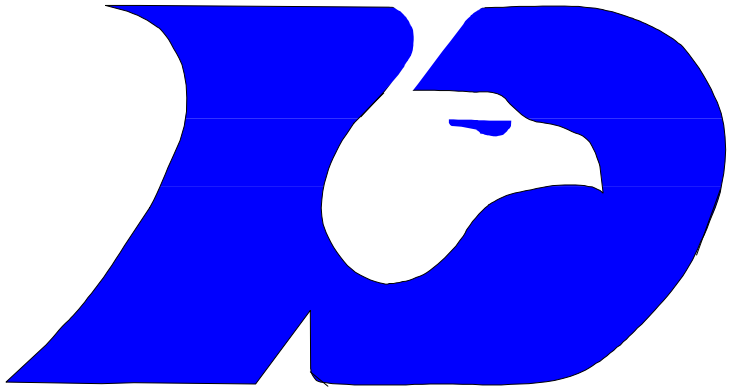
PAVING DESIGN MANUAL



CITY OF DESOTO

DEPARTMENT OF DEVELOPMENT SERVICES

Table of Contents

LIST OF FIGURES

LIST OF TABLES

Section I INTRODUCTION

1.01 PURPOSE

The purpose of the Paving Design Manual is to provide guidelines for designing streets and related appurtenances in the City of DeSoto. These guidelines will be used by the Development Services Department, consulting engineers employed by the City of DeSoto, and engineers for private development in the City of DeSoto. The standards set forth in this document are the minimum criteria permitted by the City of DeSoto to be used in paving design. Unusual circumstances or conditions may arise which require variance from the standards. Any variances from the standards set forth in this manual must be accompanied by written approval from the City Engineer.

1.02 SCOPE

The scope of this Paving Design Manual includes the various design elements, criteria, standards and instructions required to prepare paving plans for the Development Services Department. Included in the manual is the classification of the various streets according to the City Thoroughfare Plan. Geometric design standards to be used on the various classifications and criteria for design of pavement structures are also presented. These minimum guidelines along with the professional judgment of the design engineer should result in the construction of safe, economical, comfortable riding streets and thoroughfares carrying acceptable traffic volumes while providing for pedestrian traffic as well.

Section II STREET CLASSIFICATIONS

2.01 CITY THOROUGHFARE PLAN (General)

The arrangement, character, extent, and location of all streets shall conform to the City of DeSoto Comprehensive Plan. Dimensional classification of City streets establishes the physical dimensions of a thoroughfare, including the number of lanes, right-of-way width and pavement width as set forth in the Thoroughfare Plan for the City of DeSoto.

2.02 ROADWAY DESCRIPTION AND SECTIONS

(1) **Arterial** – The phrase "arterial street" shall be used to designate principal traffic thoroughfares which are more or less continuous across the City, which are intended to connect remote parts of the City or areas adjacent thereto, and act as principal connecting streets with State and Federal Highways. Arterial streets are designated on the Thoroughfare Plan.

(2) **Major Collector** – The phrase "major collector street" shall refer to a street which is more or less continuous across several residential neighborhoods and which, because of its location, continuity and development, tends to supplement and perform some of the functions of a major thoroughfare but is of lesser width.

(3) **Collector -** The phrase "collector street" shall be a street which is continuous through parts of a residential neighborhood and is intended as a connecting street between residential areas and major thoroughfares, freeways or expressways. A collector street is usually not continuous for over one (1) mile.

(4) **Residential** – The phrase "residential street" shall be a street which is intended primarily to service traffic within a neighborhood or limited residential district, and which is not necessarily continuous through several residential districts.

(5) **Industrial or Commercial** – A street intended primarily to serve traffic within an area of industrial or commercial development

(6) **Cul-de-sac** – A street which terminates at one (1) end with a turnaround.

(7) **Alleys** – The phrase "alley" shall refer to a minor traffic way that is primarily used for vehicular service access to the back or side of properties otherwise abutting a street.

Table I and Figures 1 and 2 outline the roadway types and sections as set forth in the Thoroughfare Plan for the City of DeSoto, Texas.

TABLE I
ROADWAY SECTIONS

Type of Roadway	*Pavement Width
Arterial	33' (each direction)
Major Collector	48'
Collector	36' - 40'
Residential	26'

**Face of Curb to Face of Curb*

Section III. STREET DESIGN STANDARDS

3.01 MINIMUM HORIZONTAL RADIUS

Arterial streets shall have a minimum horizontal radius at the centerline of 800 feet; major collector streets shall have a minimum horizontal radius at the centerline of 300 feet; collector or residential streets shall have a minimum horizontal radius at the centerline of 150 feet.

3.02 MINIMUM VERTICAL ALIGNMENT

Vertical alignment is a function of Stopping Sight Distance (SSD) which is given by:`

$$d = 1.47Vt + 1.075\frac{V^2}{a}$$

Where: t = brake reaction time, 2.5 sec;
V = design speed, mph;
a = deceleration rate, ft/s²

Rates of vertical curvature, K, is the length of curve per percent algebraic difference in intersecting grades (A). K = L/A as shown in Table 2 and Table 3.
No vertical curve shall be less than 100 feet in length, unless approved by the City Engineer.

Table 2
Minimum Acceptable Crest Curve Given Speed and
Difference in Grade of Road

S		K	L=KA									
MPH	Ft.		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10
30	200	30	100	100	100	120	150	180	210	240	270	300
35	250	50	100	100	150	200	250	300	350	400	450	500
40	325	80	100	160	240	320	400	480	560	640	720	800
45	400	120	120	240	360	480	600	720	840	960	1080	1200

Table 3
Minimum Acceptable Sag Curve Given Speed and
Difference in Grade of Road

S		K	L=KA									
MPH	Ft.		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10
30	200	40	100	100	120	160	200	240	280	320	360	400
35	250	50	100	100	150	200	250	300	350	400	450	500
40	325	70	100	140	210	280	350	420	490	560	630	700
45	400	90	100	180	270	360	450	540	630	720	810	900

3.03 STREET INTERSECTIONS

(1) Street intersections shall be perpendicular, within a five degree tolerance, at the intersection or the right-of-way lines.

(2 The radius shall be 30 feet at the intersection of arterial and major collector streets, or major collector and major collector streets, and major collector and collector streets, excluding industrial and commercial zoned areas.

(3) The radius shall be 40 feet at the intersection of major collector and arterial streets, or major collector and major collector streets in industrial / commercial zoned areas.

(4) The radius shall be 20 feet at all other intersecting streets.

(5) At intersections, the curb radius encroaches on the right-of-way so as to not provide sufficient room for sidewalks, utilities, etc. within the parkway. Therefore, right-of-way shall be dedicated at the intersection of all streets such that a minimum of 9-1/2 feet of parkway shall be maintained from the back of curb along the curb's radius. 10 feet corner clips shall be provided on residential intersections. 25 feet corner clips shall be provided on major arterial intersections.

(6) Residential or collector streets intersecting major thoroughfares shall be located so as to provide minimum sight distance as indicated in the table below. Sight distance can be calculated using the standards and criteria contained in the "Policy on Geometric Design of Highways and Streets", 2001 - Fourth Edition, American Association of State Highway and Transportation Officials.

Design Speed (MPH)	Sight Distance (Feet)
20	200
25	250
30	300
35	350
40	400
45	450
50	500

3.04 DEAD END STREETS, CUL-DE-SACS

Dead end streets may be platted where the land adjoining the proposed plat has not been developed and the opportunity exists for future extension of the proposed street and shall not exceed 150 feet. In the event that such proposed street exceeds 150 feet in length or one lot width, from the nearest street intersection, the street will be provided with an approved cul-de-sac, turn-around considered as a permanent addition, having a minimum right-of-way radius of 50 feet (minimum concrete pavement radius of 37.50 feet).

Where streets within the proposed subdivision are dictated by lot design to be cul-de-sac, such cul-de-sac streets shall be provided with a permanent cul-de-sac having a minimum right-of-way radius of 50 feet and shall not exceed 600 feet in length except in circumstances dictated by topography and existing development. Future streets that may offer a second point of access shall not be considered when measuring the length of cul-de-sac until the street is actually constructed. In situations where cul-de-sac exceed the prescribed length, a combination of the following based on the number of lots and dwelling units will be considered as a mitigating measure:

(1) A secondary emergency entrance/exit;
(2) Widening of the street and enlarging the cul-de-sac turn-around;
(3) Reduced density along the cul-de-sac, larger lots with fewer homes;
(4) Additional fire hydrants; and
(5) Looped water system.

3.05 RELATION TO ADJOINING STREETS AND LAND

The system of streets designated for the subdivision, except in unusual cases, must connect with streets already dedicated in adjacent subdivision; and where not platted, must be the reasonable projection of streets in the nearest subdivided tracts, and must be continued to the boundaries of the tract subdivided, so that other subdivisions may connect therewith. For streets connecting to arterial or major collector streets, refer to Section VI Median Openings and Left Turn Lanes.

3.06 STREET GRADES

Major streets may have a maximum grade of 6%. Secondary and collector streets may have a maximum grade of 7½%. Minor or local residential streets may have a maximum grade of 7½%.

All streets must have a minimum grade of at least 4/10 (0.40) of 1%. Centerline grade changes with an algebraic difference of 1% or more shall be connected with vertical curves of sufficient length to provide a minimum of 600 feet sight distance on major streets; 400 feet sight distance on secondary or collector streets and minor or local residential streets.

