Report

Access Management Plan

City of

Middleton, WI

December 2006

Report for

City of Middleton, Wisconsin

Access Management Plan

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GENERAL

1.01 OVERVIEW

Access management is a tool to balance transportation system mobility (defined by safety and efficiency) with the access rights of property owners. All properties have the right to access a community's transportation system. The degree of accessibility will vary by functional classification of the adjacent street based on the intended balance of serving mobility and accessibility needs as shown in Figure 1.01-1.

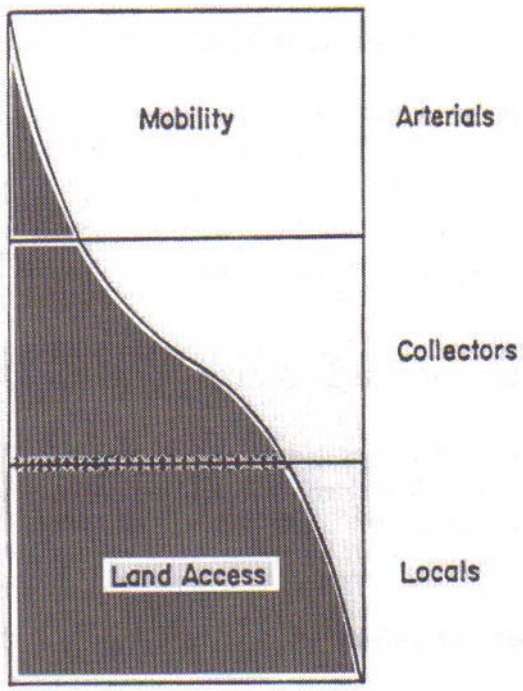


Figure 1.01-1 Functional Street System Mobility

Arterial Streets are intended primarily to provide transportation mobility for through-traffic movements under safe and efficient operating conditions with limited direct access to adjacent land uses. Arterial streets accommodate long-trip patterns and typically carry traffic volumes ranging from 10,000 to 35,000 vehicles per day (vpd). Collectors serve to collect trips from the local street system and route them to the arterial system, as well as provide access to individual properties. Trips on collectors are shorter in length than found on arterials, with traffic volumes typically ranging from 1,000 to 10,000 vpd. In comparison, the primary purpose of local streets is to provide direct access to adjacent properties while maintaining traffic safety. Traffic volumes on local streets in urban areas are generally below 1,000 vpd.

Access management studies have documented that controlling access to adjacent land uses improves traffic safety and operational efficiency as shown in Tables 1.01-1 and 1.01-2.

Access Points per Mile	Median Type		
	Undivided	Two-way Left-Turn Lane	Nontraversable
< 20	3.8	3.4	2.9
20.1 – 40	7.3	5.9	5.1
40.1 – 60	9.4	7.9	6.8
> 60	10.6	9.2	8.2

Table 1.01-1 Crash Rates by Number of Access Points and Type of Median In Urban and Suburban Areas (Crashes per Million Vehicle-Miles Traveled)
Source: FHWA Access Management Manual

Access Points Per Mile	Reduction in Free-Flow Speed
0	0.0
10	2.5
20	5.0
30	7.5
40 or more	10.0

Table 1.01-2 Access Frequency Impact on Traffic Speed
Source: FHWA Access Management Manual.

As shown in Table 1.01-1, the number of crashes per million miles traveled more than doubles when the number of driveway access points per mile increases from less than 20 to more than 40. Similarly, Table 1.01-2 shows that free-flow speeds on arterials and collectors are reduced by 5 mph with 20 access points per mile and by 10 mph on streets with 40 or more access points per mile.

SECTION 2
ACCESS MANAGEMENT

2.01 PRINCIPLES OF ACCESS MANAGEMENT

Access management programs seek to limit and consolidate access points along arterial and collector streets while promoting the use of the supporting local street system for access to developments. Access management controls will vary by the functional classification of a street. The principles of access management, however, are the same for all functional street classifications.

