Washington City
Where Dixie Begins

Washington City Access Management Plan

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HORROCKS ENGINEERS

Contents

1.0 ACCESS MANAGEMENT PLAN

The Federal Highway Administration's official definition of access management is "...the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding system in terms of safety, capacity and speed." In practical terms, it means managing the number of driveways that a vehicle may encounter without hampering reasonable access to a property and removing slower turning vehicles from the main traffic stream as efficiently as possible.

Access management attempts to:

- Deal with the traffic problems caused by unmanaged development before they occur
- Address how land is accessed along arterials and major collectors
- Focus on mitigating traffic problems arising from development and the increased traffic volumes attempting to utilize these developments
- Call upon local planning and zoning to address overall patterns of growth and the aesthetic issues arising from development

The overall goal of local access management plans is to reduce traffic conflicts by:

- Limiting the number of conflict points that a vehicle may experience in its travel. This is especially true at intersections and driveways where vehicle, pedestrian and bicycle paths cross, merge and diverge. Generally, as the number of conflict points increases, so does the potential for crashes. Eleven conflict points are present at the intersection of a four-lane roadway and a two-lane driveway. In comparison, by restricting left-turn ingress and egress movements at the same driveway, the number of conflict points is reduced to two.
- Separating conflict points that cannot be completely eliminated. Where conflict points occur, it is desirable to provide adequate spacing between conflict points to provide motorists, pedestrians and cyclists adequate time to react to one conflict point at a time.
- Removing slower turning vehicles from through travel lanes. Motorists need time to react and begin slowing to avoid vehicles exiting, entering or turning across the roadway. Providing turning lanes and restricting turning movements allows turning and merging traffic to appropriately adjust travel speeds with minimal impact to through travel movements.
- Providing adequate on-site circulation and storage. The proper design of internal site circulation and vehicle storage can improve operations on the major roadway.

1.1 Principles of Access Management

Constantly growing traffic congestion, concerns over traffic safety, and the ever increasing cost of upgrading roads have generated interest in managing the access to not only the highway system, but to surface streets as well. Access management is the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity, and speed. Access management attempts to balance the need to provide good mobility for through traffic with the requirements for reasonable access to adjacent land uses.

Arguably the most important concept in understanding the need for access management is to insure the movement of traffic and access to property is mutually exclusive. No facility can move traffic very well and provide unlimited access at the same time. Figure 1 shows the relationship between mobility, access, and the functional classification of streets. The extreme examples of this concept are the freeways and the cul-de-sac. The freeway moves traffic very well with few opportunities for access, while the cul-de-sac has unlimited opportunities for access, but doesn’t move traffic very well. In many cases, accidents and congestion are the result of streets trying to serve both mobility and access at the same time.
A good access management program will accomplish the following:

- Limit the number of conflict points at driveway locations.
- Separate conflict areas.
- Reduce the interference of through traffic.
- Provide sufficient spacing for at-grade, signalized intersections.
- Provide adequate on-site circulation and storage.

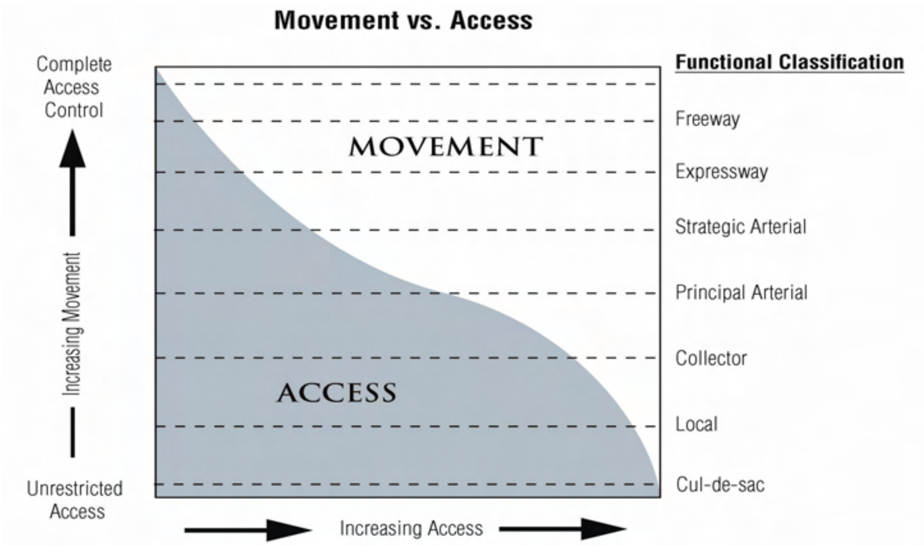

Figure 1 – Mobility vs. Access by Functional Classification

Access management attempts to put an end to the seemingly endless cycle of road improvements followed by increased access, increased congestion, and the need for more road improvements. Poor planning and inadequate control of access can quickly lead to an unnecessarily high number of direct accesses along roadways. The movements that occur on and off roadways at driveway locations, when those driveways are too closely spaced, can make it very difficult for through traffic to flow smoothly at desired speeds and levels of safety. The American Association of State Highways and Transportation Officials (AASHTO) state that “the number of accidents is disproportionately higher at driveways than at other intersections…thus their design and location merits special consideration.” Studies have shown that anywhere between 50 and 70 percent of all crashes that occur on the urban street system are access related.

