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CHAPTER 8 - MAJOR THOROUGHFARE PLAN

MAJOR THOROUGHFARE PLAN

The ability to transport people and goods from one place to another is one of the basic components of the economic and social system upon which a community depends. Consequently, the adequacy of the major street system will have a substantial impact on the rate and pattern of its future growth. To ensure that the street system is able to expand efficiently and remains consistent with the Future Land Use Plan requires careful, long-range planning.

This section will review the street and highway system of De Soto. The Major Thoroughfare Plan identifies the projected major street network including highways, arterial and collector roads within the City and surrounding planning area. The completion of local and regional connections within and throughout the City is critical to the future success of De Soto. Individual roads and streets do not serve trips independently; rather, most trips involve movement through a network of roadways. A functional classification system of roadways provides a method for channeling traffic in a logical, efficient and safe manner.

The Major Thoroughfare Plan represents the existing and recommended transportation system in De Soto and the surrounding planning area by street classification. In order to help ensure that the City's road network is complete and adequately to serving the community, the City has enforced a policy of requiring road construction in conjunction with approved development. The City's current policy is to require development to construct the required local roads and improvements necessary to mitigate impacts to existing collectors and arterials. In regard to construction of new collectors and arterials, the City has implemented an excise tax which is used to help offset the cost of major road construction. However, development beyond improved roads must include construction of road extension, the details of which are worked out in conjunction with each development approval.

Like the need for roadways to serve vehicular traffic, the City has made substantial investments in infrastructure to serve pedestrian traffic. As with most cities, De Soto's sidewalk network is incomplete. In an effort to complete the sidewalk network, the City requires approved development to include construction of sidewalks on one side of local streets and both sides of collector and arterials. The City has also participated in infill projects recently focusing on pedestrian connections to area schools and public facilities. In addition, recreational pedestrian improvements have been realized in the form of local and regional trail improvements completed in cooperation with the Johnson County Parks and Recreation Department.

STANDARD STREET CLASSIFICATIONS

De Soto's existing road and highway network is classified by function. Roads and highways are grouped into classes or systems according to the service they provide. The factors that identify roadway classifications are:

- the level of through-traffic movement; and
- access to adjacent land or individual properties.

Roadways are not classified by the amount of traffic they carry; however, higher traffic volumes are usually consistent with upper level roadway classifications as discussed below.

A functional street classification system was adopted for the City of De Soto to help the City and development community in the planning, design, management and maintenance of De Soto's transportation facilities. These roadway classifications project the right-of-way and design standards for the ultimate construction of a roadway. Ultimately, however, the function of a roadway, traffic volume, and adjacent land use determine the type of roadway which should support daily traffic activity.

The functional classification for roadways uses a hierarchical structure to identify the operation of all roadways within a transportation system. The hierarchy of road types in ascending order is:

- expressways/freeways;
- surban arterial roads;
- collector roads; and
- local roads.

Expressways/Freeways

Expressways and freeways are primary arterial roadways which are fully or partially access controlled facilities. These routes are typically the highest traveled corridors which serve as a primary means of access to the community and carry the major portion of trips entering or leaving the city. As such, they are divided, multi-lane facilities with a primary function of moving large volumes of through traffic at high speed and are primarily intended to serve long trips.

Suburban Arterials

The main function of an arterial street is to move large volumes of traffic from one place to another at a high speed, provide continuous linkages between major traffic generators and serve as a transition roadway between collector streets and expressways. Planned access is its secondary function.

Arterial roadways are further classified into minor arterial roadways (four-lane) and major arterial roadways (five-lane). Minor arterial roadways are appropriate for carrying traffic through primarily residential land uses without directly accessing any of the properties. Major arterial roadways serve major activity centers and carry a high proportion of traffic on a limited number of roadway miles.

The arterial street is given preferential treatment over collector and local streets in signing and signalization of intersections. Ideally, local streets should not have direct access to arterials, but are

provided access to the arterial through the collector street system. Arterials in De Soto intersect with many local streets in the older parts of the City because of a grid pattern of development. Generally, parking on arterials should be restricted, particularly where it interferes with traffic flow.

Access to private property along an arterial should be controlled to avoid hazards and the interference of traffic flow due to ingress and egress traffic movements. Access control can be achieved at differing levels through subdivision design, street design, and curb cut regulations. Two such methods include restricting curb cuts and utilization of shared parking among businesses both of which are promoted by this plan.