The four major principles of access management are as follows:

1. Minimize the number of access points.
2. Separate conflict areas.
3. Minimize acceleration/deceleration requirements.
4. Remove turning vehicles from through-traffic lanes.

As previously shown in Tables 1.01-1 and 1.01-2, minimizing the number of access points reduces traffic conflict locations along a roadway, improving safety and traffic flow conditions. The separation of conflict areas directly reduces the number of conflict points, the overlapping of traffic movements between conflict areas, and the footprint of conflict areas by limiting vehicle maneuvers at or between adjacent access points. A reduction in vehicle acceleration/deceleration requirements along a street reduces the severity of conflicts by allowing vehicles entering or exiting a roadway to more closely match through-traffic speeds. Finally, the removal of turning vehicles from through-traffic lanes reduces the severity of conflicts by providing storage areas and exclusive channelization for turning movements.

In addition to controlling the spacing and frequency of driveway access points along arterial or collector streets, it is equally important to control the design of driveways. The four factors that are considered critical to sound driveway design are:

1. Throat width
2. Throat length
3. Curb radii
4. Vision corners

These considerations are necessary to minimize adverse effects from vehicle conflicts, backups, and vehicle acceleration/deceleration requirements at each driveway access location.

The sound application of these principles will:

- Reduce crashes.
- Maximize existing street capacity.
- Preserve the public investment in transportation infrastructure.
- Reduce the need to widen or build new streets.
- Protect the value of private investments.

A. Access Location

The goals of access location management are to limit the number of driveways along a street, the spacing between driveways, and their proximity to intersections. Therefore, access location management is divided into three elements: (1) limiting property access to the lowest functionally classified street; (2) limiting access spacing along street segments between intersections; and (3) limiting access along the approaches to intersections.

1. Limit Access to Lowest Functionally Classified Street

Access to arterial streets (and collector streets where possible) should be minimized by requiring access connections to adjacent lower functionally classified streets. Arterial streets are functionally classified to carry high traffic volumes, operate at higher traffic speeds, and serve primarily through traffic. This criteria is typically applied to corner properties with frontage on arterial street and other local streets. With a good urban street network design, this criteria can also be applied to other properties not directly located at street intersections by providing access to minor streets at the rear of lots. If a property can receive access from an adjacent street with a lower functional classification it should not be granted access from the higher functionally classified street. In this manner, traffic access conflicts are shifted to the lower functionally classified street, which will typically have lower volumes and speeds and provide safer conditions. Figure 2.01-1 illustrates an example of requiring driveway access from lower level functionally classified streets. As shown in the Figure 2.01-1, the number of access points is reduced from eight to two along the south side of the east-west arterial street corridor.