Fewer direct accesses, greater separation of driveways, and better driveway design and location are the basic elements of access management. There is less occasion for through traffic to brake and change lanes in order to avoid turning traffic when these techniques are implemented uniformly and comprehensively.

Consequently, with good access management, the flow of traffic will be smoother and average travel speeds higher. There will definitely be less potential for accidents. According to the Federal Highway Administration (FHWA), before and after analyses show that routes with well managed access can experience 50 percent fewer accidents than comparable facilities with no access controls.

1.2 Roadway Functional Classification and Access

Access spacing should recognize that access and mobility are competing functions. This recognition is fundamental to the design of roadway systems that preserve public investments, contribute to traffic safety, reduce fuel consumption and vehicle emissions, and do not become functionally obsolete. Suitable functional design of the roadway system also preserves the private investment in residential and commercial development.

A typical trip on an urban street system can be described as occurring in identifiable steps. These steps can be sorted into a definite hierarchy with respect to how the competing functions of mobility and access are satisfied. At the low end of the hierarchy are roadway facilities that provide good access to abutting properties, but provide limited opportunity for through movement. Vehicles entering or exiting a roadway typically perform the ingress or egress maneuver at a very low speed, momentarily blocking through traffic and impeding the movement of traffic on the roadway. At the high end of the hierarchy are facilities that provide good mobility by limiting and controlling access to the roadway, thereby reducing conflicts that slow the flow of through traffic.

The functional system of classification divides streets into three basic classes identified as arterials, collectors, and local streets. The function of an arterial is to provide for mobility of through traffic. Access to an arterial is controlled to reduce interferences and facilitate through movement. Collector streets provide a mix for the functions of mobility and access, and therefore accomplish neither well. The predominant purpose of local streets is to provide good access. Each class of roadway has its own geometric, traffic control, and spacing requirements.

The access management concepts and standards presented below are consistent with guidelines established by the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), the Transportation Research Board (TRB), and the Institute of Transportation Engineers (ITE).

1.2.1 Roadway Network and Access Management Standards

Washington City's roadway network consists of a hierarchy of streets that range in function from providing a high level of mobility and limited access (arterial street) to a high level of access and limited mobility (local street). As defined in the Master Transportation Plan, the roadway network consists of Freeways/Expressways, Arterials, Collectors, and Local Streets. Table 1 shows the access management category for each roadway in the city.

Table 1 - Access Management Category

Roadway	Beginning At	Ending At	Access Category
100 East / Main Street	Industrial Road	500 South	3
1100 East	Telegraph Road	Washington Parkway	2
20 East	City Limit	2000 South	4
240 West	City Limit	2000 South	5
300 East	Merrill Road	3650 South	5
2000 South / Sandia	800 West	Washington Fields Road	4
2550 South / Merrill Road	Washington Fields Road	City Limit	2
3050 East / Green Springs Drive	Telegraph Road	City Limit	4

3090 South	City Limit	Washington Fields Road	4
3650 South	Southern Corridor	City Limit	3
540 West	City Limit	Merrill Road	5
840 South	City Limit	300 East / Washington Fields Road	4
Buena Vista	Green Springs Drive	Northern Corridor / Washington Parkway	3
Bulloch Street	300 East	1100 East	5
Camino Real	Washington Fields Road	Washington Dam Road	5
Camino Real	Washington Fields Road	20 East	5
Coral Canyon Blvd	SR-9	Telegraph Road	4
Fairway Drive	Green Springs Drive	Northern Corridor / Washington Parkway	5
Frontage Road	300 East	1100 East	4
Foothill Drive	100 East / Main Street	Washington Fields Road	5
Green Springs	Cove Drive	1860 North	2
Green Springs	Telegraph Road	Cove Drive	3
Green Springs	1860 North	Northern Corridor / Washington Parkway	3
Harvest Lane	20 East	Merrill Road	5
Indian Springs Drive	Washington Fields Road	Seminole Way	4
Industrial Road	City Limit	Washington Fields Road	4
Landfill Road	Sunrise Valley	Telegraph Road	3
Landfill Road	Warner Valley Road	Southern Corridor	2
Liberty Greens Drive	Coral Canyon Blvd	Coral Canyon Blvd	5
Long Valley Road	3650 South	Washington Dam Road	4
Main Street	600 South	Northern Corridor / Washington Parkway	3
Majestic Drive	Washington Fields Road	Long Valley Road	5
Middleton Drive	City Limit	Green Springs	3
Noble Drive	3650 South	Majestic Drive	5
Northern Corridor / Washington Parkway	I-15	City Limit	1
Red Cliffs Drive	City Limit	Green Springs	3
Seminole Way	Washington Dam Road	Apache Drive	5
Fairgrounds Road	Southern Corridor	SR-9	3
Telegraph Road	Washington Parkway	SR-9	2

Telegraph Road	300 East	Washington Parkway	3
Warner Valley Road	Washington Fields Road	Southern Corridor	3
Warner Valley Road	Southern Corridor	Landfill Road	3
Washington Dam Road	Washington Fields Road	Camino Real	2
Washington Dam Road	Camino Real	Southern Corridor	3
Washington Fields Road	Airport Road / Southern Corridor	3650 South	1
Washington Fields Road	3650 South	400 South	2
Washington Fields Road / 300 East	400 South	Telegraph Road	3
300 East	Telegraph Road	Frontage Road	5
Washington Parkway	Telegraph Road	I-15	1
Washington Parkway Extension	Washington Dam Road	Telegraph Road	1
Sunrise Valley Road	Washington Dam Road	Fairgrounds Road	4