3.07 STREET WIDTHS

Arterial streets shall have a minimum dedicated right-of-way width of 120 feet and a minimum pavement width in accordance with Section II Table 1 Roadway Sections. Major collector streets shall have a minimum dedicated right-of-way width of 70 feet, with a minimum paving width of 48 feet. Collector streets shall have a minimum dedicated right-of-way of 60 feet, with a minimum paving width of 36 to 40 feet. Residential streets shall have a minimum dedicated right-of-way width of 50 feet, with a paving width of 26 feet. Pavement widths are specified from face to face of curb. The minimum right-of-way width of a minor street in an industrial or commercial addition shall be 60 feet.

3.08 STREET CONSTRUCTION STANDARDS

Construction of all streets shall be in strict accordance with current City of DeSoto Paving Standards. The sub-grade on all streets, alleys, median openings and left turn lanes shall be thoroughly compacted and stabilized with hydrated lime for a minimum compacted depth of six inches below the pavement, unless otherwise directed by the City Engineer. Lime stabilized sub-grade shall be in strict accordance with Ordinance Number 170. Upon approval by the City Engineer, Portland cement may be used for sub-grade stabilization of loose - granular type soils. Sub-grade stabilization shall extend a minimum of 1 foot past edge of proposed paving on un-improved street and alley rehabilitation and all streets and alleys in new development.

Streets platted as "private streets" to be used as fire lanes shall be constructed in strict accordance with current City of Desoto Paving Standards. Minimum width of pavement shall be 26 feet. Minimum easement width shall be 50 feet. Any variance must be approved by the City Engineer.

TABLE IV
PAVEMENT STRUCTURES

Street or Thoroughfare Type	Usual Pavement Width (F-F)	Basic Thickness	Pavement Strength
Arterial	33'(each direction)	8"	3000 PSI Compressive
Major Collector	48'	8"	3000 PSI Compressive
Collector	36' to 40'	7"	3000 PSI Compressive
Residential	26'	6"	3000 PSI Compressive

Table IV outlines the pavement structure for each type of roadway section.

NOTES:

1. Alternative pavements designs based on flexural strength may be submitted to the City Engineer for review and consideration.
2. Pavement strengths are minimum requirements based on 28-day test, and flexural tests shall be third point loading.
3. The use of fly ash as a substitute for Portland Cement shall not be allowed.
3. All streets shall include 6-inch monolithic curbs.
4. Mountable curb (lay-down) shall not be allowed within Public Street Rights-of-Way
5. All pavements shall have minimum 6-inch compacted lime stabilized sub-grade.
6. Manually constructed concrete street pavement, turn lanes, intersections, alleys, and street cut repairs shall be constructed of 3600 psi. concrete with vibration in place by means of a mechanical device.

3.08a CONCRETE MIX DESIGN

Concrete for all concrete street and alley pavement, driveway approaches, sidewalk, and drainage structures, shall be Class "A", 3000 psi, five (5) sack Portland Cement (Type I) per cubic yard as specified In the Texas

Department of Transportation Standard Specifications for Construction of Highways, Streets, and Bridges, 2004 Edition, Item 421- Portland Cement Concrete.

Aggregates for Class A concrete shall be either Grade 2 or Grade 3 for coarse aggregate, and grade 1 for fine aggregate as outlined in Item 421 of the Texas Department of Transportation Specifications referenced above.

Minimum curing time for all concrete shall be as outlined in Item 421 of the Texas Department of Transportation Specifications referenced above.

Refer to the City of DeSoto Standard Construction Detail Sheets for specific and/or other construction requirements.

3.08b Hot Mix Asphaltic Concrete Mix Design

Type "B" and Type "D" Hot Mix Asphaltic Concrete for construction of street pavement or repairs shall meet all requirements as specified in the Texas Department of Transportation Standard Specifications for Construction of Highways, Streets, and Bridges, 2004 Edition, Item 340- Dense Graded Hot Mix Asphalt.

Production, hauling, placement, and lay-down operations, compaction, and testing shall be as outlined in Item 340 of the Texas Department of Transportation Specifications referenced above.

3.08c Temporary Batch Plant

If the Contractor chooses to construct a temporary batch plant, the following conditions (at a minimum) must be satisfied prior to approval from the City.

1. Batch plant must be permitted by Texas Air Control Board. Copy of permit shall be provided to the City.
2. Batch plant must be permitted by EPA. A copy of Notice of Content (NOI) and Storm water Pollution Prevention plan must be on the premises.
3. Location map must be provided indicating that the nearest recreational area, school, or residence is located at least 300 feet away.
4. Location map must be provided indicating routes for raw material delivery.

5. A Letter of Permission must be provided by the City of DeSoto of the property (on which the batch plant is to be constructed) requiring that the contractor leave the site in as good or better condition.
6. The start and stop dates for operation of the plant must be provided.
7. It must be stated that the batch plant will be used to provide concrete for no other project(s) without written approval from the City of DeSoto.

3.09 STREET NAME & TRAFFIC CONTROL SIGNS

The developer shall pay the cost of purchasing and installing street posts and markers at each street intersection, which posts and markers shall be of the same type used throughout the City.

3.10 SIDEWALKS

A sidewalk is defined as that paved area in a roadway right-of-way between the curb lines or the edge of pavement of the roadway and the adjacent property lines for pedestrian use. The maximum cross-fall of the sidewalk shall be ¼-inch per foot.

Zoning Classification Requiring Sidewalks: Concrete sidewalks shall be constructed along all streets in all zoning classifications except those zoned agriculture. Sidewalks shall conform to requirements of the Americans with Disabilities Act and the following standards:

(1) For Arterial and Major Collector streets, sidewalks and barrier free ramps shall be constructed in conjunction with capital improvements or as adjacent properties are developed. Sidewalks shall be 6 feet in width and located adjacent to back-of-curb or as directed by the City Engineer. Should it be impractical to install the sidewalk at that time, funds for the sidewalk construction shall be placed in escrow with the City for use at the time when sidewalks are needed. Payment or escrow shall be made at the time of site plan or final plat approval.

(2) Collector Streets (60' R-O-W): Sidewalks shall be 6 feet in width and located 1 foot from the right-of-way line or as directed by the City Engineer. Developer shall be required to construct barrier free ramps at all street and alley intersections. Building contractor shall be required to construct sidewalks in conjunction with building construction, and driveway approach with barrier free ramps where applicable.

(3) Residential Street (50' R-O-W): Sidewalks shall be 5 feet in width and located 1 foot from the right-of-way line or as directed by the City Engineer. Developer shall be required to construct barrier free ramps at all street, alley, and driveway intersections. Building contractor shall be required to construct sidewalks in conjunction with building construction, and driveway approach with barrier free ramps where applicable

(4) Non-Residential Areas: Sidewalks not less than 6 feet in width and barrier free ramps shall be provided upon development in the office, business, commercial and industrial areas.

(5) Sidewalks not less than 5 feet in width and barrier free ramps shall be provided around the perimeter of schools and parks.

(6) Exceptions: In areas without curbs and where routing to clear mailboxes, poles, trees or other obstacles is necessary, location of sidewalks shall be subject to approval by the Engineering Department. In all cases, the specified width of the sidewalk shall be wrapped around the obstacle. All sidewalks shall be constructed in accordance with City of DeSoto Standard Specifications for sidewalks.

Section IV. ALLEY DESIGN STANDARDS

(1) Alleys shall not intersect arterial or major collector thoroughfares. Alleys which run parallel to and share a common right-of-way line with a major thoroughfare shall turn away from the major street not less than one subdivision lot width or a minimum of 50 feet (whichever is greater) from the cross street intersection.

(2) Alley radii at street intersections shall not be less than 10 feet.

(3) Alleys in residential areas shall be constructed a minimum of 10 feet in width within a minimum 15 feet right-of-way. Wider alleys, required for drainage or other purposes, shall be constructed in right-of-way approved by the City's Engineering Department.

(4) Alley turnouts shall be a minimum of 12 feet in width at the street right-of-way line or the width of the alley whichever is greater.

(5) Where integral curbs are added to increase drainage capacity, the curb shall be constructed on the outside edge of the alley pavement such that the minimum alley driving surface width of 10 feet is maintained. Combination curb and grate inlets shall be used in alleys.

(6) Paving in alleys adjacent to masonry screening walls shall abut the screening walls and shall be constructed a minimum of 12 feet in width.

(7) No alley shall be longer than 1000 feet without provision of an outlet connection to a street. The alley length measurement shall exclude the depth of the residential lot which it serves.

(8) The maximum grade for alleys is 6% within 30 feet of an intersection with a street and 12% elsewhere, unless otherwise approved by the Engineering Department. The minimum grade is 0.4%. Changes in grade shall not exceed 3% without providing vertical curves.

(9) Horizontal geometric standards for alleys are shown in the Standard Construction Details.

(10) Alleys for other than residential uses shall be dedicated and paved a minimum of 25 feet in width.

(11) Concrete for alley pavement shall be 3000 psi minimum compressive strength, and shall include 6-inch monolithic curbs where required by the City's Engineering Department.

(12) Alleys shall be constructed with a minimum thickness of 5 inches in the invert and 8 inches at the edges (average 6½ -inch thickness). Where two alleys intersect, they shall have a minimum radius of 40 feet and meet current City of DeSoto Paving Standards.

(13) The sub-grade on all alleys shall be thoroughly compacted and stabilized with hydrated lime for a minimum depth of six inches below the pavement, unless otherwise approved by the City's Engineering Department.

Section V. DRIVEWAY DESIGN STANDARDS

5.01 DEFINITIONS

(1) A "residential driveway" shall mean one which provides access from an alley or street to a single-family residence, duplex, or multi-family building containing five or fewer dwelling units.