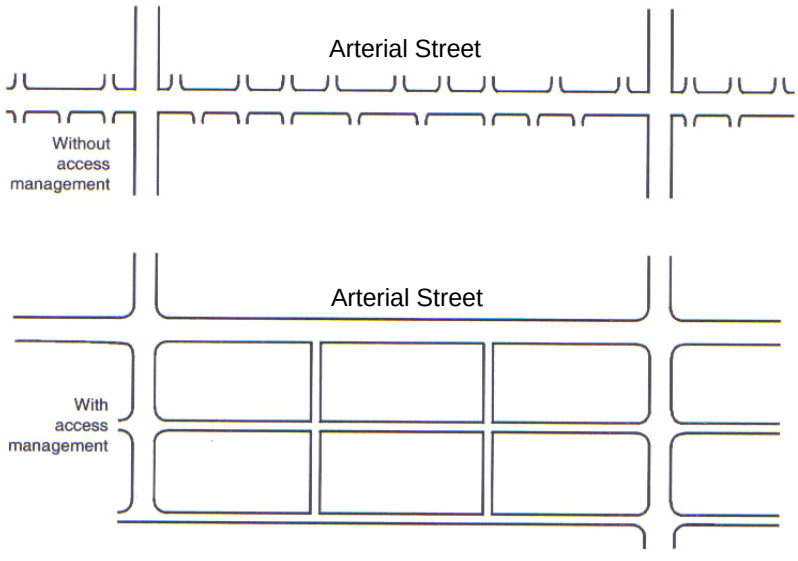


Figure 2.01-1 Example of Limiting Access to Nonarterial Streets

2. Limit Street Segment Driveway Spacing

Driveways should be sufficiently spaced to minimize conflicts from adjacent driveway movements and from through traffic on the adjacent street system. Control of driveway spacing generally requires consideration of the following two criteria: (1) properties should be limited to the fewest possible access points and (2) access spacing should be controlled to minimize traffic conflicts.

a. Limit Number of Property Access Points

Each single-family residential property should be permitted only one driveway. These properties do not generate high traffic volumes and present minimal conflicts with local street traffic movements.

For commercial properties, the number of access points that should be allowed depends on the length of property frontage along an arterial or collector street and the volume of traffic generated by the development. A general rule of thumb requires a property to generate more than 500 trips per hour (typically equivalent to 5,000 trips per day) to justify more than one driveway. Should a property generate this high volume of trips, a second driveway may be considered if its frontage exceeds 600 feet. Three driveways may be considered if the development's frontage exceeds 1,300 feet. A second or third access driveway should only be granted if a traffic impact study for the property indicates a need for two or three access driveways to maintain traffic flow on the street. On a median-divided street, a second driveway can be approved but limited to right-turn entering and exiting movements. If more than one access driveway is required for a major traffic generating property, then the criteria for control of the access spacing should be applied.

On some properties it may be possible to minimize the number of access points by sharing access between adjacent properties. This can be accomplished by encouraging cross easements between adjacent properties and parking circulation designs that accommodate ingress/egress traffic patterns to both properties. Figure 2.01-2 illustrates an example of shared access control between two adjacent properties and how access to four different properties can be reduced to two driveways through shared access.