Access Categories are defined as:

1 = Major Arterial
2 = Arterial with posted speed > 45 mph
3 = Arterial with posted speed ≤ 45 mph
4 = Major Collector
5 = Residential Collector

Some of the City's arterial streets fall under the jurisdiction of the Utah Department of Transportation (UDOT) and are subject to statewide access management standards. Refer to UDOT's "Accommodation of Utilities and the Control and Protection of State Highway Rights of Way" for access management standards for these roadways. For all other streets, Washington City access management standards apply.

1.3 Access Management Techniques

There are a number of access management techniques that can be used to preserve or enhance the capacity of a roadway. Specific techniques for managing access are discussed in this section and illustrated with examples. Not all techniques will apply to every situation. Some of them are more appropriate to less developed rural areas of the City, whereas others are more appropriate in the urban areas. In the urban areas, the techniques can be applied when existing sites are redeveloped or when negotiations with landowners are successful. Therefore, it is up to the City's Planning Board to determine what will work best based in each situation.

1.3.1 Number of Access Points

Controlling the number of access points or driveways from a site to a roadway reduces potential conflicts between cars, pedestrians, and bicycles. Each parcel should normally be allowed one access point, and shared access is required were possible. Provisions can be made in the local land use regulations to allow for more than one access point where special circumstances would require additional accesses. Incentives such as density bonuses or reduced frontage requirements can encourage developers to utilize access from existing side roads or to construct side roads rather than directly access an arterial or a collector road.

1.3.2 Spacing of Access Points

Establishing a minimum distance between access points reduces the number of points a driver has to observe and reduces the opportunity for conflicts. Spacing requirements should be based on the classification and design speed of the road, the existing and projected volume of traffic as a result of the proposed development, and the physical conditions of the site. Minimum spacing standards should be applied to both residential and commercial/industrial developments.

To ensure efficient traffic flow, new signals should be limited to locations where the progressive movement of traffic will not be impeded significantly. Uniform, or near uniform, spacing of signals is essential for the progression of traffic. As a minimum, signals should be spaced no closer than one-quarter mile (1,320 feet). It may be recommended on principal arterial streets that signals be spaced at one-third mile (1,760 feet) to one-half mile (2,640 feet).

Unsignalized driveways are far more common than signalized driveways. They affect all kinds of activity, not merely large activity centers. Traffic operational factors leading toward wider spacing of driveways (especially medium- and higher-volume driveways) include weaving and merging distances, stopping sight distance, acceleration rates, and storage distance for back-to-back left turns. From a spacing perspective, these driveways should be treated the same as public streets. Sound traffic engineering criteria indicates that 500 feet or more should be provided between full-movement unsignalized accesses.

Restricted access movement (i.e., right-in/right-out access) can provide for additional access to promote economic development with minimum impact to the roadway facility. This type of access should be spaced to allow for a minimum of traffic conflicts and provide distance for deceleration and acceleration of traffic in and out of the access. The spacing requirement of accesses is based on the functional classification of the roadway facility and is shown in Table 2. Access spacing shall be measured from center of access to center of access. The spacing of right-turn accesses on each side of a divided roadway can be treated separately; however, where left-turn at median breaks are involved, the access on both sides should line up or be offset from the median break by a minimum of 300 feet. On undivided roadways, access on both sides of the road should be aligned. Where this is not possible, driveways should have an offset distance based on the roadway classification (Table 3). This offset is the distance from the center of an access to the center of the next access on the opposite side of the road.

Table 2 – Access Spacing Based on Functional Classification

Functional Classification	Minimum Signal Spacing (ft)*	Minimum Unsignalized Full-Movement Access Spacing (ft)*	Minimum Right-In/Right-Out Access Spacing (ft)*
Major Arterial	2,640	660	330
Minor Arterial	1,320	500	250
Major Collector (Commercial Zone)	1,320	500	250
Major Collector (Residential Zone)	1,320	250	150
Residential Collector	1,320	250	N/A
Commercial Local	1,320	400	200
Residential Local	1,320	150	N/A
Residential Sub-Local	1,320	150	N/A

*Distances in table are measured from center to center of driveway. Minimum values may not be acceptable in certain circumstances. Minimum values may be approved upon review by the city engineer.

Table 3 – Minimum Offset between Driveways on Opposite Sides of Undivided Roadways

Functional Classification	Minimum Offset (ft)*
Major Arterial	600 for speed ≥ 45 mph and 300 for speeds < 45 mph
Minor Arterial	220
Major Collector (Residential Zone)	200
Major Collector (Commercial Zone)	200
Residential Collector	150
Commercial Local	200
Residential Local	N/A
Residential Sub-Local	N/A

*Distances in table are measured from center to center of driveway.
Note: Values are based on TRB Access Management Guidelines.

1.3.3 Medians

Medians are used to control and manage left turns and crossing movements as well as separating traffic moving in opposite directions. Restricting left turning movements reduces the conflicts between through and turning traffic resulting in improved safety. Studies have shown that the installation of a non-traversable median will reduce crashes by 30 % over that of a two way left turn lane (TWLTL). Medians are typically used on arterial or other roadways with high volumes of traffic and four or more lanes of traffic.