(2) A "commercial driveway" shall mean one providing access to an office, retail or institutional building or to a multiple-family building having more than five dwelling units. It is anticipated that such buildings will be customarily serviced by trucks as an incidental, rather than a principal driveway use. Industrial plant driveways whose principal function is to serve administrative or employee parking lots shall also be considered commercial driveways.

(3) An "industrial driveway" shall mean one directly serving substantial numbers of truck movements to and from loading docks on an industrial facility warehouse or truck terminal. A centralized retail development, such as a community or regional shopping center, may have one or more driveways specially designed, signed and located to provide access for trucks and such driveways shall be considered industrial driveways.

5.02 DRIVEWAY WIDTH

As the term is used here, the width of a driveway refers to the width of pavement at the property line. Driveways of the residential type shall be permitted only onto collector and residential streets if alley access is not provided. All access to residential property abutting major thoroughfares shall be off the alley unless otherwise approved by the City's Engineering Department. Residential driveways onto streets shall have a minimum width of 12 feet and a maximum width of 24 feet. Commercial driveways shall have a minimum width of 15 feet for one-way operation, 20 feet for two-way operation and a maximum width of 30 feet. Industrial driveways shall have a minimum width of 20 feet and a maximum width of 40 feet.

5.03 DRIVEWAY RADIUS

All driveways intersecting dedicated streets shall be built with a circular curb radius connecting the 6 inch raised curb of the roadway to the design width pavement of the driveway. Driveways shall be located far enough from the interior property line to permit the curb radius to fall entirely in front of the subject property. Driveways intersecting with alley pavement shall be located far enough from the interior property line to permit the curved or flared radius to fall entirely in front of the subject property. The curb radii for residential drives shall be a minimum of 5 feet and a maximum of 15 feet. The radii for commercial drives shall be a minimum of 10 feet and a maximum of 20 feet. The radii for industrial driveways shall be a minimum of 15 feet and a maximum of 25 feet.

In order that the definition of the location of the edge of pavement for the thoroughfare may be maintained, driveway radii shall always be designed to intersect the street at a 90-degree angle. One-way driveways may be designed to intersect a street at a minimum 45-degree angle.

5.04 NUMBER OF DRIVEWAYS

Driveway approaches shall not occupy more than seventy percent (70%) of the frontage abutting the roadway on the tract of ground devoted to one use, which abuts the roadway. No more than two driveway approaches shall be permitted on any parcel of property with a street frontage of 150 feet or less.

5.05 DRIVEWAY SPACING AND LOCATIONS

The spacing and location of driveways shall be related to adjacent driveways, site distance, and nearby street intersections. The spacing between driveways shall be dependent upon the speed limit of the thoroughfare as follows:

Speed Limit (MPH)	Driveway Spacing (Feet)
20	45
25	65
30	90
35	100
40	120
45	150

Driveways intersecting streets shall be located so as to provide minimum sight distance as indicated in the table below. Sight distance can be calculated using the standards and criteria contained in the "Policy on Geometric Design of Highways and Streets", 2001 – Fourth Edition, American Association of State Highway and Transportation Officials.

Design Speed (MPH	Sight Distance (Feet)
20	200
25	250
30	300
35	350
40	400
45	450
50	500

At intersections with no free right-turn lane, the minimum distance of a driveway from the intersection of major thoroughfares shall be 50 feet from the curb-line of the intersecting street, and the minimum distance of a driveway from the intersection of minor thoroughfares shall be 30 feet from the curb-line of the intersecting street, as it is shown graphically in Figure No. 4. If one-way angle drives are used, the radius for the driveway may not begin less than 35 feet from the curb-line of the intersecting street as shown in Figure No. 4. The requirements for driveway locations near intersections with free right-turn lanes are given in Table V and Figure No. 5. General requirements for driveway design are shown in Figure No. 6. A summary of driveway width, radius and angle requirements is given in Table VI.

TABLE V

Distance in feet from intersection with free right turn:

Thoroughfare	Percent of Right Turns		
Speed Limit (MPH)	10%	10% - 29%	30%
30	30	40	50
35	35	50	60
40	40	55	65
45	45	60	70
50	75	80	85

When more than one driveway approach is required to serve a parcel of property, a traffic island shall separate the driveway approaches. The width of the traffic island at the property line shall be a minimum of 20 feet. If a straight curb, rather than a traffic island, is to be provided between driveways, the curb shall be at least 20 feet long.

5.06 DRIVEWAY GRADES

The minimum driveway grade within the street right of way is set using ¼ inch per foot (2%) rise above the top of curb to the property line. The maximum driveway grade permitted within 10 feet of the gutter line is determined by the street pavement cross-fall at the driveway. The grade break at the gutter line, and at any point within 10 feet of the gutter line, must not exceed 12% unless a vertical curve is provided. This is necessary to avoid car bumper drag problems from occurring. Streets with a ¼ inch per foot cross-fall to the gutter (-2%) will limit the maximum driveway grade to 10%. Streets with ½ inch per foot cross-fall to the gutter line (-4%) require a maximum driveway grade of 8%.

Greater driveway grades may occasionally be required due to steep existing driveway grades and terrain. Grades in excess of 12% must be specifically approved by the City Engineer. The maximum change in grade without a vertical curve is 12% for any 10 feet in distance.

TABLE VI
SUMMARY OF REQUIREMENTS

	RESIDENTIAL	COMMERCIAL	INDUSTRIAL
WIDTH			
Minimum (Feet)	12	20 (15 one-way)	20
Maximum (Feet)	24	30	40
RIGHT TURN RADIUS			
Minimum (Feet)	5	10	15
Maximum (Feet)	15	20	25
ONE-WAY DRIVE ANGLE			
Minimum	45º (deg.)	45º (deg.)	45º (deg.)

Section VI. MEDIAN OPENING AND LEFT TURN LANES

Median openings and left turn lanes, constructed to serve dedicated streets in a development or to serve private drives shall be paved to City Standards. The sub-grade at all median openings and left turn lanes shall be thoroughly compacted and stabilized with hydrated lime for a minimum depth of 6 inches below the pavement, unless otherwise approved by the City's Engineering Department. On existing roadways, additional median openings shall be located in strict accordance with the Paving Design Manual. Median openings on divided major thoroughfares shall be accompanied by the construction of a left-turn lane in one or both directions. The following standards for median openings are established to facilitate traffic movement and promote traffic safety.

6.01 Arterial / Major Collector Streets:

Median openings will normally be permitted at all intersections with dedicated city streets. Exceptions would be at certain minor streets where due to unusual conditions a hazardous situation would result.

Mid-block median openings or other openings with turn permitted into adjacent property will not normally be permitted unless all the following conditions exist:

(1) The property to be served is a significant traffic generator with demonstrated or projected trip generation of not less than 250 vehicles in a 12 hour period.

(2) The median opening is not less than 400 feet from an intersection with a Arterial or Major Collector roadway.

(3) The median opening is not less than 260 feet from an intersection with a Collector or Residential roadway.

(4) The median opening is not less than 300 feet from any other existing or proposed mid-block median opening.

(5) The median width is sufficient to permit the construction of a left turn storage lane.

6.02 Median Opening Width

The minimum width of mid-block median openings shall be 60 feet. Where intersecting streets are more than one lane each way or lanes are separated by a median, the minimum width of the proposed median opening shall be the width of the intersecting right-of-way plus 20 feet.

6.03 Minimum Left-Turn Storage Requirements

All left-turn storage areas shall be ten feet wide and a minimum storage requirement for left-turn lanes are as follows:

MINIMUM STORAGE REQUIREMENTS

Intersecting Type of Roadway	Minimum Storage
Arterial with Residential	60 Feet
Arterial with Collector	100 Feet
Arterial with Major Collector	150 Feet
Arterial with Arterial	150 Feet
Arterial / Major Collector with Private Development	60 Feet

Note: Storage requirements listed herein are absolute minimums. Storage requirements may increase based upon actual and projected traffic demands. For all left turn lanes, the transition curves shall be two 250 feet radius curves, which will require a total transition length of 100 feet.

Section VII. UTILITY INSTALLATION STANDARDS

7.01 Water, Wastewater, and Storm Sewer

(1) Arterial & Major Collector Streets:
- a. Water shall be located within the right-of-way, 6½ feet off of right-of-way line.
- b. Wastewater shall be located within the right-of-way, 7½ feet off of right-of-way line.
- c. Storm sewer shall be located under inside lane pavement.

(2) Collector & Residential Streets:
- a. Water shall be located within the right-of-way, 6½ feet off of right-of-way line
- b. Wastewater shall be located within the right-of-way, 7½ feet off of right-of-way line.
- c. Storm Sewer shall be located at center of right-of-way.

(3) Alley Right-of-Way:
- a. In most cases, water and wastewater are located in roadways. If required for a particular development, utility infrastructure shall be located along the center-line of the alley right-of-way.
- b. In most cases, storm sewer is located in roadways. If required for a particular development, storm sewer shall be located along the center-line of the alley right-of-way.
- c. Should both water and wastewater be located together in alley right-of-way, a minimum separation of 9 feet horizontal shall be maintained.
- d. Should all three City utilities be located together in alley right-of-way, the right-of-way width shall be adjusted to allow required minimum separation of the utilities as determined by the City Engineer.

7.02 Franchise Utilities and other “By-Right” Service Providers

(1) Arterial & Major Collector Streets:
- a. All franchise Utilities (gas, electric, telephone, television, etc.) shall be placed in the first 10 feet of space adjacent to the street, or within utility easements out-side of right-of-way, or as approved by the City.