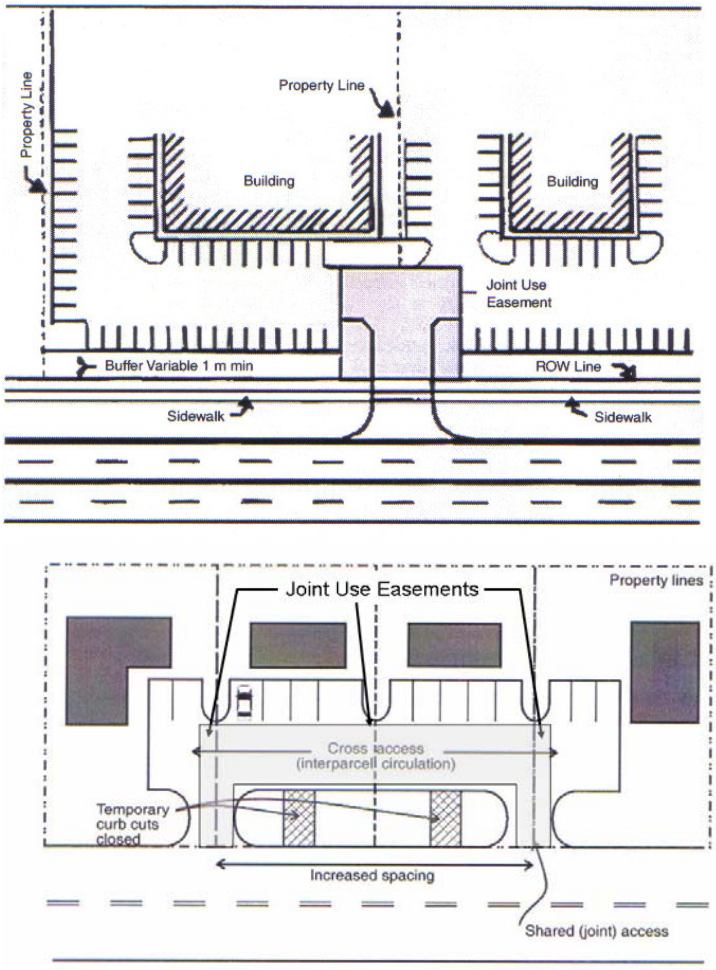


Figure 2.01-2 Shared Access Examples
Source: FHWA Access Management Manual

b. Control Access Spacing

Driveways should be adequately spaced to limit traffic entrance/exit maneuver conflicts between driveways. Each driveway should be located based on its proximity to adjacent driveways, driveways on the opposite side of the street, and if the street is median-divided, its proximity to a median opening. Table 2.01-1 illustrates minimum recommended driveway spacing criteria based on the posted speed limit of the arterial or collector street.

Posted Speed (mph)	Driveway Spacing (Center to Center)
25	105 feet
30	125 feet
35	150 feet
40	185 feet

Table 2.01-1 Driveway Spacing Criteria
Source: FHWA Access Management Manual

The application of the minimum spacing requirement assumes that a property has sufficient frontage to provide the required spacing. When a property does not have sufficient frontage along a street or the ability to share access with adjacent properties to meet this criterion, each property can be granted an individual access driveway. Under the above condition, access should be located to maximize spacing between adjacent property driveways.

On median-divided streets, driveways should be located to align with existing or planned median openings or be sufficiently located away from the median opening to account for a future driveway to be located at the median opening. This is required to minimize median-traffic movement conflicts with adjacent driveway movements. Table 2.01-2 illustrates minimum recommended median opening spacing requirements based on posted speeds for arterial and collector streets with nonresidential development land uses.

Posted Speed (mph)	Median Opening Spacing
25	300 feet
30	370 feet
35	460 feet
40	530 feet

Table 2.01-2 Median Spacing Criteria
Source: FHWA Access Management Manual.

For undivided streets, driveways on opposite sides of the street should be located across from each other, be spaced at least 150 feet apart for driveways to minor generators, or 300 feet apart for driveways to major generators. Minor generators are defined as developments that generate less than 5,000 trips per day. Major generators are defined as developments that generate greater than 5,000 trips per day. For arterial and collector streets with residential land uses, it is typically not feasible to provide 150-foot driveway spacing because of limited property frontage widths. Under this condition, spacing requirements of residential driveways on opposite sides of the street that cannot be located across from one another are reduced to 50 feet.

3. Limit Intersection Approach Clearance

The location of access driveways in proximity to street intersections should avoid the functional area of an intersection. The functional area of an intersection varies based on traffic queuing on the approaches to an intersection as well as traffic flow characteristics on each of the legs exiting an intersection. Figure 2.01-3 shows the general functional area of an intersection.

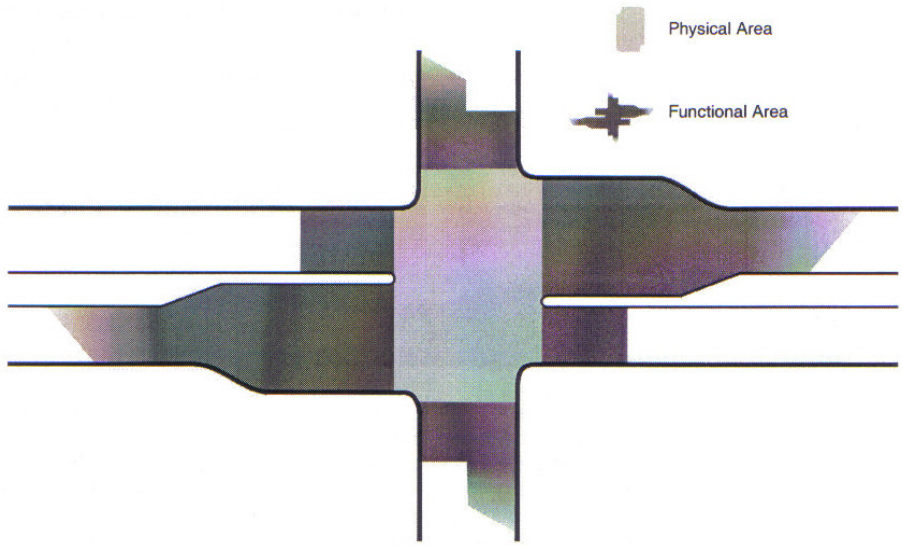


Figure 2.01-3 Intersection Functional Area
Source: FHWA Access Management Manual.