The use and design of a median is determined by the characteristics of the roadway such as: traffic volumes, speed, number and configuration of lanes, right-of-way width and land uses along the roadway. The need for a median can be identified through engineering review, a traffic study assessing the impact of a proposed project, and should be considered on any roadway that has a speed limit greater than 40 MPH. Medians can improve pedestrian safety by providing a refuge area for those crossing the street. The designer should consider incorporating pedestrian refuge at all major intersection crossings.

In addition, medians are often used in commercial and residential developments to separate lanes of traffic and limit conflicts caused by left turns, and to provide traffic calming by limiting traffic movements in targeted areas. Medians can also add to the overall aesthetics of a roadway corridor or a development by incorporating landscaping or other items of visual interest. A well designed roadway with good access management can be aesthetically pleasing. It provides the landscape architect greater opportunity in the development of practical and efficient landscape plans. However care should be taken to maintain sight distance around the intersection /access locations. It is therefore required that only ground cover plantings be planted within 350 feet of an intersection/access opening. Also care should be taken to select landscape materials and location of the materials that will not intrude into the roadway which could result in a safety problem for the motorist. Also care should be taken in selecting trees that will not be larger than 4 inches in diameter when mature.

Continuous two way left turn lanes can reduce the conflict and delays caused by vehicles turning left as they cross on-coming traffic. Left turn lanes also reduce accidents caused by slowing vehicles and traffic going around on the right. However, it has been determined that two-way left turn lanes may begin to exhibit undesirable characteristics associated with left-turning accidents when volumes become greater. Some states such as Georgia allow two-way left turn lanes on roadways that experience up to 18,000 vehicles per day, but have found that mid-block angled accidents become more frequent and outweigh the benefits that the lane provides. Therefore, Georgia considers medians on roadways with more than 18,000 vpd ADT. New roads that utilize other access management techniques should not need a two way left turn lane.

Median openings are provided at all signalized at-grade intersections. They are also generally provided at unsignalized junctions of arterial and collector streets. They may be provided at driveways, where they will have minimum impact on roadway flow. The spacing of median openings for driveways should reflect traffic signal coordination requirements and the storage-space needed for left turns. Minimum desired spacing of unsignalized median openings at driveways shall be based on the left turn storage requirements. Median openings for left-turn entrances (where there is no left-turn exit from the activity center) should be spaced to allow sufficient storage for left-turning vehicles.

Left-turn ingress or egress requires a median opening when traffic traveling in opposing directions is separated by a barrier median. Median widths commonly vary from 30 inches to over 30 feet. A 14 foot median is desirable in order to provide for an adequate left turn lane at intersections.

Design elements include the median width, the spacing of median openings and the geometries of median noses at opening. Typically, median widths at intersections are 30 inches formed by two 15 inch curbs back to back with a plowable (tapered) end.

1.3.4 Corner Clearance

Corner Clearance is the distance between a driveway and an intersection. Providing adequate corner clearance improves traffic flow and roadway safety by ensuring that the traffic turning into the driveway does not interfere with the function of the intersection. For residential corner lots, driveways shall not be placed within the distance of twenty-five (25) feet from the point of curvature of the radius of the curb, or forty (40) feet from the point of the intersection of property lines nearest the intersection, whichever is further from the street intersection. In multi-family or commercial areas, an access opening shall not be located within the functional area of the intersection as shown in Figure 2.

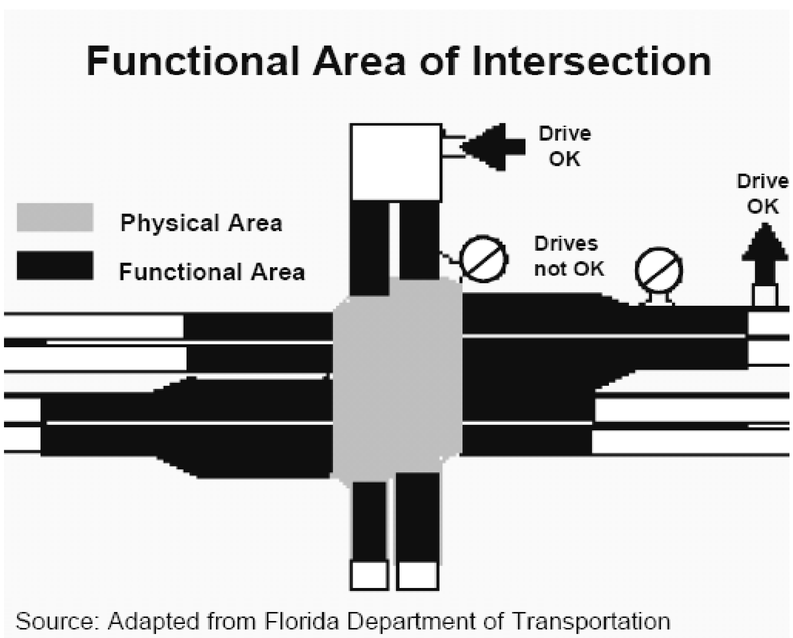

Figure 2 – Functional Area of Intersections

Corner Clearance shall be based on an engineering study that includes the following distances illustrated in Figure 3 and Table 4. Figure 4 shows an example of inadequate corner clearance that can inhibit roadway capacity and decrease safety.