(2) Collector & Residential Streets:

a. Subdivisions with no alleys; all franchise Utilities (gas, electric, telephone, television, etc.) shall be placed in a 5 feet utility easement within the first five feet outside the right-of-way line, or in variable width utility easements within property line perimeters.
b. Subdivisions with alleys; all franchise utilities (gas, electric, telephone, television, etc.) shall be placed in a variable width utility easement out side alley right-of-way.

7.03 Open Cut Requirements

(1) Open cut trenching of paved City streets or alleys for construction of public and/or franchise utilities in the City of DeSoto is prohibited. Should an emergency require open cut construction, approval shall be obtained from the City Engineer or Development Services Managing Director.

(2) Open cut repairs to City streets shall be in accordance with the standard specifications approved by the City of Desoto. Any variance shall be approved by the City Engineer

(3) A permit for work in City right-of-way or easements shall be required for all construction or repairs in rights-of-w`ay or easements.

Section VIII. LIGHTING & VISIBILITY REQUIREMENTS

8.01 Street Lighting

(1) Arterial & Major Collector Streets: Minimum spacing for streets lights shall be 150 feet. Street lights are required at every street intersection and at specific locations where lighting can increase roadway safety and ease of operation.

(2) Collector & Residential Streets: Minimum spacing for streets lights shall be 250 feet. Street lights are required at every street intersection and at specific locations where lighting can increase roadway safety and ease of operation.

The City of DeSoto shall approve lighting plans prior to installation of street lights by TXU Electric Delivery or any other entity.

8.02 Intersection Visibility Triangle

No fence, wall, screen, sign, structure, foliage, hedge, tree, bush, shrub, berm, or any other item, either man-made or natural shall be erected, planted, or maintained in a position, which will obstruct or interfere with these standards.

Vision at all intersections where streets intersect at or near right angles shall be clear at elevation between 2-1/2 feet and 9 feet above the average gutter elevation, except single trunk trees, within a triangular area formed by extending the two curb lines from their point of intersection, 50 feet, and connecting these points with an imaginary line, thereby making a triangle as shown in Figure 3.

Note: Single trunk trees within the triangles and in the median shall be allowed and spaced so as to not cause a "picket fence" effect.

The desirable minimum sight distances are based on the premise that the approaching driver can observe the intersecting vehicle 2.5 seconds before he must apply the brakes and travel the minimum stopping distance for his approach speed. Due to varying factors such as street grades, design speeds for different roadways, the minimum sight distances shall be determined using the AASHTO manual, A Policy on Geometric Design of Highways and Streets 2001 – Fourth Edition.

Section IX. FIRE LANE REQUIREMENTS

As determined by the City Fire Marshall, Fire Lanes must extend to within 150 feet of all portions of the exterior walls of the first story of all buildings. Fire Lanes shall be a minimum 24 feet wide and have a minimum vertical clearance of 13'6". Fire Lanes shall be stripped with "NO PARKING" (6" lettering) on both sides of the fire lane. Marking shall be spaced every 25 feet.

The radius necessary to accommodate emergency vehicles varies with the width of the fire lane. The following table identifies the width at the midpoint in the curve that is required depending of the width of the fire lane leading to the curve and the curve radius:

Width of Fire Lane	Radius	Min. Width of Fire Lane At Midpoint in Curve
24'	20'	30'
30'	10'	30'

A 100' diameter paved (3000 psi. reinforced concrete) turn-around for emergency vehicles shall be provided at the end of any fire lane that exceeds 150 feet in length and has no secondary outlet to a paved city street.

Section X. OFF-STREET PARKING AND LOADING REQUIREMENTS

Off-street parking and loading shall be provided as set forth in the following schedules and provisions. Section 38, sub-sections 38.1 through 38.10 of the City of DeSoto Zoning Ordinance.

Section XI. ADA REQUIREMENTS

Curbs and walks constructed at intersections of all streets and thoroughfares must comply with the provisions of the American Disability Act and be constructed in a manner to be easily and safely negotiated by physically challenged persons.

Section XII. CONSTRUCTION PLAN PREPARATION & INSPECTIONS

12.01 CONSTRUCTION PLAN PREPARATION

In accordance with the Subdivision Ordinance, subdivisions and other developments shall be constructed after the Preliminary Plat is approved. After the construction is completed and public infrastructure is ready for acceptance by the City, a Final Plat will be submitted by the developer for approval.

Prior to Preliminary Plat submitting application for a preliminary plat, construction plans must be completed and approved by the Development Services department. The construction plans shall be in accordance with this design manual. Deviations from these design standards will not be accepted unless approved by the City Engineer.

12.02 CONSTRUCTION INSPECTION

All construction work, such as street grading, street paving, storm sewers, curb and/or gutter work, sanitary sewers or water mains performed by the owner, developer, or contractor, shall be subject to inspection during construction by the proper authorities of the City and shall be constructed in accordance with the standard specifications approved by the City Council, and in accordance with the approved plans.

Section XIII. ACCESS MANAGEMENT PRACTICES

(Note: Section XIII is currently under review by TxDoT. All construction in State Right-of-Way shall be reviewed and permitted by TxDoT until City Standards have been approved.)

13.01 Design Standards

(A) Traffic Impact Analysis (TIA): The City may require trip estimates for proposed development. The trip estimate shall be based on the latest version of the Institute of Transportation Engineer's "Trip Generation Manual". If trip estimates exceed 100vph or 1000vpd, the City may require a traffic impact analysis to determine necessary mitigation measures to maintain an acceptable level of service as determined by the City Engineer. If trip estimates exceed 500vph or 5000vpd, a traffic impact analysis shall be required. Traffic projections will include at a minimum, 2, 5, and 10 year horizon.

(B) Roadway Classification: Roadways are classified in their functional categories as provided in Section II, Street Classifications, sub-section 2.02, Roadway Descriptions and Sections, and Figures 1 and 2, Typical Roadway Sections, of this manual.

(C) Intersections: Intersections shall be designed in accordance to Section III, Street Design Standards, sub-section 3.03, Street Intersections, of this manual.

(D) Driveways: The location and width of all residential and non-residential driveways that will connect to a public street must be reviewed and approved by the City prior to construction. Driveway design shall be in accordance to Section V, Driveway Design Standards, Figures 4 and 5, Minimum Distance from Intersections, and Figure 6, Driveway Standards, of this manual. Values shown represent minimum and/or maximum standards for design and construction of driveways.

(d-1) At a signalized intersection in which one public street terminates at the intersection of a connecting cross street, a driveway shall not be placed on the cross street as to be in alignment with the terminating street. If the requirements for driveways otherwise allow the placement of a driveway at that location, the driveway width must match the cross-section of the intersecting public street.

(E) Median Openings and Left Turn Lanes: Median openings and left turn lanes shall be designed in accordance to Section VII, Median Openings and Turn Lanes, of this manual.

(F) Right Turn Lanes and Deceleration Lanes: The City may require a trip estimate and traffic impact analysis to determine the need of a right turn lane at the intersection of an arterial/arterial, major collector/major collector or arterial/major collector streets. There shall be sufficient length of property width available for the appropriate design. Right turn lanes shall not be allowed at intersections of collector or residential streets.

Construction of right turn deceleration lanes into commercial and multi-family districts shall be considered on arterial and major collector streets if a trip estimate determines a minimum threshold of ≤ 45mph where right turn volume is >60vph and there is sufficient length of property width available for the appropriate design. Reference: Texas Department of Transportation Access Management Manual, Section 7, Auxiliary Lanes, Table 2-3.

Right turn, acceleration, and deceleration lane design shall be in accordance with Texas Department of Transportation Roadway Design Manual, Chapter 3, Figure 3-3, 3-3A, and 3-4.

(G) To minimize the number of access points along arterial and major collector roadways, developers of multiple and single properties shall be required to provide Shared Access as described below:

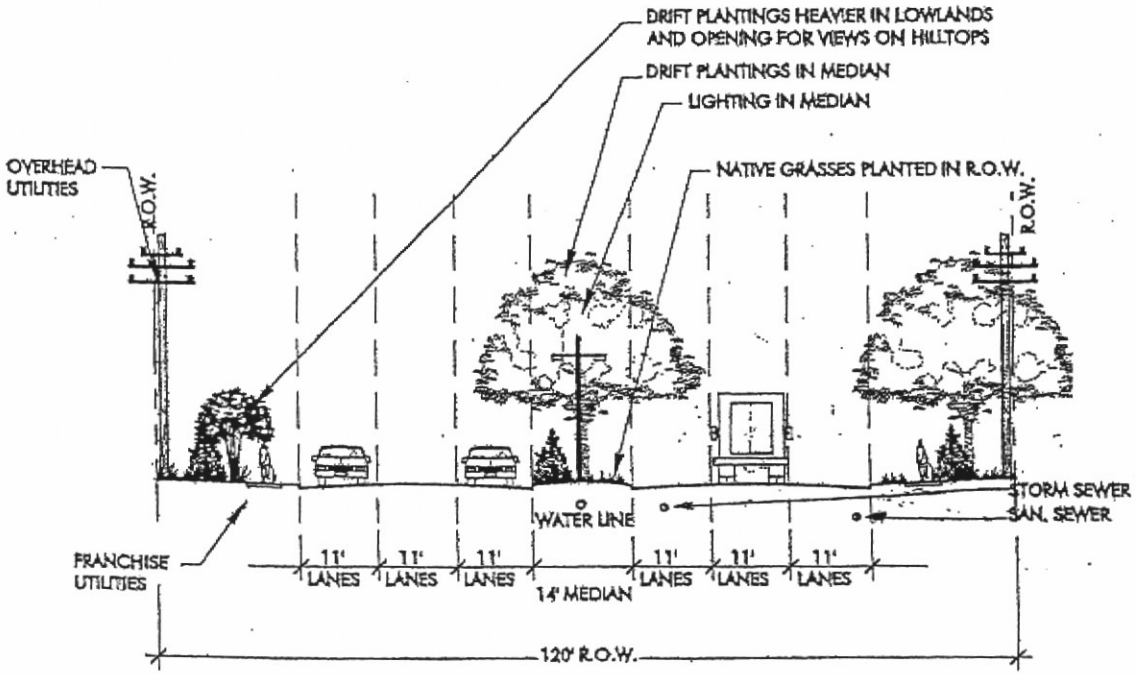
Shared Access: A public access easement shall be required between adjacent lots fronting on arterial or collector streets in order to minimize the total number of access points along those streets and to facilitate traffic flow between lots. The location shall be approved by the City. Minimum easement width shall be 24 feet and the length shall be the full width of adjoining properties fronting the roadway.