Rural Arterials

The purpose of a rural arterial, such as Corrlis Road, is to serve as a temporary link in the circulation system until development warrants constructing the road to suburban standards. Frequently, it is necessary to complete such a link years before the adjacent areas develop; therefore, their interim use is to connect presently developed areas with existing highways, commercial areas, etc. In addition, by designating these roads as rural arterials, sufficient right-of-way width can be acquired through appropriate dedications as an area develops. Rural arterial construction is similar to that of suburban arterials except that curbs and gutters are absent.

Collectors

Collector streets serve traffic desiring to travel between major arterials and local streets and are used mainly for traffic movement within residential, commercial and industrial areas. Collector routes provide the combined services of funneling traffic and protecting local roads from bearing unnecessary traffic volumes. Although intended to move traffic, collector roads are generally developed to discourage any long distance of continuous through traffic which should more appropriately be carried by arterial roads.

For safe accommodation of local traffic movement and effective preservation of the character of residential areas, experience has shown that collector streets should be spaced at intervals of about one-half mile. Within De Soto, however, the current street system is not as systematic.

Like arterial roads, collectors can be further divided into minor and major collectors. The main function of a minor collector is to move residential traffic at low speeds, providing a transition between local streets and major collectors or arterials. The primary function of a major collector street is to move moderate volumes of non-residential traffic at low speeds. Like arterials, it is ideal to limit frontage development along collectors wherever possible to ensure safe and uninterrupted traffic flow on these streets. Specifically, direct access to abutting residential properties should be limited.

Local Streets

The main function of a local street is to provide direct access to abutting properties (primarily residential uses) at low speeds within the immediate neighborhood. Although connectivity is encouraged to provide multiple access points and diffuse traffic, continuity of local streets is not as important as with other street

types and through traffic should be discouraged. Generally, local streets should be designed to intersect with a collector street and provide easy access to adjacent property.

MAJOR THOROUGHFARE PLAN MAP

Based on the evaluation of the existing street system and the projected growth of De Soto, a **Major Thoroughfare Plan Map** (see **Map 14**) has been prepared. The functional street hierarchy described herein provides the foundation for the designation of the Major Thoroughfare Plan. These streets fit together to form a network of streets to service the needs of each land use throughout the City. How well the transportation needs are met depends upon how closely the street network can be matched to the existing land use pattern. As the City of De Soto grows, however, the demands made upon the street network could change. Therefore, it is important that the future land use pattern be considered along with the existing pattern when decisions regarding street classifications are made.

Indicated on the map are projected expansions of the existing street network and creation of new streets needed to accommodate the safe and efficient movement of traffic in conjunction with continued growth and development. As a general rule, arterials are located at one-mile intervals and collectors located midway between arterials. This general rule, however, must often be modified to accommodate land uses with high traffic demand, the existing road network, or natural and man-made features such as Kill Creek which disrupt the normal street pattern.

The map and supporting plan contained herein are intended to guide transportation decisions in conjunction with planning improvements and development proposals. For example, the Thoroughfare Plan should be consulted when preparing the Capital Improvement Program and ranking major street improvements.

FUTURE TRANSPORTATION NETWORK AND DESIGN GUIDELINES

In addition to the existing transportation network described in detail in this Chapter, the City plans to serve the growth areas by a network of arterial, collector and local streets. The future transportation network is outlined in the **Map 14, Major Thoroughfare Plan Map,** as described above. Improvements to the existing transportation network, design standards and extensions of the major arterial, major and minor collector streets are described below. The improvement guidelines follow the American Public Works Association (APWA) standards for design and the American Society of State Highway Transportation Officials (AASHTO).