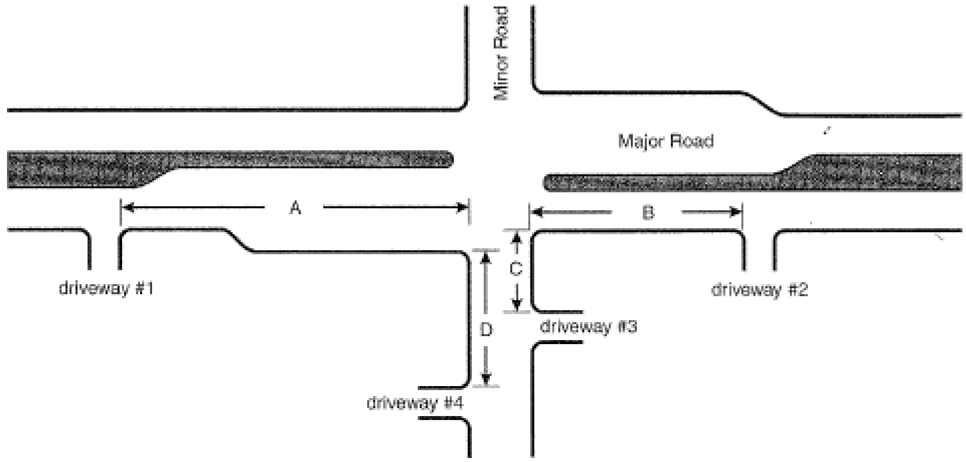

Figure 3 – Corner Clearance Types

Clearance Type	Sample Clearance Criteria
A- Approach side on the major roadway	Equal or exceed the functional distance of the intersection d1+d2+d3 (based on engineering study). d1= Distance traveled during perception d2= Distance traveled while driver decelerates to a stop d3= Storage length
B- Departure side on the major roadway	Residential Roadways 50 feet* Major Collector Residential 75 feet* Major Collector Commercial 150 feet* Minor Arterial Roadways 185 feet* Major Arterial Roadways 230 feet*
C- Approach side on the minor roadway	Shall be a minimum of 100 feet
D- Departure side on the minor roadway	Shall be a minimum of 50 feet

Table 4 – Corner Clearance Criteria

* Based on a spillback rate of 15% from TRB Access Management Manual

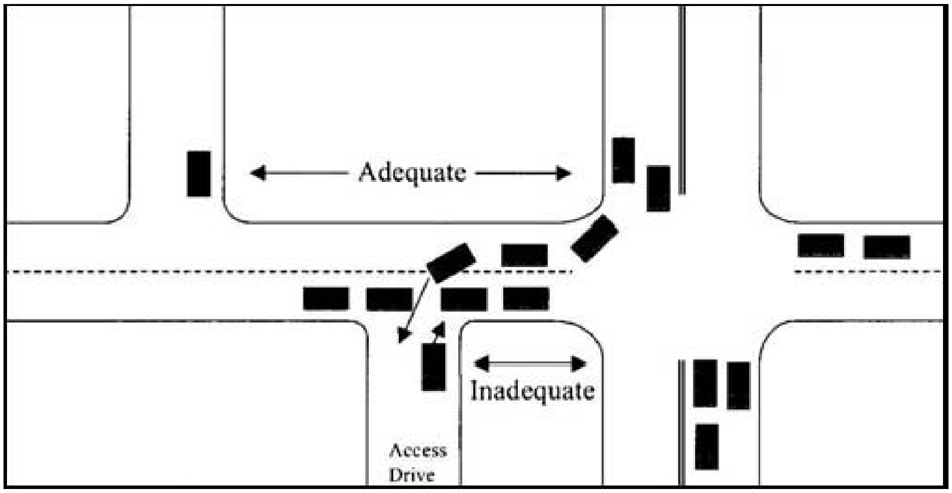

Figure 4 – Inadequate Corner Clearance

1.3.5 Width of Access Points

Uncontrolled access is a serious hazard for vehicles entering or exiting a site, vehicles passing by a site, bicyclists and pedestrians. In addition to limiting the number of access points, the width of the access point should be restricted based on the use of the site in question. Driveways that are wider than necessary tend to cause confusion with entering and exiting traffic. Lanes in busy driveways should be clearly defined with signing and striping to minimize driver error and for ease of operation.

Residential driveways are generally less important when it comes to access management because they are mostly located in residential zones on local streets that have relatively low traffic volumes. However, residential driveways should still be designed to encourage safe entry and exit. Residential driveway widths should be limited to a maximum width of 32 feet at the edge of pavement, including turning radii, unless approved by the city engineer. This width will accommodate a driveway intended for 3 cars parked side-by-side, a common configuration for 3-car garages or 2-car garages and an RV pad. The width of 32 feet allows 10 feet of width for each parked car with 1 foot additional width on each side of the driveway. It is important to design for vehicles to back straight out without extraneous wheel movement as this may prove to be too difficult for some drivers, introducing opportunities for error while backing out. Driveways that only need width for a one-car garage or some other similar narrow width should allow enough room for a backing-out maneuver for the typical driver, preferably 16 feet. Narrower widths shall be approved by the city engineer.