A public cross access easement shall be required across any lot fronting on an arterial street in order to minimize the number of access points and facilitate access between and across individual lots and any other location where existing lot widths are not sufficient to allow individual driveways per the City's driveway criteria. The location shall be approved by the City. Minimum easement width shall be 24 feet and the length shall be the full width of the lot fronting the roadway.

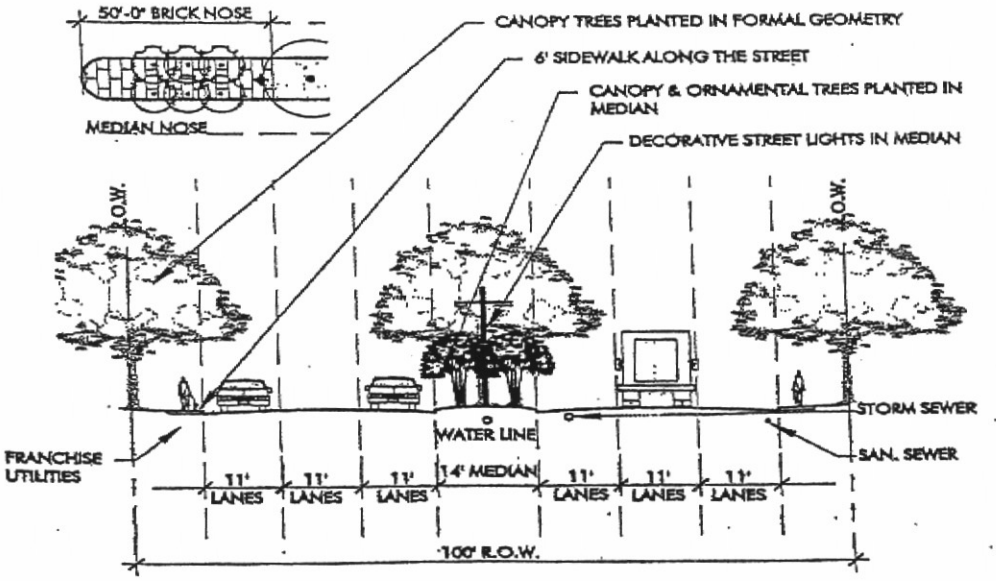
(H) Driveway Throat Length: A minimum driveway throat length may be required to allow for traffic entering the site to be stored on site in order to avoid a queue of traffic from the development from being out on the roadway causing delays to the through traffic stream. The driveways throat length shall be defined as the distance from the street to the first point conflict in the driveway. Minimum driveway throat length shall be approved by the City.

(I) Signalization and Other Traffic Control Devices: The traffic impact analysis may determine the need of signalization or other traffic controls in order to provide safe and efficient traffic flow. The development shall be responsible for all or part of any right-of-way, design, hardware, and construction cost of a traffic signal and/or other control devices if it is determined that improvements are necessitated by traffic generated by the development.