Traffic movements entering or exiting driveways within an intersection's functional area add conflict points to the intersection. As shown in Figure 2.01-4, a standard four-leg intersection has a total of 32 conflict points without any conflicts from nearby driveway traffic movements.

Turning movements at a driveway located within an intersection's functional area complicate driving activity and can lead to crashes. Driveway movements can also be blocked by vehicles queued at an intersection approach resulting in driver delays and frustration, which can also lead to increased crashes.

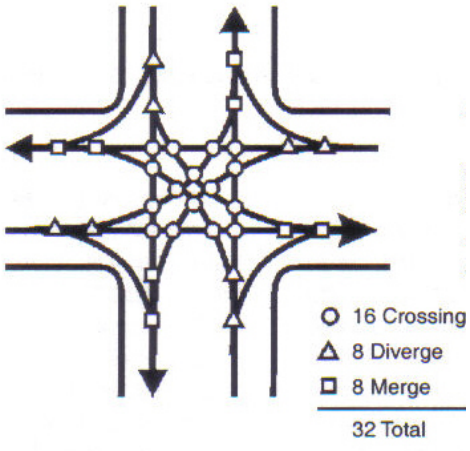
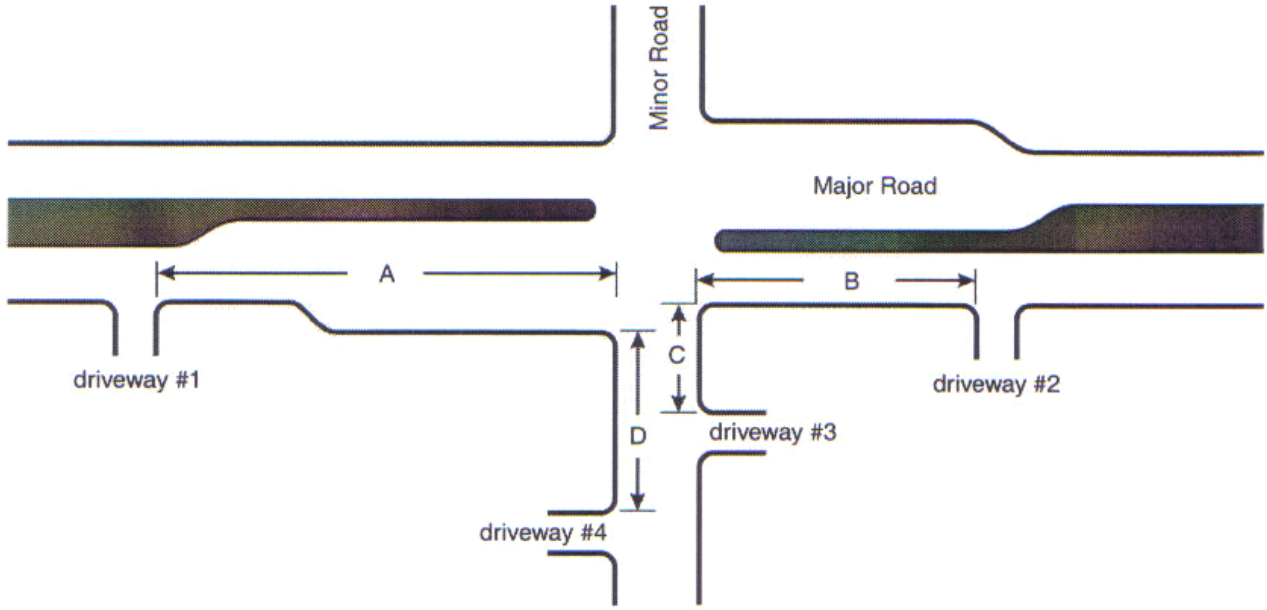