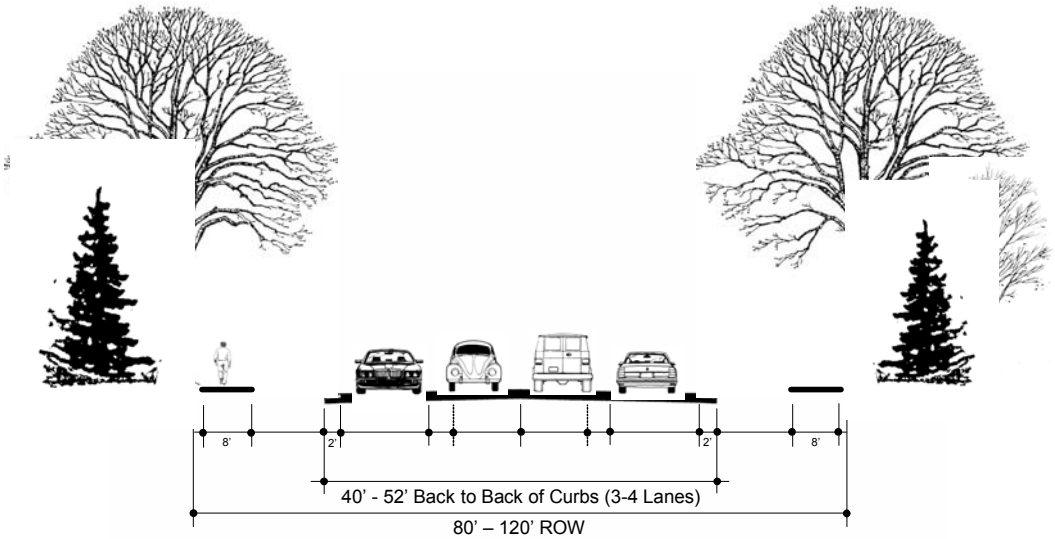
It should be clear that the classification system and design standards presented in this section of the Plan are intended to provide basic guidelines for evaluations of the City's current transportation system, for future street design and construction, and for future improvements of public streets. However, they are not intended to cover every segment of the city streets. In many cases, detailed engineering studies are necessary to identify and evaluate every significant factor involved and to determine if these design standards apply. For example, in an already developed area, it may not be possible to acquire the additional right-of-way necessary to meet the standards as specified for that street type.

In general, it should also be acknowledged that road improvements are an evolving process, often beginning with construction to one standard, followed by a series of improvements necessary to accommodate additional traffic and eventually reaching and ultimate design standard. To that extent, the following design standards are presented as a guide for the ultimate road improvements. However, road may initially be constructed to lesser standards. For example, 91st Street west of Lexington Avenue is projected as an arterial street. Although the road is projected to ultimately function as an arterial, the road currently functions more like a collector road. As such, initial road improvements included construction to collector standards within an arterial right-of-way allowing for future expansion as necessary to accommodate additional traffic volumes. In that sense, obtaining right-of-way adequate to accommodate the ultimate roadway improvements is a primary objective in the City's transportation planning efforts.

Arterials

In addition to Lexington Avenue, Kill Creek Road and 83rd Street which are important links between the City, K-10 Highway and the planning area to the south and east, the Plan calls for additional east-west and north-south arterial roads necessary to complete the transportation network. For example, an extended 91st Street, improved 95th Street, and improved Edgerton and Evening Star Roads are projected as future arterials. In addition, Johnson County has projected Kill Creek Road south of K-10 and 119th Street as part of the County's arterial street network through the Comprehensive Arterial Road Network Plan (CARNP).

Figure 8.1: Typical Cross Section for Arterial Streets



Source: Adapted from the APWA Street Section Details to reflect De Soto sidewalk requirements

Generally, the minimum right-of-way requirement for arterials is 80-120 feet depending on whether the arterial is divided or undivided. Undivided or minor arterials, which are anticipated to serve the majority of the community's arterial needs, may range from 80-100 feet in right-of-way width. The minimum pavement width is 40 feet from back to back of curbs which allows three lanes – one lane in each direction plus a center turn lane. Four lane arterials generally require 52 feet of pavement width from back

to back of curbs. Turning lanes should be constructed at major intersections. A 14-16 foot median or center lane may also be required for some arterial streets.

Only public streets should be allowed to access an arterial and intersection spacing should be related to design speed. The ideal traffic volume for a minor arterial should range between 12,000 to 25,000 vehicles per day. Minor arterials are appropriate for carrying traffic through primarily residential land use without directly accessing any of the properties.