TYPICAL ROADWAY SECTIONS



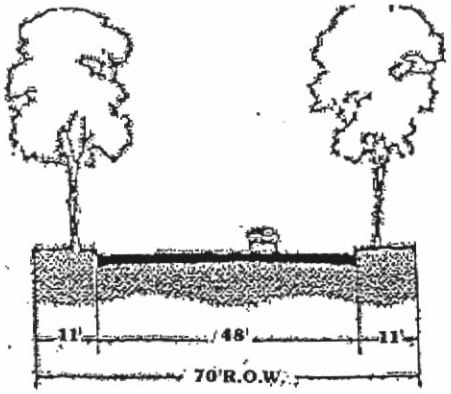
Arterial



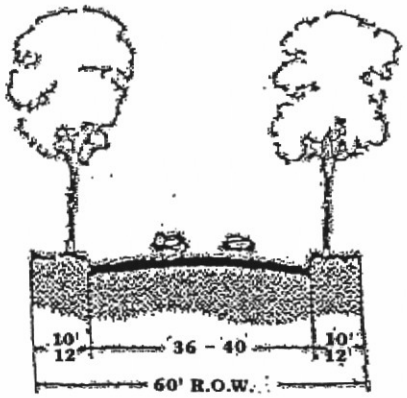
Arterial

Figure 1 - Page 25

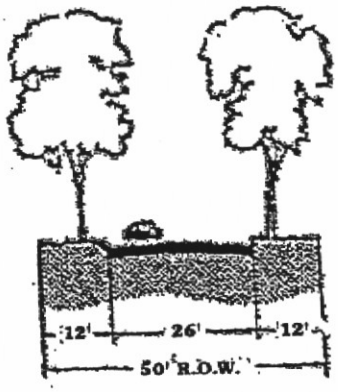
TYPICAL ROADWAY SECTIONS



Major Collector



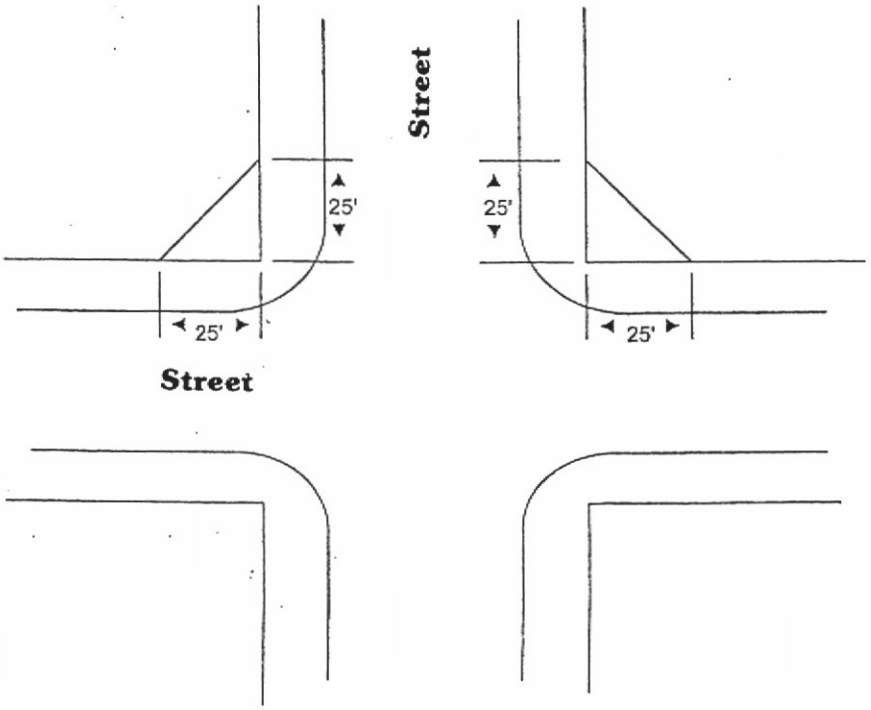
Collector



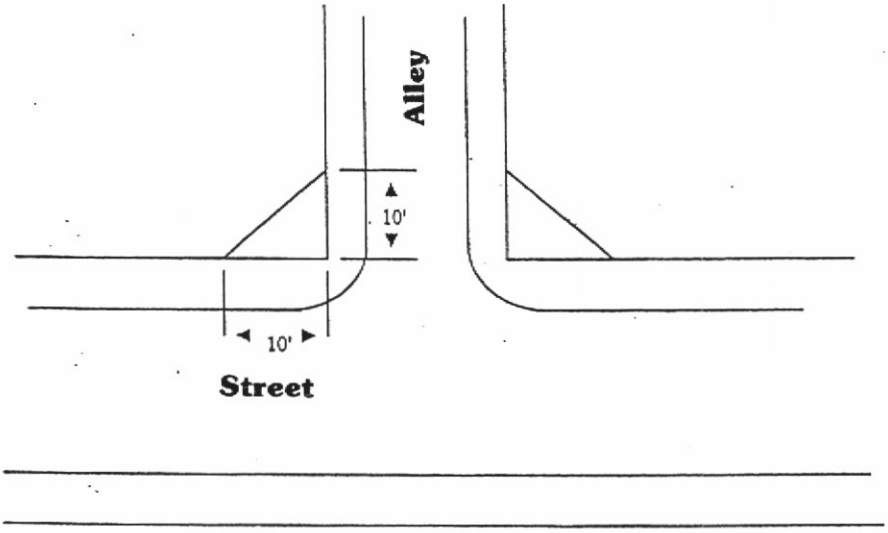
Residential

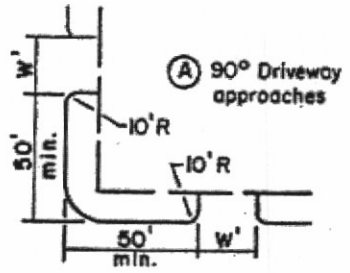
Figure 2 - Page 26

INTERSECTION VISIBILITY TRIANGLE

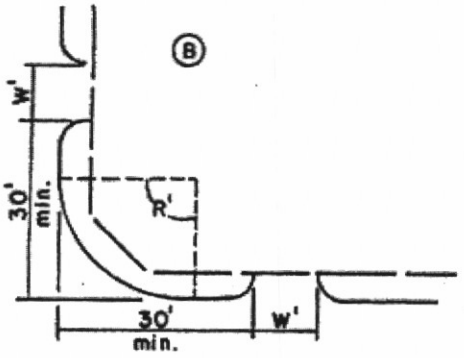


ALLEY INTERSECTION VISIBILITY TRIANGLE

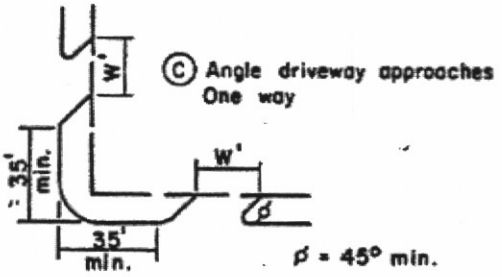




Arterial and Major Collector



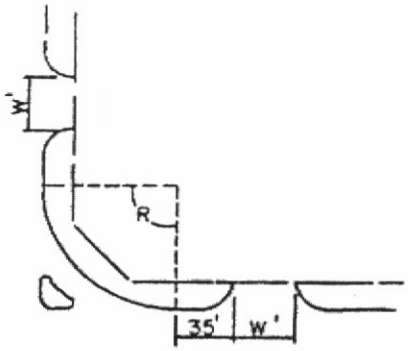
Collector and Residential



Collector and Residential

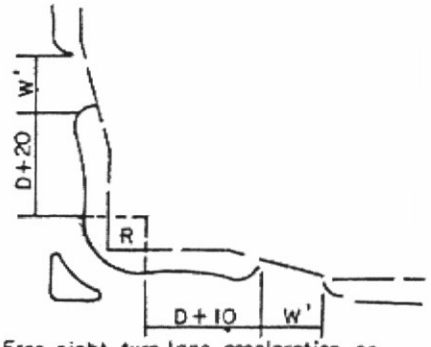
DRIVEWAYS

Minimum Distance From Intersections
(No Free Right Turn Lane)

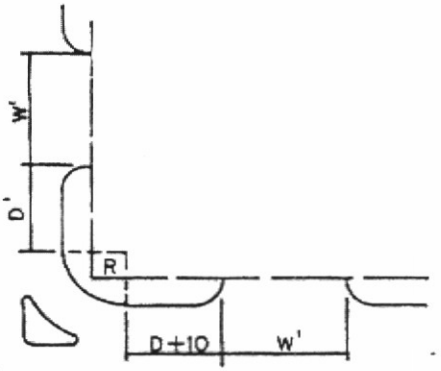


Ⓐ Free right turn lane no accelaration or deceleration lane.

Note:
Distance in feet from intersection with free right turn. As provided in Table 5.



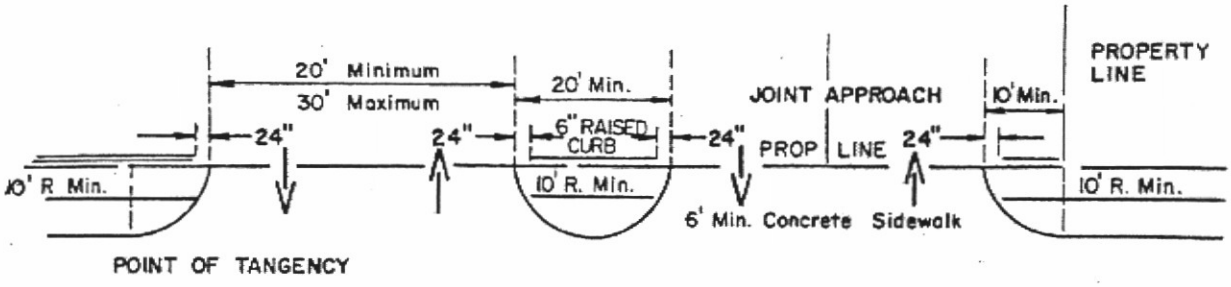
Ⓑ Free right turn lane accelaration or deceleration lanes exist.



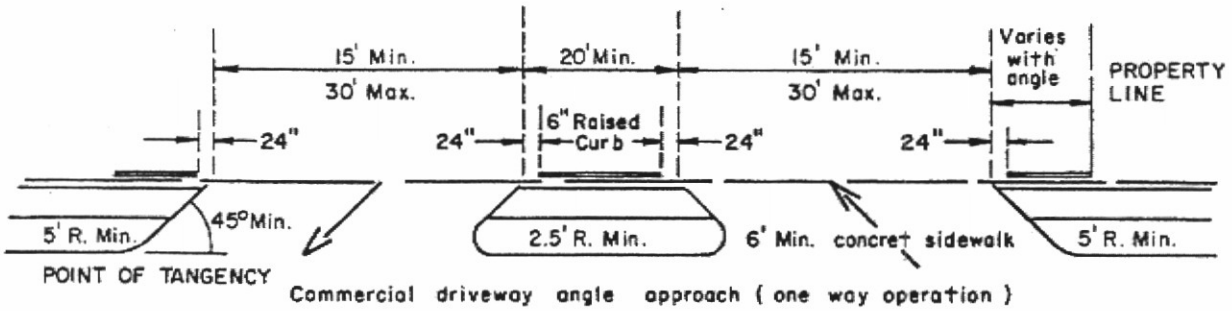
Ⓒ Free right turn lane continuous flow

DRIVEWAYS

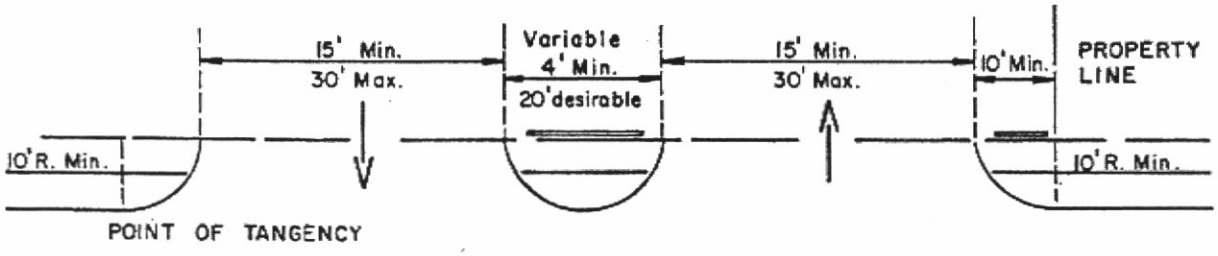
Minimum Distance From Intersections
With Free Right Turn Lane



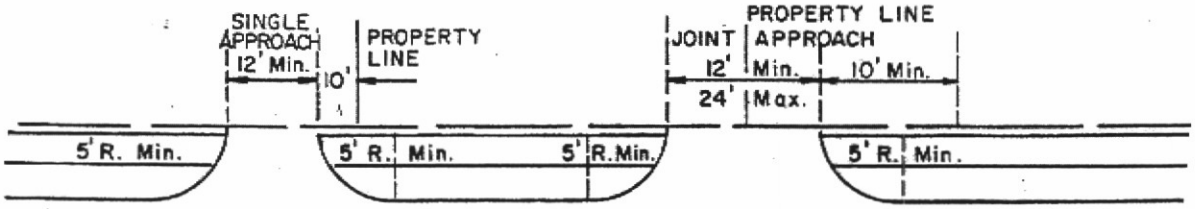
Commercial driveway approach (Two way operation)



Commercial driveway angle approach (one way operation)