Figure 2.01-4 Intersection Conflict Points
Source: FHWA Access Management Manual

Figure 2.01-5 provides recommended minimum driveway spacing criteria for the approaches to intersections controlled by stop signs or traffic signals.



Clearance Type	Volume in Lane Adjacent to Access	Intersection Capacity	Posted Speed	Min. Corner Clearance
A – Upstream on Major Street			20 mph	115 feet plus queue storage
			30 mph	270 feet plus queue storage
			40 mph	420 feet plus queue storage
			50 mph	610 feet plus queue storage
B – Downstream on Major Street			30 mph	200 feet
			40 mph	305 feet
			50 mph	425 feet
C – Approach Side on Minor Street	50 vph, ~500 ADT	< 100 vph (Stop control with high cross traffic)		100 feet
		> 100 vph (Stop control with low cross traffic)		50 feet
	100 vph, ~1,000 ADT	<100 vph (Stop control with high cross traffic)		100 feet
		<200 vph (Stop control with low cross traffic)		75 feet
		>200 vph (Signal Control)		50 feet plus queue storage
D – Departure Side on Minor Approach			20 mph	115 feet
			30 mph	225 feet
			40 mph	365 feet
			50 mph	535 feet

Figure 2.01-5 Corner Clearance Criteria at Controlled Intersections
Source: FHWA Access Management Manual

B. Driveway Design

Driveway design has a major effect on street traffic operation and on property traffic circulation patterns. Conflicts between entering and exiting driveway traffic, both left- and right-turn movements, with street through-traffic movements can increase traffic delays and crashes. Poor parking lot traffic circulation can directly affect street traffic operating conditions by slowing or queuing vehicles into street traffic. Figure 2.01-6 illustrates some of the major driveway design elements for nonresidential land uses.

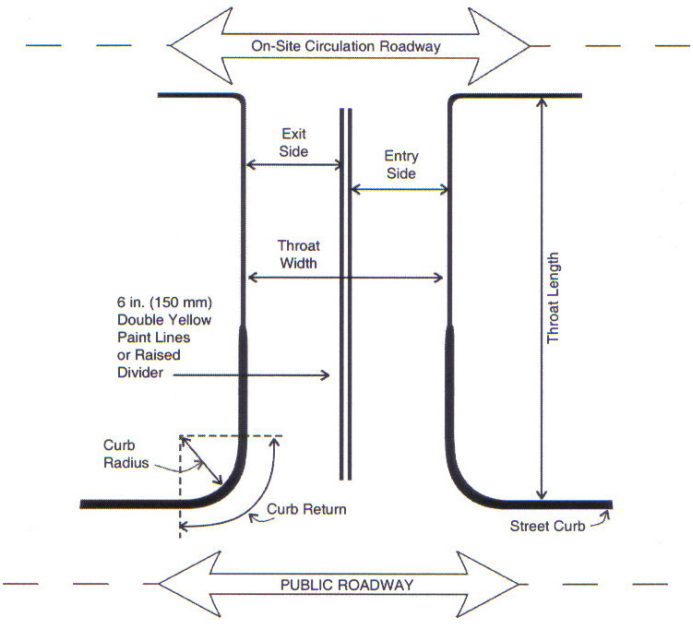


Figure 2.01-6 Nonresidential Driveway Design Elements
Source: FHWA Access Management Manual.