As De Soto continues to grow, major or divided arterials may be necessary to accommodate substantially larger traffic volumes such as those that can be anticipated from the build out of a developed 9,000 acre former Sunflower Army Ammunition Plant. Traffic volumes on major arterials can range between 25,000 to 35,000 vehicles per day. Often a center turn lane is appropriate because of frequent entrances into higher traffic generation land uses such as business parks and retail centers. Because this capacity is reduced by excessive curb cuts and mid-block turning movements, a median can be constructed in locations where left-turns should be prohibited. For design speeds greater than 35 mph or for peak hour right turn-in traffic volumes exceeding 100 vehicles, it is recommended that a right turn lane be constructed along the arterial approaching the curb cut.

Because both arterial types are intended to move larger volumes of traffic, their capacity must be protected. As such, parking is not allowed on either side of an arterial. Similarly, curb cuts and direct access to arterials should be minimized through the use of access control standards.

In addition to the intended traffic carrying capacity, arterials provide primary vehicular connections throughout the community. These connections should also accommodate and promote area pedestrian access. In order to do so, a sidewalk of at least eight feet wide should be furnished on both sides of the roadway.

Although traffic volumes may not currently warrant construction to arterial standards, arterials are usually spaced at approximately one mile intervals. However, arterials may be required at closer spacing based on the projected traffic demands. There is no absolute spacing requirement since spacing should be the function of adjacent land use type and density.

Collector Streets

The Plan calls for additional collectors throughout the City and planning area. Two primary collector types are envisioned to serve the City's street network needs: major and minor. Designs for each of these collector types vary slightly depending on the ultimate improvements warranted.

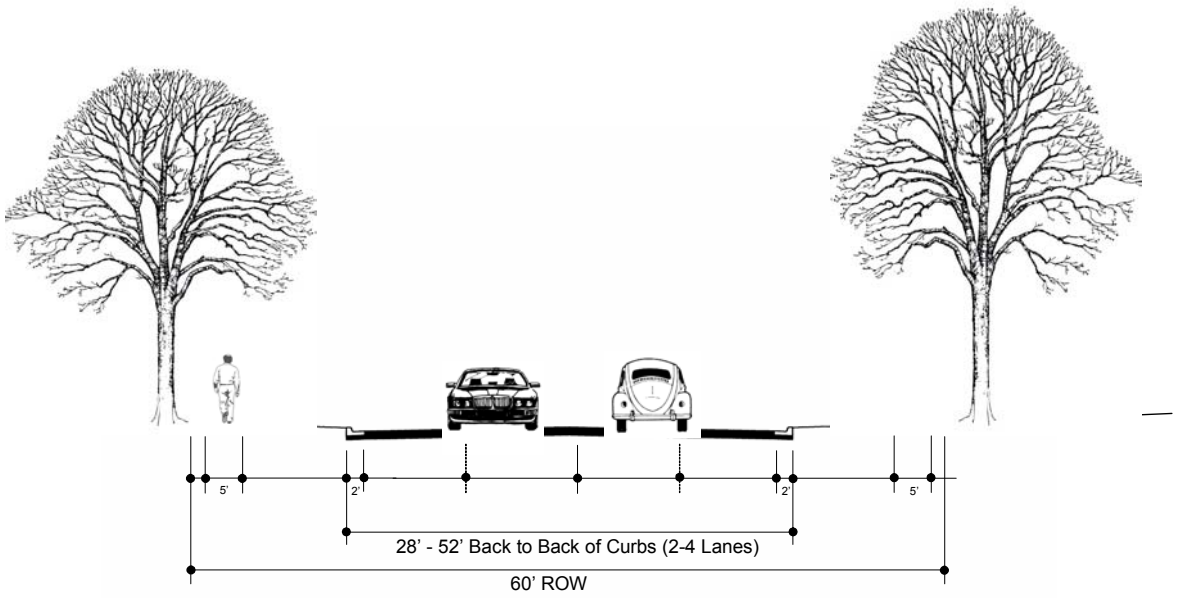
Major collectors are typically appropriate for serving industrial and commercial land use areas, such as adjacent to business parks or commercial development where traffic demand is expected to range between 1,500 and 12,000 vehicles per day.

The right-of-way requirement for a major collector street is 60-80 feet with a pavement width of 28 - 52 feet back to back of curbs. The minimum pavement requirements include two moving lanes of 12 feet in each direction. A three lane or wider two-lane major collector would generally have a pavement width of

40 feet including the curb and gutter. Finally, a four-lane major collector would have 52 feet of pavement including curb and gutter.