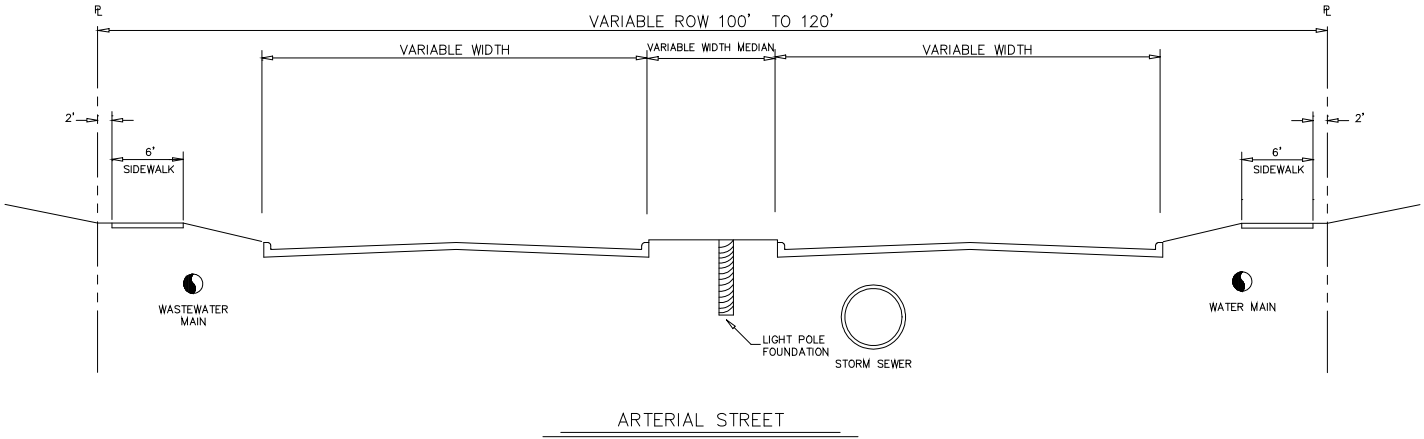


Commercial driveway approach (one way operation)
90° driveways



Residential driveway approach

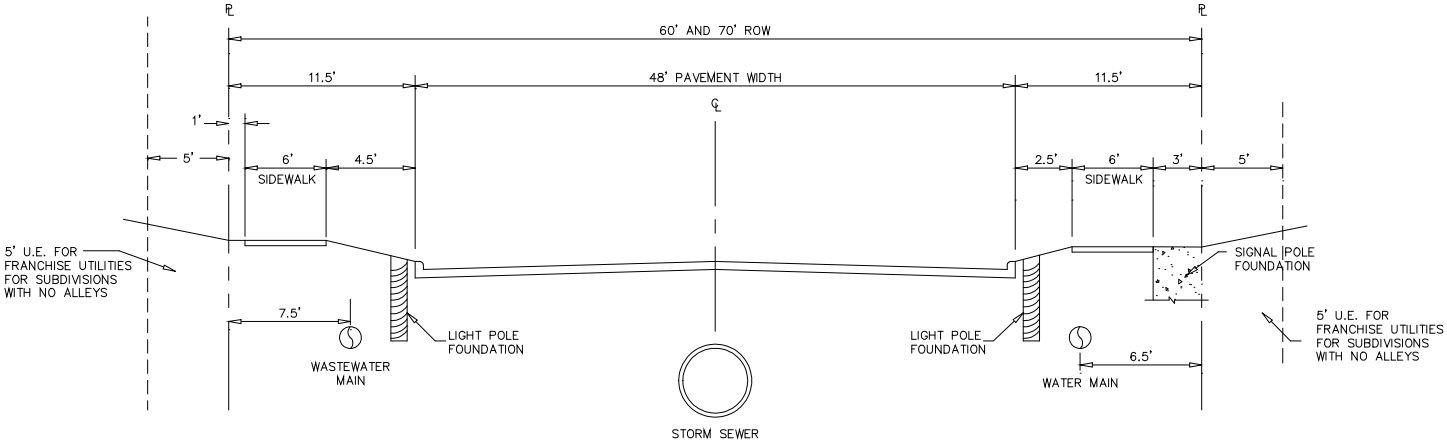
DRIVEWAY STANDARDS



City of DeSoto, Texas

Typical Utility Location

April 19, 2005

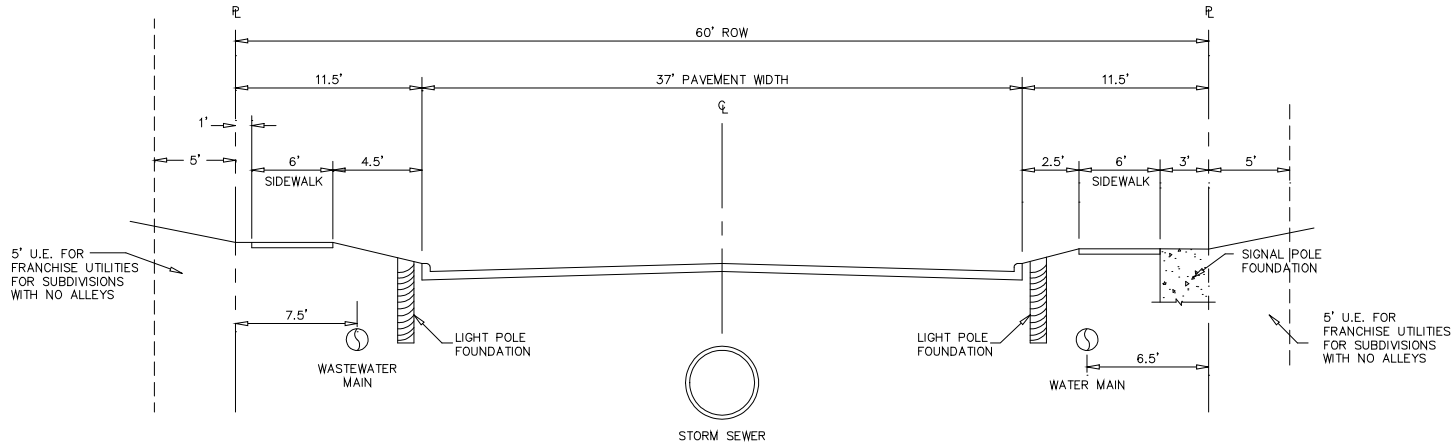


MAJOR COLLECTOR STREET

City of DeSoto, Texas

Typical Utility Location

April 18, 2005

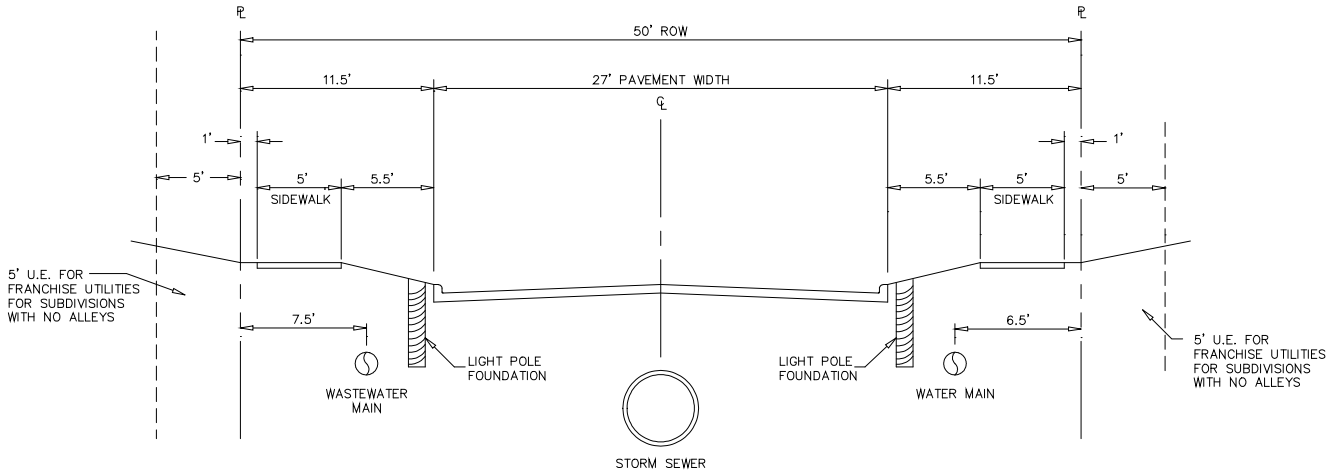


COLLECTOR STREET

City of DeSoto, Texas

Typical Utility Location

April 18, 2005



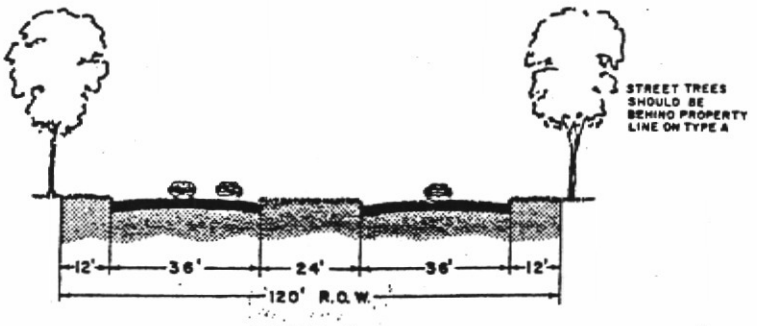
RESIDENTIAL STREET

City of DeSoto, Texas

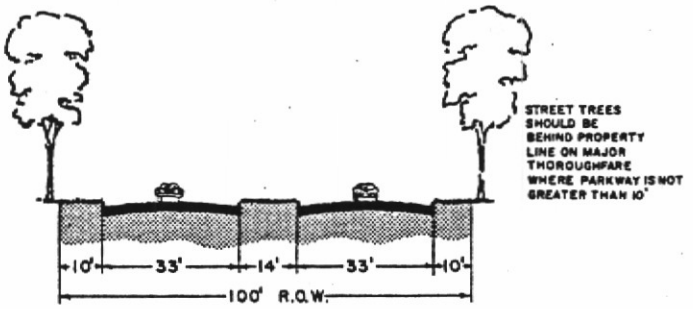
Typical Utility Location

January 28, 2005

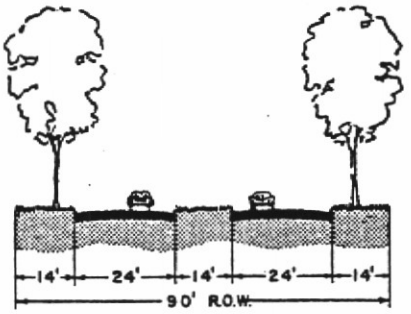
TYPICAL ROADWAY SECTIONS



TYPE A
MAJOR THOROUGHFARE



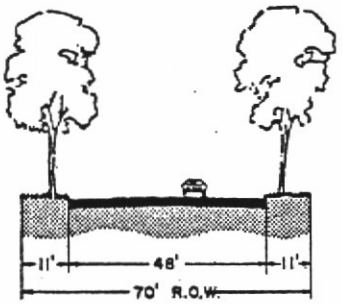
TYPE B
MAJOR THOROUGHFARE



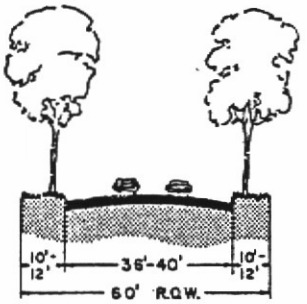
TYPE C
MAJOR THOROUGHFARE

Figure 1

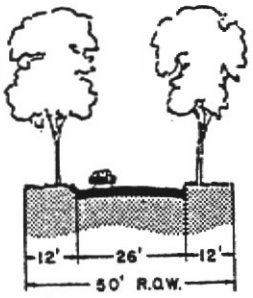
TYPICAL ROADWAY SECTIONS



TYPE D
SECONDARY THOROUGHFARE

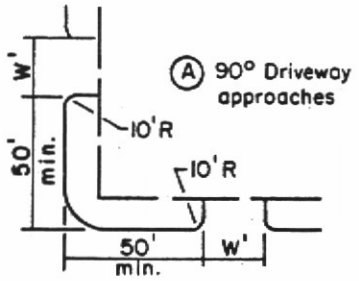


TYPE E
COLLECTOR STREET

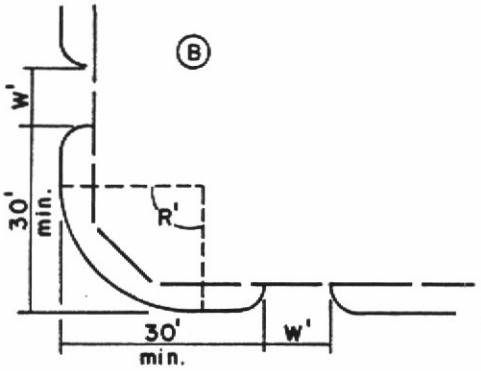