The maximum width for a commercial or industrial site entrance with two-way traffic should be limited to 44 feet including 12’ for right out 12’ for left out with 16’ for receiving lane and 2- 2 foot shoulders. The width of the entrance should be determined based on the type of use for the site, the type of traffic (i.e. cars vs. 18 wheel trucks), and the projected volume of traffic.

1.3.6 Turning Radius

The turning radius of a driveway or access road affects both the flow and safety of through traffic as well as vehicles entering and exiting the roadway. The size of the turning radius affects the speed at which vehicles can exit the flow of traffic and enter a driveway. In general, the larger the turning radius, the greater the speed at which a vehicle can turn into a site. An excessively small turning radius will require a turning vehicle to slow down significantly to make the turn, therefore backing up the traffic flow or encroaching into the other lane. An excessively large turning radius will encourage turning vehicles to travel quickly, thereby creating hazards to pedestrians. Either of these situations increases the potential for accidents.

The speed of the roadway, the anticipated type and volume of the traffic, pedestrian safety and the type of use proposed for the site should be considered when evaluating the turning radius. Proposed uses that would require deliveries by large trucks (such as major retail establishments and gas stations) should provide larger turning radii to accommodate such vehicles. Other uses such as banks, offices or areas with high pedestrian traffic could adequately be served with smaller turning radii based on the type of traffic they would generate. A minimum curb radius of 25 feet is required.

1.3.7 Throat Length

Throat Length is the length of the driveway that is controlled internally from turning traffic measured from the intersection with the road. Driveways should be designed with adequate throat length to accommodate queuing of the maximum number of vehicles as defined by the peak period of operation in the traffic study. This will prevent potential conflicts between traffic entering the site and internal traffic flow. Inadequate throat length may cause turning traffic to back up onto the road thereby impeding traffic flow and increasing the potential for accidents. The minimum throat length for an access into a minor commercial property is 50 feet. For major commercial development FHWA recommends a minimum throat length of 150’ for a major driveway entrance, with 300’ desirable. Figure 5 shows both a poor and good example of driveway throat length.

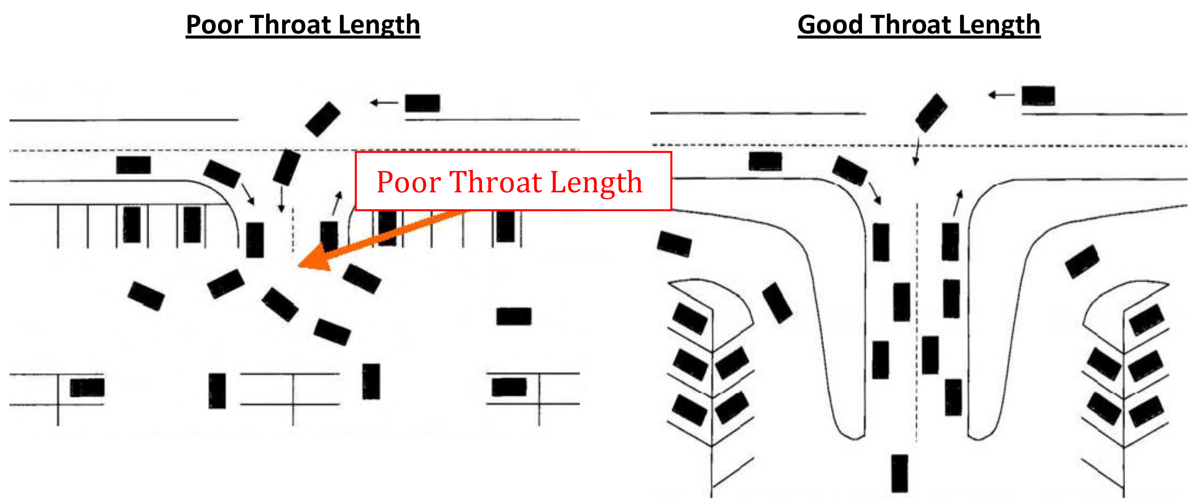

Figure 5 – Driveway Throat Length Examples

1.3.8 Driveway Profiles

The slope of a driveway can dramatically influence its operation. Usage by large vehicles can have a tremendous effect on operations if slopes are severe. The profile, or grade, of a driveway should be designed to provide a comfortable and safe transition for those using the facility, and to accommodate the storm water drainage system of the roadway. A maximum grade of 2 percent for a minimum of 50' should be provided for commercial driveways. For street accesses and major traffic generators in multi-family, industrial, or commercial zones, driveways should have curb returns and 6-foot waterways or culvert crossings. Table 5 gives the maximum change that can occur between the roadway cross-slope and the driveway slope.

Table 5 – Maximum Change between Roadway Cross-Slope and Driveway Slope

Roadway Functional Classification	Driveway	
	High Volume	Low Volume
Major Arterial	5%	6%
Minor Arterial	6%	7%
Collector	7%	8%
Commercial Local	N/A	≤10%
Residential Local	N/A	≤12%
Residential Sub-Local	N/A	≤12%

1.3.9 Shared Access

Access points shall be shared between adjacent parcels to minimize the potential for conflict between turning and through traffic. Shared access can be used effectively for both residential and nonresidential developments. Since the issues surrounding shared access for residential and nonresidential development are slightly different, they are discussed separately.