1. Driveway Throat Width

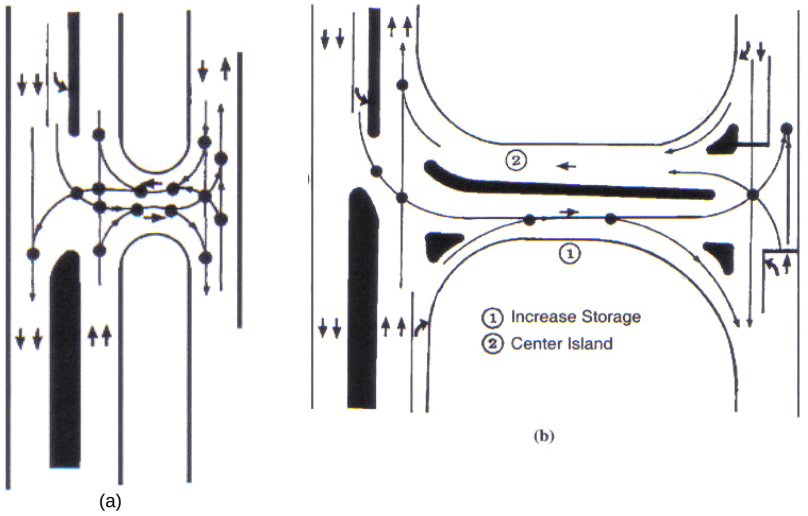
Driveway throat width and curb radii are related and control vehicle entering speeds that can affect through-traffic movements on the street. Driveway width also affects pedestrians and bicyclists. Narrow driveways serve to minimize the conflict zones between vehicles and crossing pedestrians or bicyclists. Studies have shown the driveway throat width on single-entry lanes should be 14 feet. The driveway throat width of 14 feet permits an entering vehicle to maintain a reasonable speed when entering the development. Only when two lanes are required for movements into a major traffic generating development, or additional width is required to accommodate regular trucking access to manufacturing or light industrial development, should a driveway be widened beyond the recommended maximum single-entrance lane width of 16 feet.

Driveway exit lane widths should be a minimum of 10 feet unless a traffic impact study shows a need for additional lanes. Whether signed or not, Wisconsin Statutes require drivers to stop in the driveway prior to entering the street. If two lanes are required for operational purposes to minimize driveway queuing or to separate right-turn vehicles from through or left-turn exit

movements, the exit lanes should be 10 to 12 feet wide and separated from entering traffic by a raised median with a minimum width of 4 feet. The median width is necessary to protect traffic control signage that may be located within it.

2. Driveway Throat Length

As shown in Figure 2.01-6, driveway throat length is the distance between parking lot circulation activity and the street curb. Parking space activity and site circulation roadways should be separated from traffic entering or exiting the driveway to avoid the overlapping driveway entrance and parking lot circulation conflicts as shown in Figure 2.01-7.



(a) = poor design
(b) = good design

Figure 2.01-7 Driveway Design Examples

The standards shown in Table 2.01-3 should be applied to the design of driveway throat lengths. For major traffic generators (greater than 5,000 trips per day), a traffic impact study analysis should be used to identify exit queuing conditions that may require additional throat length.

Parking Spaces per Exit Lane	Land Use			
	Multifamily	Retail	Office	Industrial
0-200	25 feet	25 feet	25 feet	50 feet
201-400	25 feet	50 feet	100 feet	150 feet
401-600	50 feet	150 feet	200 feet	add lanes
601-700	100 feet	200 feet	add lanes	
> 701	200 feet	add lanes		