TYPE F
MINOR RESIDENTIAL
STREET

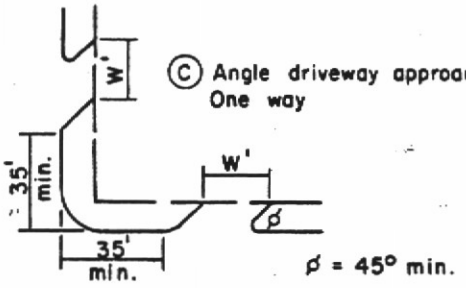
Figure 2



Type A,B,C,&D Roadways



Type E&F Roadways

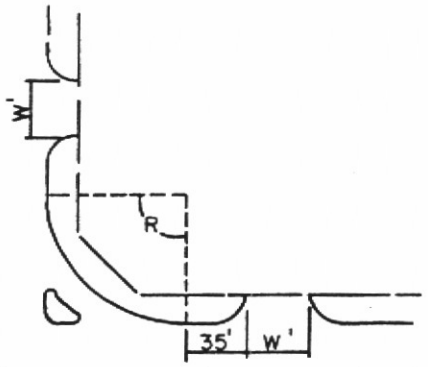


Angle drive
Type E&F Roadways

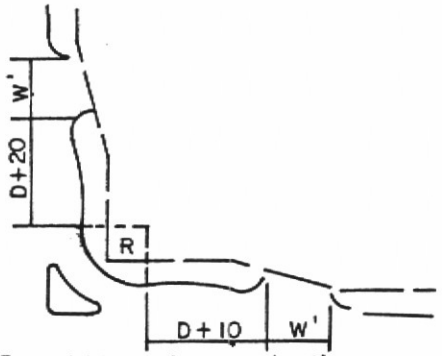
DRIVEWAYS

Minimum Distance From Intersections (No Free Right Turn Lane)

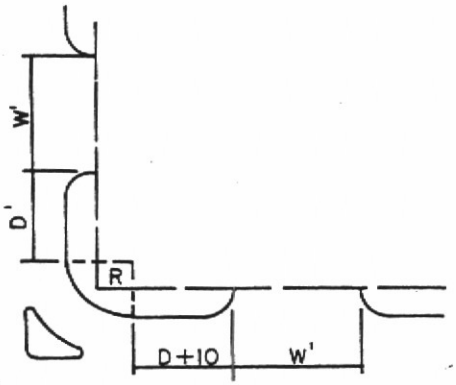
Figure No. 3



Ⓐ Free right turn lane no accelaration or deceleration lane.



Ⓑ Free right turn lane accelaration or deceleration lanes exist.



Ⓒ Free right turn lane continuous flow

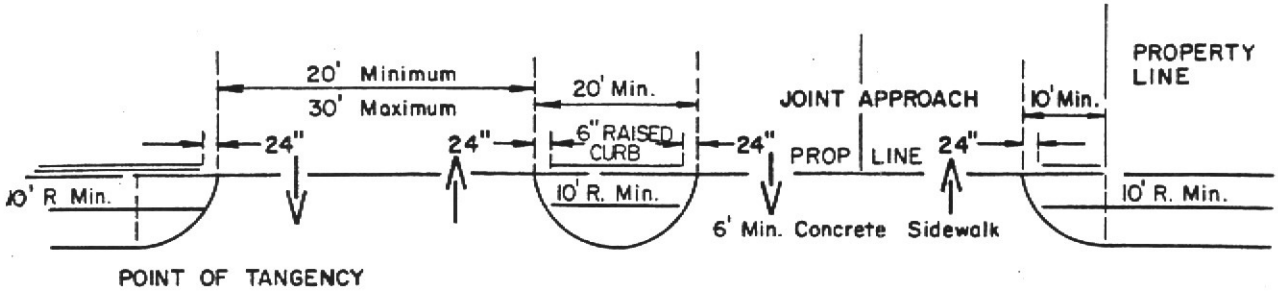
NOTE:

Location of driveways dependent open speed end free right turn volume percent as shown in TABLE I.

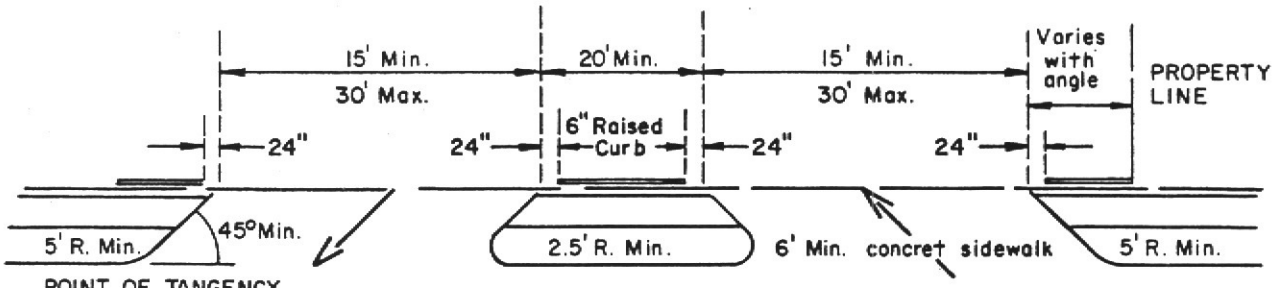
DRIVEWAYS

Minimum Distance From Intersections With Free Right Turn Lane

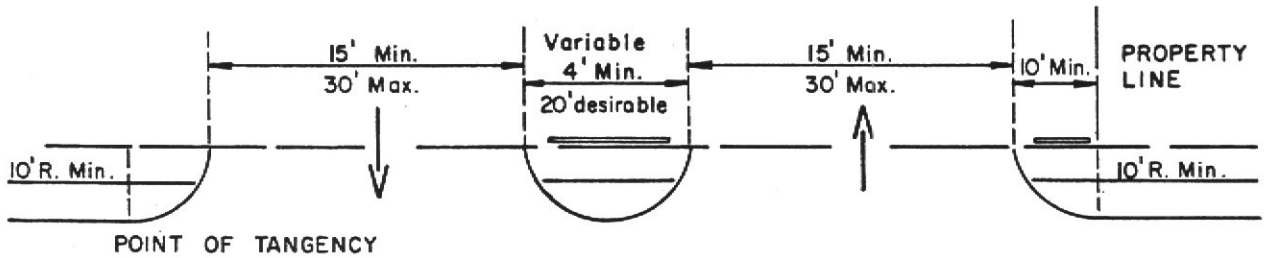
Figure No. 4



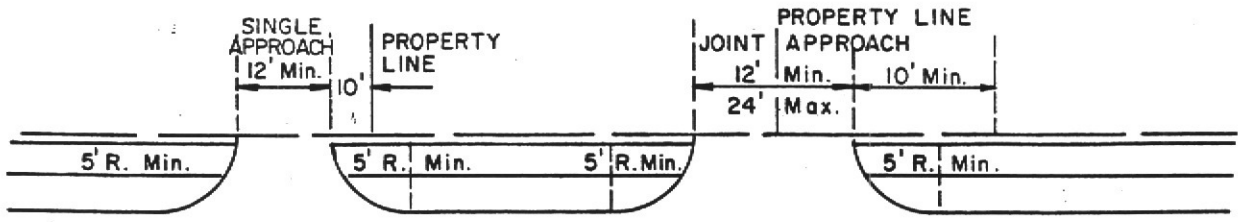
Commercial driveway approach (Two way operation)



Commercial driveway angle approach (one way operation)



Commercial driveway approach (one way operation)
90° driveways



Residential driveway approach

DRIVEWAY STANDARDS

Figure No. 5