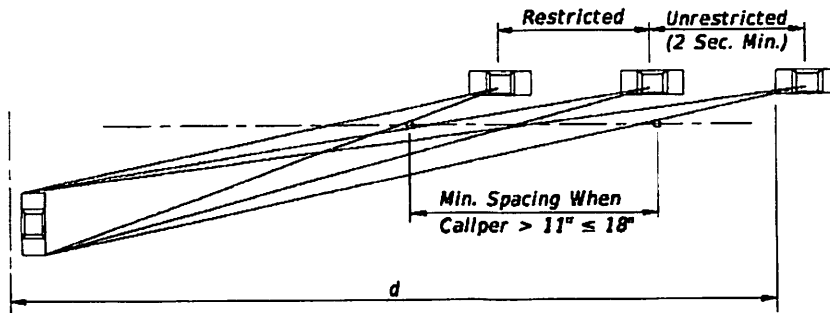
- (1) Size and spacing are based on the following conditions:
 - (a) A single line of trees in the median parallel to but not necessarily collinear with the centerline.
 - (b) A straight approaching mainline and intersection angle between 60° and 120°.
 - (c) Space trees with 4" < Dia. ≤ 11" intermixed with trees with 11" < Dia. ≤ 18" based on trees with 11" < Dia. ≤ 18".
- (2) Detail tree size, spacing, and location in the plans for any other conditions.
- (3) Trunked Plants may be placed on 20 foot centers.

Figure 212.11.4 Shadow Diagram



**SHADOW DIAGRAM
TREE SPACING (DIA. 11" OR LESS)**

Figure 212.11.5 Perception Diagram

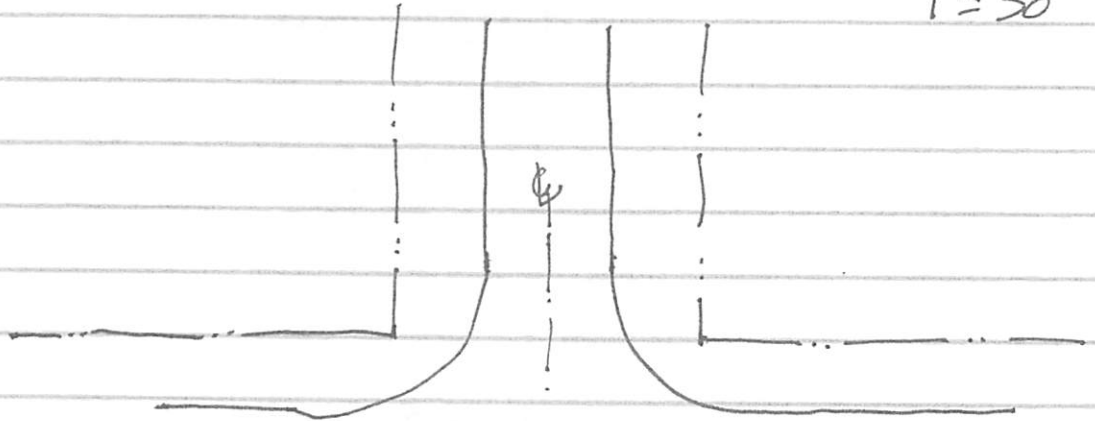


**PERCEPTION DIAGRAM
TREE SPACING (DIA. BETWEEN 11" AND 18")**

EXAMPLE

2021 -
841

1" = 30'



ARLINGTON RD.

FDOT DESIGN MANUAL
EDGE OF TRAVEL
LANE W/NO PARKING

FDOT DESIGN MANUAL
EDGE OF TRAVEL LANE
W/ PARKING

PARKING

29.5'

TRAFFIC/LANDSCAPE
CODE

ROMNEY