Residential

Residential subdivisions located along arterial or collector roadways should be required to construct an internal road system rather than be developed along the existing roadway frontage or a single access cul-de-sac. Subdivision proposals should encourage a coordinated street network by providing rights-of-way or stubs for the extension of streets to adjacent parcels. This will prevent the proliferation of driveways on arterial and collector streets and provide for an interconnected street network.

Shared driveways shall also be used to minimize the number of curb cuts in residential districts, particularly along rural arterial and collector roads. If access is necessary from an arterial or collector then shared driveways is required. Shared driveways will be built to fire lane standards.

Commercial

Joint driveways providing access to adjacent developments, and interconnections between sites, are required for all development proposals on arterial and collector roadways. Interconnections between sites can eliminate the need for additional curb cuts, thereby preserving the capacity of the roadway. This is particularly important for commercial/industrial sites and should be used to encourage the development of internal or collector roadway systems servicing more than one parcel or establishment. Future roadway rights-of-way should also be provided to promote interconnected access to vacant parcels or to facilitate the consolidation of access points for existing developments.

Pedestrian access between developments will allow people to walk between establishments, thereby reducing the number of vehicle trips. Every opportunity should be taken to provide for interconnections between existing and future developments for both vehicles and pedestrians.

1.3.10 Alignment of Access Points

Street and driveway intersections represent points of conflict for vehicles, bicycles and pedestrians. All modes of travel should be able to clearly identify intersections and assess the travel patterns of vehicles and pedestrians through the intersection. To minimize the potential conflicts and improve safety, intersections and driveways shall be aligned opposite each other wherever possible and intersect roadways at a 90 degree angle. Good driveway alignment will provide vehicles, bicycles, and pedestrians with a clear line of sight and allow them to traverse the intersection more safely.

1.3.11 Sight Distance

Sight distance is the length of the road that is visible to the driver. A minimum safe sight distance should be required for access points based on the roadway classification. The American Association of State Highway and Transportation Officials (AASHTO) publication, *A Policy on Geometric Design of Highways and Streets* contains recommendations for sight distance based on the roadway design speed and grade. Providing sufficient intersection sight distance at the driveway point for vehicles using a driveway to see oncoming traffic and judge the gap to safely make their movement is essential. Vehicles should be able to enter and leave the property safely. Intersection sight distance varies, depending on the design speed of the roadway to be entered, and assumes a passenger car can turn right or left into a two-lane highway and attain 85 percent of the design speed without being overtaken by an approaching vehicle that reduces speed to 85 percent of the design speed. Table 6, below, gives intersection sight distance requirements for passenger cars. Sight distances should be adjusted with crossroad grade in accordance with AASHTO policies.

Table 6 – Intersection/Driveway Sight Distance

Posted Speed Limit (mph)	Sight Distance Required (ft)*
30	335
35	390
40	445
45	500
50	555
55	610
60	665
65	720

*Based on a 2 lane roadway (for other lane configurations, refer to AASHTO for adjustments). Drivers' eye setback is assumed to be 15 feet measured from the edge of traveled way.

Normally, intersection sight distance will govern the required sight distance for the driveway but it is also important to verify that the main roadway have sufficient stopping sight distance. For example, a driver of a vehicle approaching an intersection should have an unobstructed view of the entire intersection including any traffic control devices and sufficient length along the intersecting highway to permit the driver to anticipate and avoid potential collisions. The safe stopping sight distance should be reviewed to make sure that the approaching vehicle has a clear view of the roadway in the area of the access. Sight distance may be more of a consideration in rural areas because of higher speeds and rolling/hilly terrain. The stopping sight distance will be greater for a roadway with a high speed and a downgrade as vehicles will take longer to stop in such a circumstance. Table 7 gives the safe stopping sight distance that should be provided for a driver on the roadway to have a clear view of the access/driveway. In making this determination for stopping sight distance, it should be assumed that the approaching driver's eye is 3.5 feet above the roadway surface and that the object to be seen is 2 feet above the surface of the road.

Table 7 – Safe Stopping Sight Distances on Grades

Design Speed (mph)	Safe Stopping Sight Distance (ft)			
	Downhill Grades		Uphill Grades	
	-3%	-6%	3%	6%
25	158	165	147	143
30	205	215	200	184
35	257	271	237	229
40	315	333	289	278
45	378	400	344	331
50	446	474	405	388
55	520	553	469	450

1.3.12 Turning Lanes

Turning lanes remove the turning traffic from the through travel lanes. Left turning lanes are used to separate the left turning traffic from the through traffic. Right turn lanes reduce traffic delays caused by the slowing of right turning vehicles. Designated right or left turn lanes are generally used in high traffic situations on arterial and collector roadways. Right-turn lanes are mandatory for newly proposed or modified accesses on high-volume arterials (15,000 vpd or greater) where driveways have a right-turning peak hour volume of 10 vehicles per hour or more. A traffic impact study will identify the need for and make recommendations on the design of turning lanes or tapers based on the existing traffic volumes, speed, and the projected impacts of the proposed use.

Storage Length

The length of the turning lane shall be a minimum of 100 feet and at an unsignalized intersection it shall be a minimum length to accommodate 2- 25 foot vehicles based on the number of vehicles likely to arrive in a 2 minute period at peak hour. For signalized intersections, the storage length shall be 1 ½ times the average number of vehicles that would queue per cycle during the peak hour based on design year volumes.