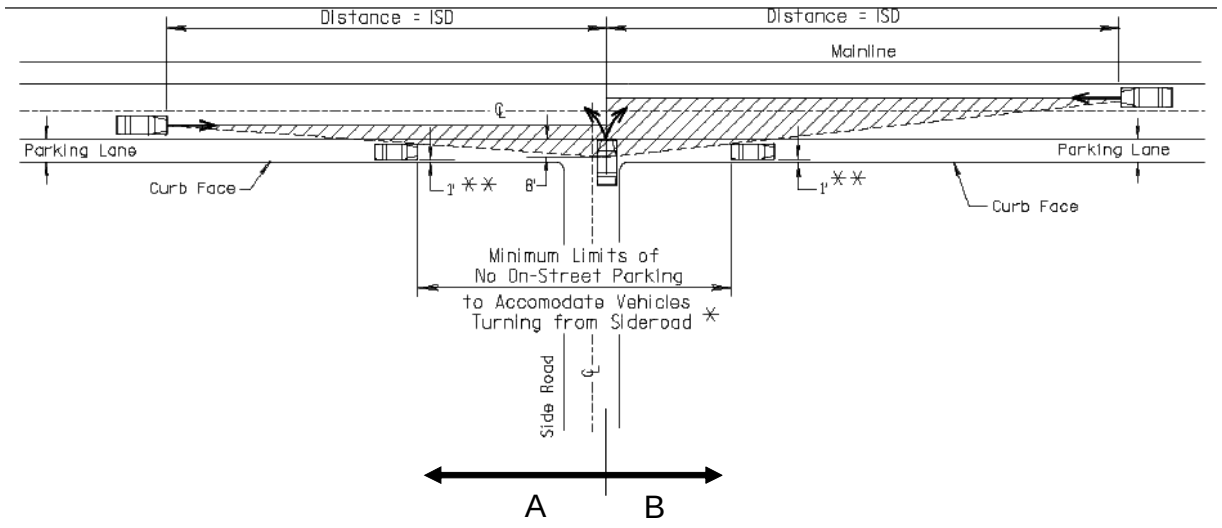
Table 2.01-3 Recommended Minimum Driveway Throat Length
Source: NCHRP Report 348, Access Management Guidelines for Activity Centers

3. Driveway Curb Radii

Curb radii design affects the turning radius used by vehicles entering a driveway and the speed of right-turning vehicles. Increased radii and vehicle speeds have a negative impact on pedestrian safety on adjacent sidewalks. Commercial/industrial driveway radii should range between 10 to 15 feet. This standard may require that larger trucks encroach on the exiting travel lane of the driveway when entering. In instances where the driveway radius is greater than the terrace width, the entrance will not be tangent to the driveway edge.

4. Driveway Vision Corners

The final element of sound driveway design on arterial streets is the provision of adequate sight distance for entering and exiting vehicles. Vision corners shown in Figure 2.01-8 are defined by American Association of State Highway and Transportation Officials (AASHTO) based on the availability of gaps and speed of through traffic on the adjacent street system. The Intersection Sight Distances (ISD), shown in Figure 2.01-8, are those recommended by the Wisconsin Department of Transportation in its Facilities Development Manual. The recommendations for residential/commercial driveways are based on a passenger car design vehicle, while those for industrial driveways are based on a single-unit truck design vehicle.



Residential/Commercial Driveways

Design Speed	ISD to Left	A = Parking Restriction to Left	ISD to Right	B = Parking Restriction to Right
25 mph	295 feet	170 feet	370 feet	115 feet
30 mph	355 feet	205 feet	445 feet	140 feet
35 mph	415 feet	240 feet	515 feet	160 feet
40 mph	475 feet	275 feet	590 feet	180 feet

Industrial Driveways

Design Speed	ISD to Left	A = Parking Restriction to Left	ISD to Right	B = Parking Restriction to Right
25 mph	370 feet	215 feet	445 feet	140 feet
30 mph	445 feet	255 feet	530 feet	165 feet
35 mph	515 feet	295 feet	620 feet	190 feet
40 mph	590 feet	340 feet	710 feet	220 feet

Figure 2.01-8 Driveway Vision Corners on Arterial Streets
Source: Wisconsin DOT Facilities Development Manual

The City of Middleton Public Works Committee decided that parking restrictions on collector streets will be considered on a case by case basis. Collector streets may either be subject to the restrictions shown in figure 2.01-8, or to State Statutes depending on the specific circumstances. Local streets will continue to be subject to State Statutes only.