Because of the predominantly residential nature of De Soto, major collectors are anticipated to be needed on a limited basis, primarily connecting non-residential development to area arterials. The Commerce Drive connection between K-10 Commerce Park and Lexington Avenue is a good example of how a major collector is intended to work.

Figure 8.2: Typical Cross Section for Major Collector Streets

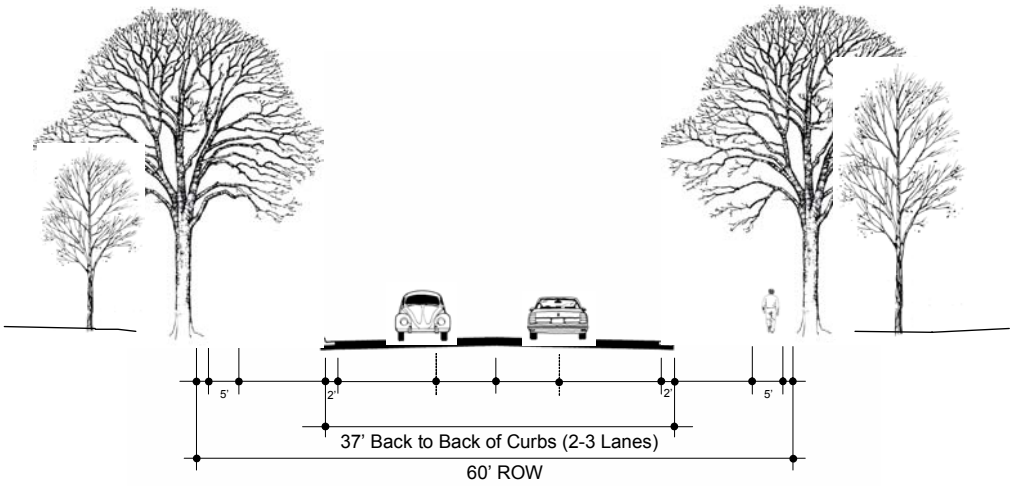


Source: Adapted from the APWA Street Section Details to reflect De Soto sidewalk requirements

As opposed to major collectors, minor collectors are anticipated to make up the majority of the City's collector improvements, serving the predominantly residential portions of the City. Minor collector roads are intended to provide the primary connection between individual neighborhoods and the arterial street network.

The right-of-way width for minor collectors is 60 feet with a pavement width of 37 feet measured from back to back of curbs. The pavement provides for a wide two-lane cross section or two travel lanes and a center turn lane. In either case, traffic volumes should range between 1,500 and 5,000 vehicles per day. Because traffic volumes are significantly higher on minor collectors that local streets, additional development setbacks are warranted to ensure impacts on abutting property are minimized.

Figure 8.3: Typical Cross Section for Minor Collector Streets



Source: Adapted from the APWA Street Section Details to reflect De Soto sidewalk requirements

For both major and minor collectors, on-street parking should be prohibited. Private access to the collector should also be limited in order to further preserve the function of the street and reduce conflicts.

As with arterials, collectors provide more direct vehicular connections than local streets. They should also accommodate more direct pedestrian connections. As such, five foot sidewalks are required on both sides of major and minor collector streets.