Lane Width

Turning lanes shall normally be a minimum of 12 feet in width. Any exception will require approval from the City Engineer.

Left-turn Lanes

The provision of left-turn lanes is essential from both capacity and safety standpoints where left turns would otherwise share the use of a through lane. Shared use of a through lane will dramatically reduce capacity, especially when opposing traffic is heavy. Left-turn lanes shall be provided at a signalized intersection.

Right-turn Lanes

Right-turn lanes remove the speed differences in the main travel lanes, thereby reducing the frequency and severity of rear-end collisions. They also increase capacity of signalized intersections and may allow more efficient traffic signal phasing.

Length of Auxiliary Lanes

A separate turning lane consists of a taper plus a full width auxiliary lane. The design of turn lanes is based primarily on the speed at which drivers will turn into the lane, the speed to which drivers must reduce in order to turn into the driveway after traversing the deceleration lane, and the amount of vehicular storage that will be required. Other special considerations include the volume of trucks that will use the turning lane and the steepness of an ascending or descending grade.

The total length of an auxiliary lane is made up of the storage length plus the distance necessary to come to a stop from the prevailing speed of the road and the taper distance (which both vary based on speed). The length needed for a vehicle to come to a stop from either the design speed or an average running speed of a roadway are shown in Table 8. These deceleration lengths assume the roadway is on a 2 percent or less vertical grade. The storage distance plus the deceleration distance and taper distance will result in the total length of an auxiliary lane (Figure 6).

A taper length of 90 ft for speeds below 45 mph, 140 ft for speeds of 45 to 50 mph, and 180 ft for speeds over 50 mph is typical. If a two-lane turn lane is to be provided, it is recommended that a 10:1 taper be used to develop the dual lanes. The taper will allow for additional storage during short duration surges in traffic volumes.

Table 8 – Deceleration Length

Speed (mph)	Deceleration Length (ft)*
30	170
35	220
40	275
45	340
50	410
55	485
60	510
65	570

*Assume the roadway is on a 2 percent or less vertical grade.

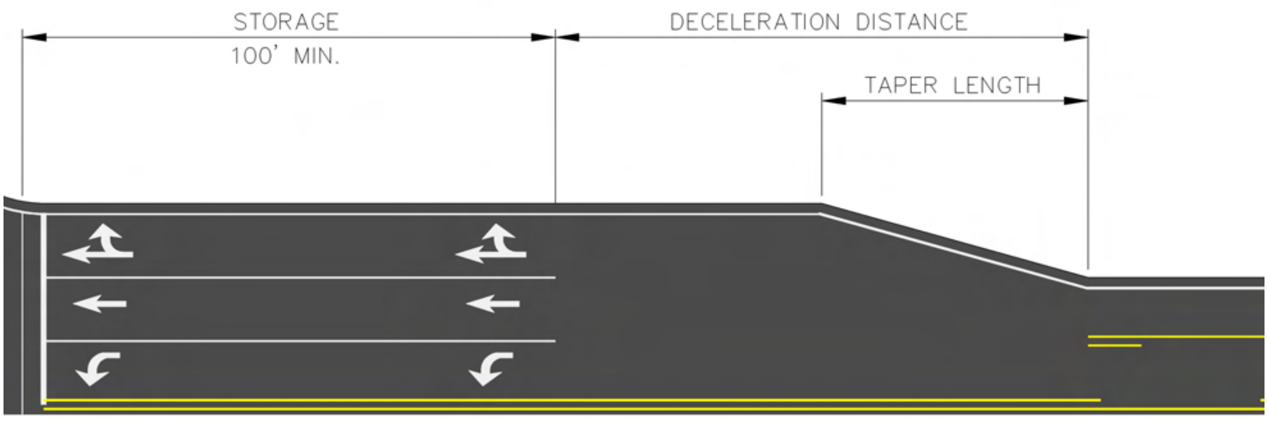

Figure 6 – Auxiliary Lane Length

1.3.13 Pedestrian and Bicycle Access

A key aspect of access management is reducing the number of vehicle trips. This can be accomplished by providing safe and appealing pedestrian access within developments and between adjacent developments.

All new development and redevelopment of existing sites should address pedestrian and bicycle access to and within the site. Sidewalks should be provided in all urban residential subdivisions and in or adjacent to commercial or industrial developments. Sidewalks and other pedestrian facilities should comply with the Americans with Disabilities Act (ADA) Standards for Accessible Design. Crosswalks should be clearly marked and located in appropriate areas. Paint or paving materials can be used to delineate crosswalks. In addition to traditional brick, an alternative involves imprinting the asphalt with a brick design and then painting the crosswalk.

Parking lot designs need to address pedestrian access to the site and circulation within the site. Five foot wide sidewalks or striped pedestrian crossings should be provided from adjacent sites through parking lots to promote safe pedestrian access. Safe and appealing pedestrian circulation systems allow people to park their cars once and walk to different establishments, resulting in an overall reduction in the number of vehicle trips. Joint and cross access between developments can provide opportunities for shared parking.

It is advisable that this policy be reviewed periodically and be modified, if necessary, to reflect the state-of-the-practice in the newly evolving subject of access management.