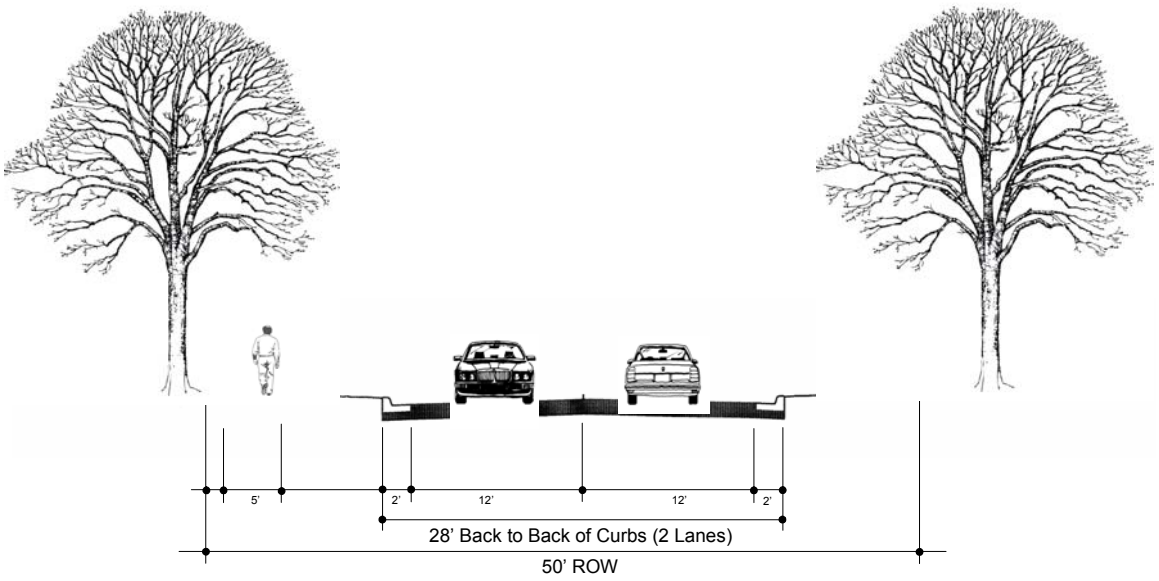
Local Residential Streets

All streets in De Soto and its growth areas not designated as arterials and collectors are considered local residential streets or neighborhood streets. Most of these streets are generally adequate to serve access needs and are not discussed in detail in this section. In the growth areas local streets will be built on an as-needed basis in conjunction with approved development.

The right-of-way requirement for local streets is 50 feet. The pavement width should be 28 feet back to back of curbs that provides one lane of 12 feet in each direction (plus a two-foot curb and gutter on each side of the road).

The ideal traffic volume for local streets is less than 1,500 vehicles per day. Parking is permitted; however, in order to meet fire codes, which require a 20-foot path for equipment, parking should be permitted on one side only. To accommodate local pedestrian circulation, a sidewalk pavement of five feet should be furnished on at least one side of the local street.

Figure 8.4: Typical Cross Section for Local Streets



Source: Adapted from the APWA Street Section Details to reflect De Soto sidewalk requirements

ACCESS CONTROL

Just as the design of a roadway helps to move traffic efficiently, controlling access to the roadway system can help do the same. Traffic hazards and traffic congestion reduce the ability of the roadway to accommodate the traffic volumes or capacity for which it is designed. Traffic congestion and traffic hazards also increase the pressure to widen roadways which requires additional public funds.

Roadway capacity can be increased or decreased in a number of ways. The method utilized most frequently to increase capacity is to widen a road to provide additional travel lanes. In some instances, however, it is not feasible to add additional travel lanes due to land uses on either side of existing roadways. In these instances, other methods of increasing roadway capacity may be more appropriate. Other methods include constructing intersection improvements, turn bays, medians, restricting road and driveway access or providing traffic signal timing improvements. Conversely, road capacity can be decreased by adding cross roads, driveways, traffic signals, or other traffic control devices.

By implementing an access control policy, De Soto can improve street capacity in redevelopment scenarios and maintain existing capacity by controlling access to arterials and collectors, providing for efficient accommodation of existing and future development.

Specific design characteristics associated with each functional classification depend on factors such as projected traffic volumes and local access control policies. Higher traffic volumes, for example those exceeding 25,000 vehicles per day, would warrant construction of a four or five lane arterial street. Traffic volumes of 15,000 vehicles per day can be accommodated by a four-lane arterial street or by a two-lane arterial street which includes turnbays, good signal and intersection spacing, and private

driveway access control. In many cases, a well built two-lane arterial street can function as well as a four-lane street at just over half the cost. Specific access control guidelines are listed below for public street intersection spacing, driveway spacing and corner clearance, and signal spacing.

Intersection Spacing

In order to provide safe and efficient travel on the City's major roads and in doing so protecting intended capacity, adequate distance should be maintained between intersections. Intersection spacing standards are intended to achieve three principle objectives.

- Provide adequate distance between intersections for the safe and efficient flow of traffic.
- Space intersections to give through-motorists an opportunity to respond to traffic entering the street from a side street.
- Base spacing requirements on through traffic speed, related spacing and reaction times.

Table 8.1 shows the minimum standards for spacing intersections, determined by through-traffic speed.

Table 8.1: Minimum Intersection Spacing Standards

Through-Traffic Speed	Minimum Intersection Spacing
30 mph	210 feet
35 mph	300 feet
40 mph	420 feet
45+ mph	550 feet

Source: Institute of Transportation Engineers

Driveway Spacing

Like a street, private driveways create an intersection with a public street. Conflicts and potential congestion occur at all intersections - public and private. Methods to reduce conflict include:

- Separating the conflicts by reducing the number of driveways and intersections;
- Limiting certain maneuvers such as left turns; and
- Separating conflicts by providing turn lanes.

To avoid these conflicts with driveway locations, access should comply with corner clearance criteria. Proper spacing of driveways permits adequate storage and stacking of automobiles on the public street. As such, driver conflicts need to be spaced in order to eliminate overlaps between through traffic and right turns. This distance may have to be increased in cases with high volumes to ensure that driveways do not interfere with the operation of turning lanes at intersections. In no case should access drives be located within the operations area of an intersection. Driveway spacing standards are intended to achieve the following objectives:

- Separate access conflicts by reducing the number of driveways and intersections.
- Limit certain traffic maneuvers such as left turns.
- Separate conflicts by providing turn lanes.
- Prohibit access drives from locating within the operations area of an intersection.
- Space driver conflicts in order to eliminate overlaps between through traffic and right turns.

- Properly space driveways to permit adequate storage and stacking of automobiles on the public street

The following standards in **Table 8.2** are based on AASHTO standards and the Institute of Transportation Engineers (ITE) Manual. These standards are intended to serve as guidelines to achieve the above objectives.

Table 8.2: Maximum Driveway Guidelines

Maximum Number of Driveways	Driveway Spacing	
	Undivided Arterial Streets Length of Lot Frontage	**Divided Arterial Streets Length of Lot Frontage**
1	0-399 feet	0-529 feet
2	400 - 899 feet	530 - 1199 feet
3	900-1,399 feet	1200 - 1859 feet
4	1,400-1,899 feet [1]	1860 - 2525 feet [2]

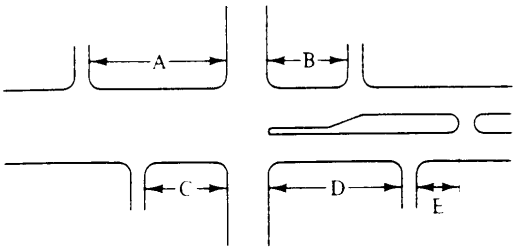
Source: Institute of Transportation Engineers (ITE) Manual
Notes: [1] For each 500 feet above 1899 feet, one additional driveway is permitted.
[2] For each 665 feet above 2525 feet, one additional driveway is permitted.

Corner Clearance

In conjunction with intersection spacing, minimum corner clearance guidelines provide for reduced conflicts at intersections. More specific minimum corner clearance guidelines are listed in **Figure 8.5**. These guidelines can be used to regulate new development, particularly multifamily and non-residential developments which often locate along arterial and collector streets.

As the City continues to grow and traffic volumes increase, the need to signalize intersections such as 91st Street and Lexington Avenue may be necessary. As such, these standards are broken into requirements for signalized and non-signalized intersections.

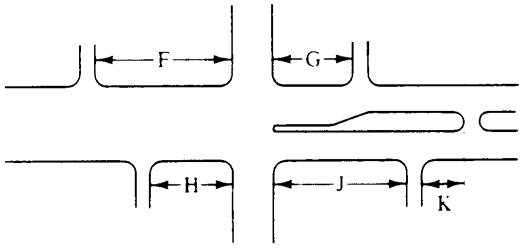
Figure 8.5: Corner Clearance Guidelines



Minimum Corner Clearances*

Item	Functional Classification of Road		
	Arterial	Collector	Local
A	230	175	50
B	115	85	50
C	230	175	50
D	230	175	50
E	75	0	0

(a) Signalized intersection control



Minimum Corner Clearances*

Item	Functional Classification of Road		
	Arterial	Collector	Local
F	115	75	50
G	115	85	50
H	85	85	50
J	115	75	50
K	75	0	0

(b) Non-signalized intersection control

Source: Adapted from The Traffic Institute, Northwest University.